TEACHER CANDIDATES’ IMAGINATIVE CAPACITY AND DISPOSITIONS TOWARD USING ICT IN PRACTICE

by

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M.A., The University of British Columbia, 2007

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY in THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES 
(Curriculum and Pedagogy)

THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)

December 2015

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Abstract

The study investigated the relationship between instructional discourses in a pre-service teacher education program and teacher candidates’ subsequent plans to use ICT in their professional practice. Teacher candidates’ dispositions, in terms of comportment and composure, were seen as indicative of the quality of their relationship with ICT. Teacher candidates’ manifestations of these dispositions, in terms of ICT imaginative capacity, were seen as indicative of the characteristics of their use (what they had the capacity to imagine and the capability to implement). Manifestations of dispositions were described as displays of ICT imaginative capacity.

The setting for the study was a post-baccalaureate two-year teacher education program in a large regional university in western Canada. Participants in the study were comprised of a thirty-eight member cohort of teacher candidates in the first year of their two-year program. A sub-group of teacher candidates was self-selected from the cohort and participated in a research intervention.

This study adapted a social constructivist theoretical framework complemented by an enactive analysis of social interactions examining communicative events from the teacher education program. An interpretive case study methodology collected data from teacher education classes, teacher candidate questionnaires, and focus group discussions. These three datasets were analyzed and interpreted to explore relationships between instructional discourses and teacher candidates’ dispositions toward using ICT.

Findings document teacher candidates’ dispositions toward using ICT as demonstrated by their capacity to imagine using ICT and their capability to implement these imaginings in practice. Conclusions suggest a need for further research into “ecologies of learning”.

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Recommendations also include a need to investigate instructional discourses with regards to developing ICT imaginative capacity and imaginative capability. The need to develop imaginative capacity extends beyond when, where, why, how, or what ICT teachers learn to use in practice.
Preface

This research study obtained the approval of the UBC Research Ethics Board - UBC BREB Number: H05-0091. Participants in the study provided consent and pseudonyms were used in the dissertation (See Appendix A Invitation to Participate, Appendix B Information / Consent Form). The research reported in this dissertation was originally proposed and funded under a SSHRC grant issued to Dr. Don H. Krug. Dr. Krug served as Principal Investigator on the study reported in this dissertation. The original SSHRC grant covered a three-year project; data collected during the first year is reported in this dissertation.

Dr. Krug designed the overall research design for the SSHRC grant, including the concept of using a theoretical framework based the idea of “ecology of cognition”, and the methods used to collect data.

I acted as Research Coordinator on the three-year project, organizing and contributing to research design, data collection, data management and analysis. My official position was as Graduate Research Assistant. Over the three-year project I was active in all aspects of the data collection, storage, and analysis. Another Masters level graduate student, Bonnie Wen, participated in collecting approximately half of the in-class observations and wrote Term End Reports of her observations and reflections. Her reports were partially used for parts of this dissertation.

Data from this study was published previously in two book chapters co-authored by Dr. Krug and myself. I was first author on one of the chapters. These chapters were written through a collaborative process; Dr. Krug primarily developed the work on efficacious learning and ICT pedagogy, as well as resilience and leadership. I did extensive reading and writing on developing
the concept of social constructivism complemented by enactivism, which is further elaborated
and developed in this dissertation.

Although I used the data collected under Dr. Krug’s supervision, the research and writing
in this dissertation are entirely my own. Some language from the original research proposal was
used in the early stages of writing and some vestiges of these ideas and references were included
to demonstrate the relationship between my development of the problem, theory, and methods, in
relation to the original spirit of Dr. Krug’s proposal. The book chapter citations include:

pedagogical and technological adaptability. In S. Mukerji & P. Tripathi (Eds.), *Cases on*
interactive technology environments and transnational collaboration: Concerns and
perspectives (pp. 74-93). Hershey, PA: IGI Global.

Arntzen, J. & Krug, D. (2011) ICT ecologies of learning: Active socially engaged learning,
resiliency and leadership. In S. D’Agustino (Ed.), *Adaptation, resistance and access to*
instructional technologies: *Assessing future trends in education* (pp. 332-354). Hershey,
PA: IGI Global.

My discussion on the problem of instrumental conceptions of ICT and referring to all
digital technologies as ‘tools’ was initially developed as a journal article in collaboration with
Dr. Krug and Bonnie Wen, fellow GRA as indicated. This article was published as:

all complex digital technologies “Tools”. *International Journal of Education and*
Development using ICT, 4(4).
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Acknowledgements

I acknowledge and am grateful for the direction from my Supervisor Dr. Don H. Krug: His conception of this study and SSHRC grant enabled me to design the study as well as perceive learning as social and ecological phenomena.

I acknowledge the support of Acting Supervisor Dr. Samson Nashon. His support and instruction made it possible for me to complete the writing of this dissertation.

I acknowledge the support of my committee members, Drs. Stephen Petrina and E. Wayne Ross. Their interest in this study and insightful questions helped me to crystalize my thoughts to synthesize my research experiences and development of an enactive theoretical framework.

I also acknowledge the instruction of Dr. Dennis Sumara in my understanding of enactivism. In May 2008, I attended a course he taught titled “Consciousness, Curriculum & Aesthetic Experience”.

Special thanks are offered to the indomitable spirit and generosity of the research participants who contributed data for this study. I couldn’t have done it without you!

With great gratitude I acknowledge the unstinting support and encouragement of my husband, Matthew Thompson, best friend, Nancy Thome, and son, Rye Stevenson. It is to them I owe a debt of gratitude for uncounted hours of listening to me talk about the research, reading convoluted, confusing prose, and discussing what I ‘really mean to say’. I thank my family and friends who have stood by, over many years, with unconditional support to see me conclude the writing of this dissertation.
Finally, I would be remiss if I did not mention my debt of gratitude to my research companions, Skipper (deceased March, 2015) and Jethro, two rescue dogs who accompanied me on the long, lonely hours of writing up this research.
Dedication

This research is dedicated to teachers everywhere: in the trenches of beleaguered public education, and in the critically robust halls of higher education. On you we rely for an informed educated citizenry, through which we foster healthy democracy. You are not alone.
Chapter 1: Introduction to the Research

The research reported this dissertation was carved from a three-year SSHRC-funded study investigating pre-service teacher education and teacher candidates’ development of technology-related professionalism in practice. The original grant was titled, “Seeds of Possibility: Mentoring K-7 Educators’ ICT [Information and Communication Technologies] Ecology of Cognition”. The grant set out to examine the challenges of developing ICT knowledge, skills and literacy (Krug, D. H., 2007) in a two-year elementary teacher education program. A thirty-eight member cohort of teacher candidates participated in contributing data to the study. In this dissertation I examined these teacher candidates’ disposition toward using ICT in practice while learning to teach. Specifically, I investigated the relationship between instructional discourses and teacher candidates’ dispositions toward using ICT in teaching throughout their extended practicum.

Figure 1 Overview of three-year SSHRC funded study
In my role as graduate research assistant (GRA) I was instrumental in collecting data in all facets of the study. I observed, first-hand, teacher candidates’ experiences of instructional discourse in their teacher education classes. At the end of the first year, I facilitated teacher candidates’ completion of questionnaires and focus group discussions pertaining to their experiences of instructional discourse and their dispositions toward using ICT in practice. In this dissertation I combine these three sets of data to address the research problem.

The theoretical basis for the three-year study was comprised of Lave and Wenger’s (1991) and Lave (1992) concepts of communities of practice to theorize how teacher candidates develop professionally. Krug (2007) was interested in examining how communities of practice among teacher candidates in a teacher education program could support shared meaning making in different situations (during their teacher education courses, during their extended practicum placements, and during their induction year of teaching). Krug conceived these extensions of communities of practice relationships as an “ecology of cognition”.

During the first year of the study, in my role as GRA, I was impressed by the complexity and diversity of dispositions toward ICT as exhibited by education instructors, teacher candidates, and elementary school teachers. I also observed a dismaying evolution of teacher candidates’ disposition toward ICT over the course of the first year of the study. I found the concept of communities of practice, especially with regards to ICT dispositions, did not provide an adequate explanation of the relationships and phenomena I was observing, or contained in teacher candidates’ end of year questionnaires and focus group discussions.

A social constructivist enactive approach allowed me to broaden my conception of the teacher candidates’ learning ICT during their pre-service education from multiple and overlapping rings of communities of practice to a more holistic ecological concept of networks.
of relationships conditioned by institutional settings, instructional discourse, and teacher candidates’ personal dispositions toward ICT. In this sense, I conceived the relationship between instructional discourses and teacher candidates’ ICT dispositions as an ecological system constituted through social relationships and communicative events. These social relationships and communicative events were seen to be constitutive of teacher candidates’ ICT dispositions. I adapted a social constructivist theory complemented by enactivism to analyze and interpret the data from the first year of the study.

In this dissertation I report how instructional discourse contributes to the social construction of teacher candidates’ ICT dispositions. I explain the relationship between instructional discourses and teacher candidates’ ICT dispositions as enactive of teacher candidates’ autopoietic interpretation, which, in turn, lead to the emergence of ICT ‘ecologies of learning’. My use of enactivism in social science, and educational, research, is not unique. Other researchers (Haskell, Linds, & Ippolito, 2002) have addressed issues of reflexivity and subjectivity in qualitative research by incorporating enactivity as a qualitative research approach. They argue that an enactive approach explains how engagement in shared action (in the case of this study, communicative events) emerges as collective dispositions. Some researchers (De Jaegher & Di Paolo, 2007) have applied enactive concepts to the process of interaction between individuals in social encounters. They conceived social cognition as the interplay between unfolding interaction processes and the individuals engaged in it. Davis and Sumara brought concepts of cognition, complexity and ecology into education and educational research (Davis & Sumara, 1997; Davis, Sumara, & Kieren, 1996; Davis, Sumara, & Luce-Kapler, 2000; Davis, Sumara, & Luce-Kapler, 2008; Sumara & Davis, 1997).
1.1 ICT Education Policy and Instructional Discourse in Canada

In order to understand the relationship between instructional discourses and teacher candidates’ ICT dispositions, it is necessary to understand the educational policy conditions socially constructive of instructional discourses pertaining to ICT. In Canada, the role of teachers/educators and teacher education or teacher training programs are undergoing major changes, and will continue to do so as more complex challenges, such as using ICT in the classroom, present themselves (Petrina, Bartosh, Guo, & Stanley-Wilson, 2008). To better understand the relationship between education policy and instructional discourse, I examined government and institutional policy and guidelines, provincial education ministry instructional resource packages and prescribed learning outcomes, provincial teacher accreditation criteria, and provincial teacher education program ICT requirements.

In British Columbia, the Ministry of Education is implementing a new education plan that is impacting curriculum, assessment, and pedagogy. The slogan driving this change is, “The world has changed, the way we educate our children should too.” 1 “Technology is changing the way we communicate and connect with each other,” the Ministry states. 2 On the curriculum page the Ministry of Education sets the education standards for students in grades K to 12 through the provincial curriculum. These standards are called Prescribed Learning Outcomes (PLOs). PLOs outline the expectations for what students should know and be able to do at each grade and within each subject area. 3

1 http://www.bcedplan.ca/  
2 http://www.bcedplan.ca/theplan.php  
3 http://www.bced.gov.bc.ca/irp/welcome.php
The Ministry of Education provides ICT Integration (ICTI) Performance Standards. These can be found under the heading “Classroom Assessment – BC Performance Standards”. These standards are applicable to Grades 5 to 10 and are intended to support teachers and students as they use technology to enhance learning across the curriculum. There are four aspects of these standards: to gather, organize, and present information, and to analyze and interpret information. The Ministry’s “Digital Literacy Standards” includes a larger scope of expectations for students and teachers, including Creativity and Innovation, Communication and Collaboration, Research and Information Fluency, Critical Thinking, Problem Solving, and Decision Making, Digital Citizenship, and Technology Operation and Concepts.

The BC Teacher Regulation Branch administers Standards for the Education, Competence and Professional Conduct of Educators for accreditation in the province. The standards do not reflect the statements of the Ministry’s education plan nor the ICT and digital literacy standards. The terms, “ICT”, “digital”, and “technology” do not appear in the accreditation standards document. Becoming certified to teach in the province does not require ICT skills, knowledge or experience. This disconnect, between definitions and expectations for ICT at the level of the Ministry, and standards pertaining to accreditation of educators, suggests a gap with regards to ICT in the field of education and implementation of ICT in the teaching profession.

There are nine teacher education programs offering B.Ed. degrees in the province. None of these programs reflect the Ministry’s ICT statements and rarely do they mention the ICT

4 http://www.bced.gov.bc.ca/perf_stands/icti/
5 http://www.bced.gov.bc.ca/dist_learning/activitygrid.htm
6 http://www.bcteacherregulation.ca/documents/AboutUs/Standards/edu_stds.pdf
performance standards. There are no admission, nor graduation, requirements for ICT skills or knowledge required by any of these programs. In the teacher education program in our study, there is a requirement to submit, immediately prior to completion of the program, an e-Portfolio to demonstrate a meeting of the standards for certification, but the e-Portfolio itself is not incorporated as an integral part of learning ICT and proved problematic in our study. Based on discourse pertaining to ICT at the Ministry and the absence of specific program requirements for ICT in teacher education, there appears to be a significant gap between ICT discourses at the policy level, teacher accreditation, and educational practice in teacher education programs in the province.

A wider examination of provincial education policy, teacher accreditation requirements and teacher education entrance and graduation requirements in Canada revealed a similar situation as was found in the home province of this study (Petrina et al., 2008). For the most part across Canada, there is not a comprehensive, coherent relationship among educational policy statements pertaining to ICT in education, teacher accreditation requirements, and entrance or graduation requirements from teacher education programs. The problem of ICT in education is not limited to the province where this study took place, or to Canada.

1.2 Problem Statement

Previous studies have found that educators who do not consider themselves technologically literate struggle to learn to use ICT (Darling-Hammond & Sykes, 1999; Guo, 2006; Zhao, Pugh, Sheldon, & Byers, 2002). In addition, studies that have investigated ICT in education seldom address the sociocultural background that conditions educators’ relationships to ICT in teacher education and professional development program (Cuban, 1993; Cuban, 1996;
Cuban, 1996; Cuban, 2012; Cuban & Kirkpatrick, 1998; Cuban, Kirkpatrick, & Peck, 2001). There continues to be a need for empirical research that analyzes the relationship among institutional ICT policies, education instructors’ ICT-related instructional discourses, and teacher candidates’ dispositions toward using ICT in practice (Froese-Germain, Riel, & McGahey, 2013; Petrina et al., 2008; Prestridge, 2012; Smith, 2012).

For example, in the province where this study took place, the Ministry of Education reported that school districts were well prepared to focus on teaching and learning that incorporates ICT to enhance student achievement (Jordan, 2010). However, this view was contradicted by the admission that the actual implementation of this level of incorporation had yet to be determined. During the period of this study, there was a controversy regarding the implementation of digitized student records system that was to put a computer on every teachers’ desk (Kuehn, 2009; Kuehn, 2011; Kuehn, 2011; Kuehn, 2011). Professional educators, and, consequently teacher educators, were challenged to make sense of how, and even why, they should learn to use ICT with regards to provincial learning expectations.

On a broader scale, the issue of institutional policy and ICT implementation reflects a similar dynamic. Voogt and Roblin (2012) examined international and national educational policy documents and identified a gap between the everyday use (or non-use) of ICT in classrooms and institutional statements about the centrality of ICT for learning. Voogt and Roblin found horizontal consistency across international concepts of ICT in education as at the core of new frameworks for national education policy and curriculum implementation. However, they also found that, despite political commitment to support ICT in education, most teaching practices did not reflect these concepts at school and classroom levels. Voogt and Roblin
concluded there was a discursive gap in terms of vertical consistency between government education policy and educators’ disposition toward using ICT in practice.

To give a sense of the breadth of the problem in the field of education, ICT use was monitored in schools for a decade (Kozma, 2003; Law, 2009; Pelgrum & Anderson, 1999). Across twenty-six countries around the world, only 6% of the schools had adopted ICT school-wide and throughout the curriculum. In another case, Law (2009) looked at representative samples of grade 8 science and mathematics teachers across 22 educational systems and found that many teachers who were having curriculum goals that used ICT for learning did not apply them in their classroom practice.

The issue of ICT implementation in education, including teacher education, is not a small or localized problem. The rate and magnitude of societal change associated with ICT has been so great as to usher in the “Digital Age” and “Knowledge Economies” based on new approaches to employment. The preparation of teacher candidates’ dispositions to use ICT has been a key research question for decades (Cuban, 1993; Cuban, 1996; Cuban, 2001; Cuban et al., 2001; Cuban, 2012). The problem of this research was to explore the relationship between instructional discourses and teacher candidates’ dispositions toward using ICT in teaching.

1.3 Purpose of the Research

The purpose of this research was to inform ICT policies, teacher accreditation and teacher education practices, as well as bring forward enactive concepts for understanding the relationship between instructional discourses and teacher candidates’ dispositions toward using ICT in teaching.

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between instructional discourses and teacher candidates’ dispositions toward ICT. The problem of ICT in education has a long history. Perhaps an enactive approach can provide an opportunity for broadening perspectives and deepening understanding, toward creating conditions for productive and sustainable change in education practice.

1.4 Research Question

The question guiding the research reported in this dissertation is: What is the relationship between instructional discourses in a teacher education program and teacher candidates’ dispositions toward using ICT when they teach on their extended practicum?

Answering this question involves studying ICT-related instructional discourses in the teacher education program and teacher candidates’ dispositions toward using ICT on their extended practicum. Instructional discourses were studied through first hand observation and second hand reports from the teacher candidates. Teacher candidates’ dispositions toward ICT in practice were gleaned from end of study questionnaires and focus group discussions.

1.5 Key Terms

For the purposes of this study:

Disposition refers to participants’ emotional and mental states conveyed through their comportment and composure while engaging with ICT in teaching settings. Page, Rudney and Marxen (2004) defined disposition, as applied to preservice education, as “teachability” (p. 30)—a disposition that encompasses a variety of values and actions, including consideration and action upon suggestions from knowledgeable others, reflections on teaching practice, and commitment to continuous learning. Liang, Chang, Chang, and Lin (2012) discussed the role emotion plays in
a creative disposition, that is, the capacity to endure painful struggles in thoughts, feelings and emotions during creative activity. Zeichner (2003) noted that teacher dispositions should include the capacity to view differences and difficulties as resources for learning rather than difficulties to overcome.

For the purposes of this study, teacher candidates’ dispositions, in terms of comportment and composure, were seen as indicative of the quality of their relationship with ICT (emotional and mental engagement). Teacher candidates’ manifestations of these dispositions, in terms of ICT imaginative capacity, were seen as indicative of the characteristics of their use (what they had the capacity to imagine and the capability to implement). Manifestations of dispositions were described as displays of ICT imaginative capacity.

**ICT Imaginative Capacity** refers to participants’ capacity to imagine using ICT as an integral part of their teaching practice and their capability to implement these imaginings in classroom settings. One characteristic of ICT was identified as demonstrations of ICT imaginative capacity in educational settings. According to Auger (1981), “there is a similarity between early indications of artistic capacity and the imaginative capacity needed by those who become scientists” (p. 144). A focus in this research was on “the imaginative capacity needed by those who become” teachers using ICT. Auger states that certain practices “can stifle the imaginative capacity needed for the proposal of new ideas” (p. 144). This research explored whether there may be instructional discourses or practices that may stifle teacher candidates' ICT imaginative capacity.
1.6 Limitations

There are three key limitations noted herein. First, this was a study of modest scale, taking place in one teacher education program with a sub-group of one cohort of thirty-eight teacher candidates. This cohort of thirty-eight teacher candidates represented approximately 10% of the entire elementary teacher education enrollment that year.

Second, this was a study of dispositions but it took place within a limited time frame. In the normal course of events, it takes time for dispositions to change, to show up. The data and findings discussed in this study represent a very preliminary result in terms of research intervention and changes to dispositions.

Third, this study was limited to the contexts of the teacher education program at the university and the elementary schools that teacher candidates attended on their extended practicum. These contexts, both at the university and in the elementary school settings, were not necessarily conducive to using ICT in practice. It cannot be assumed that every teacher candidate had the same opportunity to develop a disposition to use ICT because the actual technological conditions varied for each teacher candidate.

1.7 Dissertation Overview

This dissertation is comprised of six chapters. Chapter One, Introduction to the Research, provided context for the dissertation. It included the problem statement, the purpose of the research and the research question.

Chapter Two, Theoretical Framework, describes how social constructivism is used in the study, and, how this theory is complemented by Varela, Thompson and Rosch’s ecological theory of human experience as enactivism. I review instructional discourse in terms of Bakhtin’s
theory of dialogism and the dialogic imagination and complement this work with Maturana and
Varela’s theory of autopoiesis. I review sociocultural structures of discourse in terms of
Foucault’s work on the meaning of communicative events. I complement Foucault’s theory with
Maturana and Varela’s theory of linguistic cognitive domains as explanatory of how language
use constructs social relationships. I review Deleuze and Guattari’s theory of fuzzy aggregates
and consolidation to understand the institutional contexts of instructional discourse, and
complement their work with Luhmann’s theory of the autopoiesis of social systems, that is, how
social systems serve to re-create themselves through language and cultures of language-use.

Chapter Three, Methodology, describes how social constructivism complemented by
enactivism informs the methodology for data collection and analysis. It provides an overview of
the methodology that guided the study. The research setting and participants are described.
Methods and procedures are described in detail with regards to both data collection and analysis.

Chapter Four, Data, Analysis and Findings, provides a detailed description of the
institutional, technological and sociocultural conditions that constituted the environmental
conditions of the study. Three datasets are reported: observations from teacher education
classrooms, end of study questionnaire, and end of study focus group discussions. These dataset
reports are divided into two subsections: description and analysis, and findings.

Chapter Five, Discussion, brings forward key findings from Chapter Four in relation to
the theoretical framework described in Chapter 2. This discussion is organized around five key
findings: 1) Discordant discourse conditions pertaining to ICT in the field of education; 2)
Instructional discourse socially constructive of teacher candidates’ ICT engagements in practice;
3) Instructional discourse enactive of teacher candidates’ relationship to learning ICT; 4)
Instructional discourses and manifestations of teacher candidates’ dispositions to using ICT; and
5) Instructional discourses and teacher candidates’ ICT imaginative capacity. Chapter Six, which is the last, puts forth Conclusions and Implications from the study.
Chapter 2: Theoretical Framework

The literature reviewed in the introductory section anchors the research problem and question. Because of this prior literature review, this chapter builds on what was developed previously to discuss key concepts that constitute the framework that guided the investigation and analysis.

The research question sought to investigate the relationship between instructional discourses in a teacher education program and teacher candidates’ dispositions toward using ICT when they teach on their extended practicum. The problem statement described a discursive gap between educational policy positioning ICT use as central to learning and teacher education programs that are not preparing new teachers to use ICT in practice. This discursive gap suggested a need for a social and linguistic theoretical approach. This chapter provides a review of literature underwriting the theoretical framework.

I adopted a social constructivist perspective (Bakhtin & Holquist, 1981; Berger & Luckmann, 1991; Crotty, 1998; Deleuze & Guattari, 1987; Dreyfus, Rabinow, & Foucault, 1983; Holquist, 2002) to focus on the relationship between language use (in the form of instructional discourse) and teacher candidates’ dispositions toward ICT (in the form of plans to use ICT during extended practicum teaching). The research question entailed investigating social relationships occurring in socially constructed settings (teacher education classrooms). Social constructivism provides for an evolving conception of the relationship between instructional discourses and teacher candidates’ dispositions toward ICT.

Although social constructivism provides a way to understand social relationships and interactions as constructive of individual dispositions, it does not provide a way to explain how these effects transpire. To this end, I adopted an enactive theoretical component (Edelman, 2004;
Luhmann, 2005; Maturana & Varela, 1980; Seidl, 2004; Varela, Thompson, & Rosch, 1991) to complement social constructivism.

Enactivism provides a way to theorize the nature of social interactions as contextually conditioned by institutional, technological and sociocultural settings. Enactivism contributes to understanding the mechanisms of social interactions that give rise to individual dispositions as processes of perception and meaning making. Enactivism also provides a way to understand how alternative experiences of social interactions pertaining to ICT in a teacher education program can give rise to different dispositions to ICT in practice, and how the provision of these alternate experiences can be sustained even within institutional settings that construct dispositions of non-using or limited use of ICT by teacher candidates.

This theoretical framework is comprised of two key theoretical perspectives, social constructivism and enactivism. These theoretical perspectives are described in terms of instructional discourse and autopoiesis, sociocultural structures of discourse and linguistic cognitive domains, contexts of discourse and the autopoiesis of social systems, the emergence of dispositions toward ICT and value category memory systems, and the concept of affordance as skillful know-how. Social constructivism and enactivism provide a framework to examine the relationship between education instructors’ instructional discourse and teacher candidates’ subsequent descriptions of their disposition toward using ICT in their teaching.

2.1 ICT Instructional Discourses

Instructional discourses pertaining to ICT in education can be seen to be conditioned by international educational organizations which influence the formulation of Canadian educational policy at the federal and provincial levels (Petrina et al., 2008). To understand the conditioning
influence of these organizations, I examined texts from OECD, UNESCO, and ISTE. The mandate of these three international organizations is to influence educational policy and instructional discourse pertaining to ICT. I selected these three international organizations based on references and textual traces that I found on the Council of Ministers of Education, Canada website. The Organization for Economic Cooperation and Development (OECD) characterizes contemporary educational change as rapid societal transformation from an industrial-based economic system to knowledge-based societies. The OECD (2010) refers to “the ability to use information and communication technologies (ICT) to solve problems, to work in teams, to supervise and lead and to undertake continuous learning” (p. 10) (Benavides, Dumont, & Istance, 2008).

The United Nations Educational, Scientific and Cultural Organization (UNESCO) is a specialized agency of the United Nations system. As of December 31, 2000, UNESCO had 188 Member States. UNESCO’s policy framework for ICT competency standards for teachers states that technology can enable students to become: capable information users; information seekers, analyzers, and evaluators; problem solvers and decision makers; creative and effective users of productivity tools; communicators, collaborators, publishers, and producers; and informed, responsible, and contributing citizens (2008). The intent of the UNESCO ICT Competency Standards is to connect education reform to economic growth and social development. In the long run they are hoping to improve the quality of education, reduce poverty and inequity, advance standards of living, and prepare a country’s citizens for the challenges of the 21st century.

The International Society for Technology in Education (ISTE) partners with education leaders worldwide to effectively transform education through technology. ISTE represents more than 100,000 education leaders and emerging leaders throughout the world engaged in improving learning and teaching by advancing the effective use of technology in PK-12 and teacher education. ISTE advocacy includes giving technology to students and empowering educators to bring their voices to policy makers regarding educational technology. ISTE considers the use of technology in teaching and learning as non-negotiable for implementing real and lasting change in boosting student achievement and closing the achievement gap. ISTE’s top ten policy priorities include: 1) establish technology in education as the backbone of school improvement; 2) leverage education technology as a gateway for college and career readiness; 3) ensure technological expertise is infused throughout our schools and classrooms; 4) continuously upgrade educators’ classroom technology skills as a prerequisite of highly effective teaching; 5) invest in pre-service education technology; 6) leverage technology to scale improvement; 7) provide high speed broadband for all; 8) boost student learning through data and assessment efforts; 9) invest in ongoing research and development; and 10) promote global citizenship. ISTE definitions of ICT conceptualize various relationships between using technology and educational change.

The BC Ministry of Education has generally adopted ISTE’s NETS • S standards to define key development points for the digital literacy standards that underpin the new

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9 https://www.iste.org/standards
10 http://www.iste.org/about
curriculum\textsuperscript{11}. The Ministry specified that all students must have regular opportunities to use technology to develop skills that encourage personal productivity, creativity, critical thinking, and collaboration.

At the time of this writing, the Ministry of Education is in the process of rolling out a new curriculum and online educational administration system, both of which are dependent on widespread access to digital technology networks to function properly\textsuperscript{12}. However, comments on a social software site reveal deep frustrations and a distrust of the new curriculum and the new management system. “[A teacher] cannot do any of her work as a result of this software […] software created by non-teachers for teachers, without teacher consultation.”\textsuperscript{13}; “Our school secretary is swamped with trying to get it to work. Then later our non-enrolling teachers are going to have to spend countless hours re-typing online documents like IEPs into the new system […] and they haven’t been trained on the new software yet.”\textsuperscript{14}

Ironically, the website design explaining the new curriculum truncates the text. The new student information management system collects extensive student data, more than has ever been collected and archived before. Concurrently, the Minister of Education proposed to delete the section of the \textit{School Act} that makes the disclosure of students’ private information an offense\textsuperscript{15}. These developments are causing concerns in the classrooms and professional practices of teachers with regards to the implementation of and the implications for their professional

\textsuperscript{11} \url{http://www.bced.gov.bc.ca/dist_learning/docs/dl_student_profiles_competencies.pdf} 9/13/15 11:15 AM
\textsuperscript{12} \url{https://curriculum.gov.bc.ca} 9/12/15 2:08 PM
\textsuperscript{13} \url{https://www.facebook.com/groups/203565789706890/} [posted 2015-09-10 12:23 pm
\textsuperscript{14} \url{https://www.facebook.com/groups/203565789706890/} 2015-09-10 11:15 am
\textsuperscript{15} \url{http://www.huffingtonpost.ca/lizanne-foster/bill-11-bc-teachers-dear-minister-fassbender_b_6966606.html} 9/12/15 2:23 PM
responsibilities. Unfortunately, as a socially constitutive condition for instructional discourse, these developments do not bode well for teacher engagement with ICT in practice.

2.2 Social Constructivism

Davis and Sumara (2002) discussed the problems and possibilities of constructivist discourses in the field of education. They described a definition of social constructivism as interpretive of architectural (more common of the two) and biological usage. Architectural usage can be found in ideas of deliberate, step-by-step planning and implementation. Biological usage refers to ideas of structures of organisms and ecosystems, the idea of structuring conditions for emergence. In this sense, structure is conceived as processes in continuous states of becoming, which are shaped by the environmental conditions of their emergence and autopoiesis. Davis and Sumara’s description of biology-based definition is useful for understanding how I have employed social constructivism in this study.

I theorized concepts of social constructivism from Crotty (1998) and Berger and Luckmann (1991). Crotty (1998) defines social constructivists as individuals who develop subjective meanings of their experiences. These meanings can be directed toward certain objects (such as ICT in education). These meanings can be varied and multiple, which gives rise to a complexity of views, rather than a reductive, singular notion of ‘truth’ about any given object(s). Crotty’s (1998) assumptions are used to discuss constructivism. These assumptions form the basis for a social constructivist approach in this study.

Creswell (2009) summarized Crotty’s (1998) assumptions to include three key points. First, human beings construct meanings as they engage with the world they are interpreting. Second, humans engage with their work and make sense of it based on their historical and social perspectives. Third, the basic generation of meaning is always social, constituted through interaction within a human community. Crotty’s social constructivist theory was used to investigate the relationship between education instructors’ instructional discourse and teacher candidates’ perception of this discourse, and the subsequent meanings they ascribed to these perceptions.

![Diagram of Crotty's assumptions](image)

Figure 2 Crotty theorizes three assumptions of social constructivism

Berger and Luckmann (1991) explain how subjective interpretations give rise to the emergence of identity, both in relation to objects in the field and to others (interlocutors). Accordingly, Berger and Luckmann suggest the emergence of identity takes place within the context of a combination of subjective and social processes. In this study, the investigation sought to learn more about how teacher candidates’ made sense of their subjective experiences of the social processes involving instructional discourse in relation to objects in their field of perception, in this case ICT. The emergence of identity was conceived as manifestations of teacher candidates’ disposition toward using ICT in their teaching practice.
2.2.1 Enactivism

Enactivism refers to a conception of cognition developed by Varela, Thompson and Rosch (1991) in conjunction with the work of Maturana and Varela (1980). An enactive account of cognition suggests an active and embodied form of knowing. As Thompson, Varela and Rosch (1991) state:

In the enactive program, we explicitly call into question the assumption - prevalent throughout cognitive science - that cognition consists of the representation of a world that is independent of our perceptual and cognitive capacities by a cognitive system that exists independent of the world. We outline instead a view of cognition as embodied action and so recover the idea of embodiment. (pp. xx)

The structure of the environment (in this case, instructional discourse pertaining to ICT and teacher candidates’ disposition toward using ICT on their extended practicum) is important to take into consideration (Baerveldt & Verheggen, 1999).

An enactive concept suggests an ecological view of interactions: social interactions entail sensory motor data processed within a field of perception (Edelman, 2004; Maturana & Varela, 1980; Varela et al., 1991). Meanings ascribed to perturbations from the structure of the environment contribute to, or are enacted within, the structure of the environment, thus describing a recursive reflexive relationship between perceiving subjectivities and the structure of the environment (Baerveldt & Verheggen, 1999).

Social constructivism theorizes the relationship between social interaction and subjective meaning making within the context of socially constructed relationships. Enactivism explains the mechanisms that recursively constitute the structures of social environments as well as provide for the possibility of changing those environments from within. Sumara and Davis (1997) argued
for the relevance of enactivism for educational research wherein research activity is conceived as a site for learning and hence transformative of both individual and collective perspectives and understanding.

Varela (1999) described the capacity and capability to perceive and demonstrate affordances in the structure of the environment as examples of knowledge as enaction. He described human experience in terms of readiness-for-action as expression of a micro-identity in a microworld. His point was that our conception of who we are at any given moment couldn’t be divorced from the structure of the environments we inhabit. Varela argued that an enactive approach to cognition can be understood as perceptually guided action and that this perceptually guided action gives rise to the cognitive structures that enable action to be perceptually guided.

![Maturana and Varela (1980)](image)

**Figure 3** Maturana and Varela autopoiesis and linguistic cognitive domains

### 2.3 Instructional Discourse

Bakhtin's theory of dialogism and the dialogic imagination (Bakhtin & Holquist, 1981) explained how language use is ephemeral and that meaning is constantly in flux in spite of how the effort of putting experiences into language constructs meaning making. Bakhtin was sensitive to the role environmental conditions play in the power of communicative events. He suggested that environmental conditions refract, add to or subtract meanings. His point was that language
does not exist as a manifestation independent of the environmental conditions (context) of its usage. He referred to the idea of ‘heteroglossia’ wherein one utterance can carry multiple meanings in different communicative events.

Bakhtin’s (1981) theory is helpful to understand instructional discourses as communicative events embedded within dynamic contextual conditions. These communicative events are subject to teacher candidates’ heteroglossial interpretations that can carry multiple meanings depended on the dynamic structure of the environment. As communicative events occurring within the context of dynamic environmental structures, instructional discourse conveys the possibility of multiple meanings to the teacher candidates, some of which are constructive of subjective interpretations resulting in teacher candidate dispositions toward using ICT in practice.

![Diagram of Bakhtin's heteroglossia and subjective interpretation](image)

**Figure 4 Bakhtin theorizes heteroglossia and subjective interpretation**

### 2.3.1 Autopoiesis

Autopoiesis is a term coined by Maturana and Varela (1980) to describe the relationship between a living organism and the dynamic structure of its environment. Autopoiesis is conceived as two ideas, the self (auto) and creating (poiesis). Autopoiesis conceives of life processes as emergent processes, that is, living organisms are constantly engaged in self-
emergence within dynamic environmental conditions. Maturana and Varela conceived that autopoietic living organisms, which emerge as they are re-creating the environment, depend on an ability to respond to changing conditions and sustain structurally coupling to the environment.

Autopoiesis can be understood as creative processes that sustain life. This can also be understood as learning processes, as the organism is in a constant state of learning how the structure of its environment is changing, and adapting to the environment to sustain life.

2.4 Sociocultural Structures of Discourse

Foucault theorized sociocultural structures of discourse and the meaning of communicative events (Dreyfus et al., 1983). When Foucault analyzed statements, he found they did not qualify as an utterance, a proposition, a psychological entity, an event, or an ideal form. He found that statements were relative and varied according to both the use that was made of the statement and the way it was handled. According to Foucault, the verbal performance of the statement and the contextual conditions where it was put to use contributed to the formulation of meaning ascribed to it.

![Foucault theorizes sociocultural structures of discourse](image)

**Figure 5** Foucault theorizes sociocultural structures of discourse

In this study instructional discourse was conceived as a form of verbal performance that varied according to use and that was made of the statement and the structure of the environment...
within which it occurred. The sociocultural structure of discourse pertaining to ICT in teacher education can be analyzed for patterns of terminology, patterns of emotional intensity, and patterns of behavior. These verbal performances constituted communicative events that were relative to the dynamic contextual conditions of their occurrence. As such, these verbal performances conveyed meanings and were interpreted for meanings constitutive of teacher candidates’ disposition toward ICT.

2.4.1 Linguistic Cognitive Domains

Maturana and Varela (1980) conceived of the properties that conveyed information or environmental cues that call forth similar instances from value category memory systems (Edelman, 2004). When these communicative events or verbal performances reflexively reify certain terminology, emotional states or behaviours, they can be identified as ‘linguistic cognitive domains’ that serve as a shorthand to convey sociocultural information. This is done unconsciously without having to specifically articulate social, historical, or cultural sensibilities.

![Diagram of Maturana and Varela's linguistic cognitive domains and enactive relationships](image)

**Figure 6 Maturana and Varela linguistic cognitive domains and enactive relationships**

Linguistic cognitive domains complement Foucault’s theory of verbal performance as relative and varied according to the use that is made and the way it is handled (Dreyfus et al., 1983). With regards to the sociocultural structures of discourse, instructional discourses in the
teacher education program can be understood to convey meaning through the verbal performance of communicative events. This verbal performance provides environmental cues that enable the teacher candidates to interpret social interactions and sustain connection to the teacher education program. Linguistic cognitive domains can be understood as the linguistic structure of the environment of the teacher education program. Teacher candidates will be in a position to succeed in the program if they learn to structurally couple terminology, emotional states and behaviours constructive of their teacher education program will be in a position to succeed in the program.

Sociocultural structures of instructional discourses provide information about the patterns of terminology, emotion and behavior associated with ICT in the teacher education program. Linguistic cognitive domains provide a means to identify these patterns and track their manifestation in instructional discourse and teacher candidates’ dispositions toward using ICT.

2.5 **Contexts of Discourse: Institutional, Sociocultural, Technological**

This study investigated instructional discourses and teacher candidates’ dispositions toward ICT as an ecology comprised of sociocultural phenomena, Davis and Sumara (2005) argued for an ecological perspective in educational research that attends to the dynamic elements and conditions that constitute the emergence of engagement and insight. In the case of this study, I am concerned with the emergence of teacher candidates’ dispositions toward ICT as conditioned by instructional discourses. In this study the contexts of discourse (the structure of the environment) was conceived as institutional, sociocultural and technological.

Deleuze and Guattari (1987) described how language-use and practices could cohere within an educational institution. In terms of social constructivism, an educational institution has
its own sociocultural patterns of interaction that perpetuate the existence of the institution. These patterns are sustained through language, policies and practice. Deleuze and Guattari theorized how any sociocultural entity will form its own organizational structure over time. They described this process as an evolution from a fuzzy aggregate to its own consolidation. Deleuze and Guattari’s theory is helpful to understand the structure of the environment for this study as an evolving consolidation of institutional, sociocultural and technological structures. The consolidation of the institution, sociocultural norms and technological practices can be seen as sustaining the entity of the teacher education program.

Deleuze and Guattari described how the process of institutional consolidation also serves to simultaneously constitute the contextual conditions from which it emerges (Clark & Holquist, 1984). Thus, instructional discourse can be seen as an essential verbal performance that serves to shift teacher candidates’ sense of connection to the teacher education program from fuzzy aggregate to consolidation. In this sense, instructional discourses can be conceived as essential to sustaining the institutional entity known as the ‘teacher education program’. The context of instructional discourses might be seen as sustaining the life of the teacher education program through verbal performances. In this study, the context of instructional discourses was conceived in terms of consolidating the institution of teacher education as a sociocultural entity in relation to digital technologies.

Deleuze and Guattari characterized the process of institutional evolution from fuzzy aggregate to consolidation as ‘territorializing’. They described the process of territorializing as the constitution of semiotic systems. These semiotic systems cohere the institutional entity through consistent verbal performances. Over time the semiotic components become inseparable from the material components of the institutional entity. Territorializing verbal performances
cohere the institutional entity within which they occur. For the purposes of this study, an instructional discourse in the teacher education program is seen as a semiotic system that coheres the institutional entity of the teacher education program. Instructional discourses serve as a territorializing process that consolidates teacher candidates’ dispositions toward using ICT in practice.

Deleuze and Guattari argued that organizational consolidation can be ‘deterritorialized’ through the use of semiotic systems that form a bridge between traditional concepts of the organizational entity and the possibility of an evolving organizational entity responsive to structural change in the environment. However, they emphasized that the rate of deterritorialization is important. If the use of semiotic systems is too abrupt to existing institutional coherence, the institutional entity may affect closure to distance itself from the disruptive perturbation from the structure of the environment.

Figure 7 Theorizing the social function of speech

2.5.1 Autopoiesis in Social Systems

Deleuze and Guattari’s theory of the consolidation of institutional entity through the verbal performance of patterns of terminology, emotional state and behavior is complemented by Maturana and Varela’s (1980) concept of autopoiesis. Luhmann (Seidl, 2004) theorized
autopoiesis as applicable to social systems. Luhmann (2005) theorized the relationship between the biological property of autopoiesis and the emergence of social constructivism. Luhmann’s point was that social constructions are communicative, that is, social interactivity constitutes construction. Luhmann showed how social constructions are self-creating through language-use in the form of linguistic cognitive domains.

Luhmann’s work is helpful in this study to understand how autopoiesis in social systems can operate as a pattern for sustaining an institutional entity, as well as how it can be used to change social systems from within the institutional entity. If we conceive of Deleuze and Guattari’s theory of territorialization through semiotic systems as linguistic cognitive domains, we can see how institutional entities can be transformed from within through the use of familiar but evolving semiotic systems. These evolving but familiar uses of verbal performance are consistent enough with institutional coherence as to not trigger an abrupt closing off, and bring alternate ideas of verbal performance concerning ICT to enact change in disposition toward using ICT in practice.

2.6 Dispositions (Quality of ICT Use)

Use of the term ‘disposition’ in this study refers to the quality of ICT use. In this usage, I am conceiving ‘quality’ as indicative of emotional states associated with values, beliefs and attitudes toward ICT in education (Liang et al., 2012) (see Key Words, Chapter 1).

Vygotsky (1978) linked the social interactions associated with the use of technology as significant in the development of more sophisticated intellectual capacities and capabilities. He wrote late in life about the relationship between thought and language and how each built on the other (Wertsch, 1991). Welch, Pitts, Tenini, Kuenlen, and Wood (2010), studying dispositions in
teacher education, described the contingency of dispositions, how behavior is conditioned by circumstances and personal beliefs. They determined that personal values (comprised of beliefs, judgments and attitudes) were constitutive of dispositions. From their study they concluded that values guide attitude and behavior toward the work and profession of teaching. In their conclusion they noted the importance of the dispositions of teacher education faculty and staff members, as well as practicum teachers as they are the most influential in modeling desired and appropriate teaching dispositions.

Brown and Duguid (2002) argued there is a need to consider the critical social networks within which technological phenomena exist. They argue for the role human sociability plays in the social life of information. Brown and Duguid's work points to the ways our involvement with digital technologies influence the possibilities for future technological innovation, and also the ways our participation in society and government are influenced by our access to digital technologies (Veenhof & Statistics Canada. Science, 2008).

Beliefs, cultural norms and technological dispositions are indicators of sociality, of cognition and social interaction functionally intertwined (Semin & Echterhoff, 2011). Instructional discourses pertaining to ICT were seen as indicative of sociality, cognition and social interaction functionally intertwined. Social constructivist theory was used to investigate the relationship between the quality of instructional discourses pertaining to ICT (as exemplified by terminology, emotional state or behaviour with the technology) and teacher candidates’ subsequent dispositions toward using ICT on their extended practicum.
2.6.1 Value Category Memory Systems

Gerald Edelman (2004) theorized the relationship between the interpretation of qualities of perturbation from the field of perception and the significance of similar cues from the structure of the environment in future events. He found that the intensity of certain qualities of an experience (novelty, heightened emotion, physical sensation) played a role in how these experiences were stored in memory. He theorized that experiences were assessed in terms of importance based on these qualities (he called them qualia) and as such were made available in memory according to similar environmental cues. That is, the more intensely interpreted an experience was perceived, the significant identifiers associated with an experience (a particular color, temperature, feeling, etc.) would be available to inform interpretations of subsequent experiences that exhibited similar environmental cues.

Edelman’s theory of qualia and value category memory systems contributes to understanding why the quality of instructional discourse pertaining to ICT may or may not have a significant impression on teacher candidates’ disposition toward using ICT. It also contributes to understanding how the role of instructor comportment and composure in relation to instructional discourse pertaining to ICT, can make a significant impression on teacher candidates’ perceptions of ICT use in practice.

2.7 Affordance

The last consideration in this theoretical framework is conceiving instructional discourses in terms of affordances. When ICT is used in educational settings (Lawless & Pellegrino, 2007) it affords specific social and political opportunities (Brown, 2005) that emerge within the extant biases and contexts associated with educational learning environments (Wong, Li, Choi, & Lee,
This means that ICT in educational settings is not a benign, neutral presence. These affordances affect individual skills which act to limit or facilitate the acquisition of ICT knowledge (Friedman, Galligan, Albano, & O’Connor, 2009). The acquisition of ICT knowledge, in turn, acts to limit or facilitate individual and collective communicative power associated with ICT practices (Castells, 2007; Friedman et al., 2009).

Affordance is theorized using Gibson’s (1986) work on the possibilities of perception as a demonstration of an interactive relationship with environmental conditions. Gibson (1986) developed the theory of affordances in *The Constructivist Approach to Visual Perception*. Gibson referred to the meaningful environment as a constructivist reality wherein meanings can be discovered (p. 33). He wrote that the essence of an environment is that it surrounds an individual and within these surroundings, information is available to observers to construct their perception of the environment. Gibson called the information available for perception as constructivist optics, that is, information that cuts across existing disciplines, borrowing from them all, and going beyond them. He argued a distinction between perceiving stimulation from the surroundings, and processing stimulus information as a constructive function of extracting meaning from the stimulation.

### 2.7.1 Skillful Know-How

Gibson’s (1986) description of perceiving stimulation from the surroundings could also be understood as subjective perception of sensory motor data perturbations conveying information about the structure of the environment (Varela et al., 1991). Affordances explain the relationship between teacher candidates’ experiences of ICT-related instructional discourse as a feature in their environment. Affordance theory says that perceiving subjects are in an interactive
relationship with their surroundings. Through this interactive relationship perceiving subjects (in this case, teacher candidates) develop their social and perceptual abilities to imagine ICT in practice (Thompson, 2007). My usage of ‘ICT imaginative capacity’ in this dissertation is conceived as demonstrations of the capacity to imagine using ICT to improve learning experiences and the capability to implement those imaginings in the classroom.

**Figure 8 Theorizing demonstrations of ICT imaginative capacity**

### 2.8 Summary

The theoretical framework for this study is based on social constructivism. The theory of social constructivism is complemented by enactivism and associated cognitive theories that help explain the mechanisms that give rise to teacher candidates’ ICT dispositions in relation to their encounters with instructional discourse pertaining to ICT. Social constructivism provides a way to understand the relationship between instructional discourses and teacher candidates’ ICT dispositions as evolving, reflexive, and conditioned by institutional, sociocultural and technological settings (De Jaegher & Di Paolo, 2007; De Jaegher & Di Paolo, 2009; De Jaegher, Di Paolo, & Gallagher, 2010; Fuchs & De Jaegher, 2009). Within a social constructivist framework, the experiences of the teacher candidates are conceived as social, interactive and subjective. These experiences are further informed by the structures of the environment within
which they occur. The structures of the environment (institutional, sociocultural and technological) are conceived as dynamic and evolving as autopoietic social systems that sustain their existence through instructional discourse.

The sociocultural structure of discourse in the study is conceived as the institutional entity ‘teacher education program’ situated within the field of education in western Canada. Sociocultural structures of discourse are seen to exist through patterns of terminology, emotional state and behaviour. These recurring patterns give rise to linguistic cognitive domains. Participation in recognizable linguistic cognitive domains serve as a way to structurally couple with the institutional entity ‘teacher education program’. The process of learning the significant elements of the teacher education program’ linguistic cognitive domain shifts from a sense of fuzzy aggregate to a consolidated institutional entity over time. Belonging to the consolidated institutional entity is contingent on verbal performance of familiar linguistic cognitive domain indicative of adherence to patterns of terminology, emotional state and behaviour.

The sociocultural structure of discourse is constructive of the contexts of discourse significant to this study. Contexts of discourse are conceived as institutional, sociocultural and technological. The contexts of discourse are seen as reflexively evolving in relation to the field of education, while at the same time cohering its own internal identity as an organizational structure. This identity can be understood as familiar patterns of terminology, emotional states and behaviour conveyed through the verbal performance of linguistic cognitive domains. The perpetuation of linguistic cognitive domains from one generation of educators to the next sustains the existence of the education entity which in turn constructs the contexts for discourse.

Examination of instructional discourses and teacher candidates’ dispositions toward ICT were qualified as indicative of emotional states, mental attitudes and behaviours pertaining to
ICT in education. Examination also identified demonstrations of characteristics of ICT. These characteristics were broadly defined as demonstrations of the capacity to imagine using ICT to improve learning experiences, and the capability to implement these imaginings in practice.

As shall be seen, this study investigated complex phenomena that are not neatly explained by a single theoretical framework. A constellation of theoretical perspectives were employed to interpret and understand various aspects of the phenomenon constituting the investigation.
Chapter 3: Methodology

As discussed, a social constructivist framework complemented by an enactive analysis provides a basis for the design of the research methodology. The design allows for the collection of empirical evidence of discursive events.

In this study instructional discourses pertaining to ICT were identified and recorded in field notes. The research team discussed these field notes and used a social constructivist framework to design ICT learning sessions that were not provided as part of the regular teacher education curriculum. The teacher candidates self-reported their dispositions toward using ICT in practice at the end of the study period. Specifically, they were asked to demonstrate their skillful know-how with regards to describing ICT imaginative capacities preparatory to using ICT on their extended practicum.

The ICT learning sessions employed a social constructivist framework to provide instructional discourse pertaining to ICT utilizing collaborative critical inquiry. In this way the teacher candidates had an opportunity to experience learning ICT that was absent from their regular teacher education program. These ICT learning sessions served as a research intervention that produced ICT-related perturbations in the field of perception of the teacher candidates. The ICT-related perturbations of the ICT learning sessions in relation to ICT-related perturbations in the form of instructional discourse in the regular teacher education program provide a data corpus for analysis.

The data corpus is studied for indications of ‘ICT disposition’ and ‘ICT imaginative capacity’ consistent with a social constructivist framework complemented by enactivism. Data significant for indications of ICT disposition and ICT imaginative capacity are analyzed in terms
of the relationship between instructional discourse and teacher candidates’ plans to use ICT on their extended practicum.

3.1.1 Methodology

The methodology for this study is an interpretive (Merriam, 1998) qualitative case study (Yin, 2009) augmented by an experiential research intervention (Fenwick, 2000). The basic view underlying this research methodology is a social constructivist approach that considers reality as constructed by individuals interacting with their social worlds (Merriam, 1998). Enactive theory is used to complement data analysis (Edelman, 2004; Gibson, 1977; Gibson, 1986; Luhmann, 2005; Maturana & Varela, 1980; Seidl, 2004; Thompson, 2007; Varela et al., 1991).

The study design included the formation of a research collaborative as a sub-group of the thirty-eight member teacher candidate cohort group. This sub-group is henceforth referred to as the ‘research collaborative’. The research collaborative was comprised of eight teacher candidates. The remaining thirty teacher candidates are referred to as the ‘main cohort group’. The entire group will continue to be referred to as the ‘thirty-eight member cohort’.

The research intervention was comprised of a series of ICT learning sessions (see Appendix F, Chronology of Research Intervention). Attendance to these ICT learning sessions was divided between the thirty-eight member cohort group and the sub-group of the research collaborative. The thirty-eight member cohort group attended ICT learning sessions within the context of their teacher education program curriculum. These learning sessions were inserted into the regular program of curriculum under the authority and discretion of the Faculty Advisors who were charged with teaching professional courses. The research collaborative also attended ICT learning sessions that were scheduled outside their regular teacher education program.
curriculum. The members of the research collaborative attended these sessions as part of their voluntary commitment to take a more active role in the research.

Three datasets were collected for this study. The first dataset, observational notes of instructional discourse in teacher education classrooms, was collected first hand by myself and another graduate research assistant. These in-class observations were attended by the thirty-eight member cohort group. At the end of the study period, the thirty-eight member cohort group contributed their self-reports in the form of a questionnaire and focus group discussions. These focus group sessions did not divide the cohort into research collaborative and main cohort group. The research collaborative members were interspersed with the main cohort group members during these sessions. The research team coded the contributions from the research collaborative and was able to differentiate contributions between the main group and the sub-group during the analysis.

Data collected from the in-class observations and the teacher candidates’ self-reports provide insight to answer the question, “What is the relationship between instructional discourses in a teacher education program and teacher candidates’ dispositions toward using ICT when they teach on their extended practicum?”

First hand observations of instructional discourses pertaining to ICT in the teacher education classrooms provides qualitative data descriptive of ICT dispositions and demonstrations of ICT imaginative capacity. These first hand observations by the graduate research assistants were juxtaposed with first hand observations recalled by the teacher candidates at the end of the study period. These data provided a qualitative description of the comportment and composure of education instructors conveying ICT-related instructional
discourse and anecdotal descriptions of demonstrations of ICT imaginative capacities by education instructors.

Teacher candidate self-reports provide qualitative data describing teacher candidates’ recollections of ICT-related instructional discourse and the meanings they ascribed to these experiences. These self-reports were collected in the form of questionnaires and focus group discussions. The purpose of these self-reports was to collect empirical data first-hand from the teacher candidates indicative of their disposition toward ICT in education, and specifically how dispositions were: 1) conveyed as their sense of comportment and composure with regards to using ICT in practice; and 2) demonstrated in the form of ICT imaginative capacities described in their plans to use ICT on their extended practicum.

3.2 Settings and Participants

3.2.1 Settings

The physical setting for the study reported in this dissertation was the education building in a large regional university in western Canada. The institutional setting was a teacher education program operating under the auspices of a Faculty of Education in conjunction with the various departments that make up the faculty. The technological setting was a combination of resources provided by the university, within the faculty, available publicly, provided privately and provided by the research project. Sociocultural settings were defined by the network of relationships that emanated from a cohort of thirty-eight teacher candidates undergoing their pre-service education in a two-year elementary teacher education program. The sociocultural setting was expanded to include the research team as their work interacted with the teacher candidates. The research setting was comprised of the research activities of the research team, the
implementation of a research intervention with a small group of teacher candidate volunteers, and the provision of technological devices, software applications and online server space.

3.2.2 Participants

Participants in this study were a cohort of thirty-eight teacher candidates who entered their post-baccalaureate two-year elementary teacher education program in September 2007. This cohort of teacher candidates became participants in the study because their Faculty Advisors were interested in the use of ICT in education and agreed to allow the research group to study the learning experiences of the cohort of teacher candidates under their instruction.

The sub-group of teacher candidates who made up the research collaborative self-selected from the cohort upon invitation from the research group. The invitation read,

We are asking teacher candidates in the [thirty-eight member cohort], who are interested in participating in the research project to submit a 250-word expression of interest outlining your interest in digital technologies and education and why you would like to participate in the study. The goal of the research is to identify ways to build sustainable learning communities where teacher candidates can engage with digital technologies within their professional teaching practices. Deadline for submission is on or before Monday, January 28, 2008. Please submit to Dr. Don Krug, [faculty, department, large regional university in western Canada].

The request for an expression of interest elicited twelve responses; of which eight volunteers eventually committed to take a more active role in the research. One of the conditions of participating as a member of the research collaborative was attendance in a series of ICT learning sessions (research intervention) with the research group that were extra-curricular to
their regular teacher education program. These sessions were held on Thursday mornings from 9 am to 11 am.

The research team had hoped to attract teacher candidates planning to teach at all elementary grade levels and an even balance between male and female participants. As it turned out, the final composition of the research collaborative was made up of five men and three women planning on teaching grades 1 – 7.

The members of the research collaborative represented a range of previous ICT knowledge, skill and confidence. Two members of the research collaborative had demonstrated a high degree of engagement with ICT and had been hired to work as Tech Coaches for the cohort in September. In this capacity, they provided ICT problem solving support to both their teacher candidate colleagues and their education instructors. Three of the other members of the group were confident ICT users in their personal lives: one was involved in computer games, another made short digital films on extreme sports, and the third had worked as a computer programmer. The three women were less confident and less experienced with digital technology. One of them had used ICT in high school but was not confident using it in her teaching. The other two had low confidence using ICT and were new to teaching.

During the period of the study the thirty-eight member cohort attended sixteen different education courses. Of these sixteen courses, the GRAs were allowed into fifteen classrooms to observe instructional discourse. This group of education instructors was comprised of a cross section of professional careers in education. This group included the following: seasoned elementary educators nearing retirement; mid-career professionals from the public education system now pursuing careers in higher education; professional public educators pursuing
graduate degrees and eventual careers in higher education; and adjunct professors early in their careers in higher education.

The thirty-eight member cohort pursued their completion of the teacher education program under the supervision of two Faculty Advisors. Each Faculty Advisor was attached to nineteen of the cohort members. The Faculty Advisors were both retired elementary administrators who had long, distinguished careers in the profession. They had both taught and worked as administrators in the local school district where the practicum elementary schools were located. The Faculty Advisors were well connected with the local elementary schools and the workings of the teacher education program. The teacher candidates provided knowledge of the practicum elementary schools and practicum elementary sponsor teachers.

The research group was comprised of a tenured professor and two GRAs. In addition to myself, the other was in the masters program. The tenured professor had many years experience conducting studies pertaining to ICT in elementary education. I had just completed a master’s degree on mentoring ICT in teacher education that involved in-class experiences with education instructors. The masters GRA was new to research and the study methods.

3.3 Data Collection, Methods and Procedures

3.3.1 Data Collection

Qualitative methods of data collection included in-class observations and end of study questionnaires and focus group discussions. These methods are described in detail below.
3.3.1.1 Term 1 and Term 2 In-Class Observations

Data were collected from the teacher education program from September 2007 to April 2008. Teacher candidates attended 16 courses on the university grounds, a practicum school based course, and a guest speaker series during this period. The research group was allowed to observe 15/16 courses and the guest speaker series. The fifteen in-class course meetings and guest speaker workshops added up to 209 class meetings and the GRAs observed 162 of those meetings (78% of observable class meetings). The GRAs sat in observation some portion of each of the 162 class meetings. Their observation time totaled 84% of the amount of time the teacher candidates were in-class during these 162 class meetings. This section reports data gathered from 275.7 hours of in-class observations.
The guest speaker series was organized to introduce the teacher candidates to education professionals from a wide variety of teaching and research backgrounds. These ‘workshops’ were held on a weekly basis in the afternoon.

For each observation the data were recorded in an email format that was circulated to the research team after each observation event. These emails were used to guide research planning and design as the study progressed. The email format recorded specific details of the observation event, including education instructor, and co-instructor (if there was one), classroom location, class meeting date and time (start time and end time), observation time (start time and end time), observation event context (teacher education course or guest speaker series), course title or speaker name, ICT used, an inventory of ICT resources available at that location, a description of subject/topic and learning activities used, teacher candidate responses to these learning experiences, and additional notes.

The format of the email observation sheet is attached Appendix C Data Collection Instrument: In-Class Observation Categories.

Observation notes were summarized into term-end reports. GRA observations focused on teacher candidates’ ICT encounters during their teacher education in-class meetings. The 162 observations reports were summarized into term end reports. Each course write-up described five aspects of the observation experience. First, the GRA described the course being observed. This description included ICT-related items in the course syllabus and typical teaching strategies used by the education instructor. The next section provided a description of the observation schedule, a chronology of the classes observed for that particular term. The third section described notable uses of technology, particularly uses of ICT during the observation period. The fourth section
described observations of education instructor role modeling – how education instructors model their use of ICT for teacher candidates. The last section was used for reflections on observations.

3.3.1.2 End of Study Questionnaire

At the end of the first year of the study the research group held a series of focus groups attended by the 38-member teacher candidate cohort. Five focus groups were held in all which were attended by a total of thirty teacher candidates divided into groups of approximately six attendees per focus group event.

Each focus group was a random composition of teacher candidates and members of the research collaborative. In the first part of the focus group the teacher candidates’ completed a nine-item questionnaire. The questionnaires were completed before there was any discussion in the focus group. Questionnaire responses represented teacher candidates’ internal reflections on their experience of instructional discourse during the preceding year. After the questionnaires were completed the research team led a group discussion with the teacher candidates to provide an opportunity to elaborate on their questionnaire responses.

The focus group questionnaire was designed to ascertain teacher candidates’ ICT dispositions as they ended their first year of coursework and prepare to teach their extended practicum in the fall. We wanted to get a sense of the breadth of ICT perception and the depth of ICT understanding the teacher candidates’ had acquired during this period. We were interested to learn what preparations teacher candidates had made with regards to teaching with ICT, and how they perceived potentials sources for help or hindrance in their efforts.
The first item asked the teacher candidates to complete the following sentence, “I would define Information and Communication Technologies (ICT) as...” This question was intended to indicate teacher candidates’ conceptions of ICT in terms of 21st century societal development. Next, the teacher candidates were asked to indicate their level of agreement with the following statement, “I feel well prepared to use Information and Communication Technologies (ICT) for teaching during my extended practicum.” This question offered a Likert rating to indicate preparedness: strongly disagree, disagree, no opinion, agree and strongly agree and a space for additional comments. The next question asked the teacher candidates if they intended to use ICT for teaching during their upcoming extended practicum. This question item was simple yes/no answer. The next item asked the teacher candidates to specify how they planned on using ICT during their extended practicum, to teach specific subject matter, to facilitate learning processes, or to facilitate their teaching (i.e. lesson prep). Next, they were asked to list the preparation they would need to undertake in order to use ICT during their extended practicum. This item provided a sense of how much thought or preparation the teacher candidates had actually undertaken to be ready to teach with ICT in the upcoming term.

Finally, with regards to using ICT to teach on practicum, the teacher candidates were asked to rank several factors that they perceived would either hinder or help their use of ICT for teaching during their extended practicum. These factors were ranked according to five indicators: Greatest Hindrance, Hindrance, Neither Help Nor Hindrance, Help or Greatest Help. This item provided a sense of how the teacher candidates had experienced instructional discourse in their program and how they had interpreted their experiences with regards to the significance and meaning of these experiences.
There were two items at the end of the questionnaire that allowed the teacher candidates to add their personal comments. They were asked to comment on their experiences of the teacher education program from the past year, and they were asked to comment on their ICT encounters during the same time period. These comments provided insight into the kinds of issues and concern the teacher candidates identified as meaningful or significant enough to comment on.

See Appendix D Data Collection Instrument: End of Study Questionnaire

3.3.1.3 End of Study Focus Group Discussions

After the questionnaires were completed during the focus group sessions the research team facilitated discussion with the respondents. This discussion was designed to follow up the questionnaires to provide the teacher candidates an opportunity to talk more freely about their ICT encounters in the teacher education program. The focus group discussions provided an opportunity for the teacher candidates’ to socially construct their collective memories, meanings and significance with regards to their collective experiences of instructional discourse in the teacher education program.

Five focus group sessions were held as the teacher education program neared the end of the first year of study. These were lunch hour sessions that took place on March 27, 31, and April 1, 3, and 8. Each session was attended by six, six, five, eight and five participants, respectively. A total of twenty-two cohort group members and eight research collaborative members attended and were randomly mixed in each focus group. The research team facilitated the discussion using the questionnaire as a guide.
The focus group conversations were recorded on digital audio and transcribed into a database application. Each respondent contribution constituted a record in the database. Each record included participant identification, a unique transcript identifier, the video clip start time, transcription text, and digital audio file identifier. Participant identification was coded to the participant list in the database. This list identified members of the research collaborative and members of the research team individually. The teacher candidate cohort members were identified with one code for the group contributions. The transcriber was familiar with the voices of the research collaborative and the research team, but unable to individually identify the voices of the members of the cohort.

3.3.2 Research Intervention

The research intervention in this study was an offering of ICT learning sessions made available to the 38-member cohort and a small sub-group of teacher candidates drawn from the larger 38-member cohort who engaged in a research collaborative. The design of this research intervention played a significant role in the data reported in this dissertation.

The research intervention was offered to the 38-member teacher candidate cohort in the form of ICT learning sessions. These learning sessions were initially offered through the Faculty Advisors and included as part of the Standard Timetable program. In essence, ICT learning sessions were inserted into an existing course to make time for sessions in the computer lab with the Principal Investigator. The Principal Investigator was given authority to design curriculum and instruction for those sessions in consultation with the Faculty Advisors.

The research intervention design was based on a conception of learning as a sociocultural process and the organizational entity, “teacher education program” as a manifestation of social
constructivism (Merriam, 1988). The research design of the ICT learning sessions took the lives of the teacher candidates seriously and acknowledged their experiences in the teacher education program as comprised of multiple instances of encounters comprised of social, cultural, and, in the case of this study, technological, complexity (Denzin & Lincoln, 2013).

Applying a social constructivist approach to critical inquiry learning experiences allowed us to investigate qualities and characteristics of instructional discourse that would otherwise go unnoticed. This made it possible to identify experiences in relationships that have significant impacts on teacher candidates’ processing of those experiences and their responses to those experiences. The constructivist approach to learning was based on the idea that the teacher candidates created knowledge from the interaction between their existing knowledge or beliefs and the new ideas or situations they encountered (Clancey, 2009). Participating in collaborative critical inquiry investigating their learning experiences allowed the members of the research collaborative to build evolving ways of understanding and contextualizing their experiences with regards to using ICT in their teaching practice.

The amount of time allotted and the frequency of the sessions were determined by the Faculty Advisors. In Term 1 this amounted to two sessions of 40 minutes each, and in Term 2 four sessions of 20 and 40 minutes each. These six sessions comprised the instructional discourse provided to the 38-member teacher candidate cohort during the first year of the teacher education program.

In addition to the above-mentioned offerings, the research intervention of ICT learning sessions was offered to a small group of teacher candidate volunteers who formed the research collaborative. The ICT learning sessions for this group were offered on a weekly basis for 2 hours per session over seven weeks in Term 2. These learning sessions were not part of the
regular program and the timing of the sessions had to be organized so that all the members of the research collaborative could attend.

During Term 2 (Jan – Apr 2008), the research collaborative attended research intervention ICT learning sessions comprised of seven two-hour extra-curricular ICT learning sessions with the research group (Feb 7, 14, 28, Mar 6, 13, 27, Apr 3). One of the distinctive features of these learning sessions was the opportunity for the teacher candidates to engage in substantive discussions about the meaning of ICT in education. The research group encouraged the members of the research collaborative to conduct their own critical inquiry into the professional ICT conditions they might expect when preparing to teach with ICT in elementary schools and to share their results with the research collaborative group. In addition, taking the prevailing ICT conditions into account, the research collaborative worked on developing their own ICT instructional resources and designing their own ICT-based learning experiences for their students.

The implementation of these ICT learning sessions with the research collaborative effectively divided the 38-member cohort into two groups: members of the cohort group and members of the research collaborative. The foundation of this intervention was a combination of collaborative experiential learning processes, and critical inquiry. The collaborative experiential learning processes implemented a combination of Lave and Wenger’s (1992) work on communities of practice and Kolb’s (1984) work on experiential learning through dialogic processes (Bakhtin & Holquist, 1981).

These ICT learning sessions also employed critical inquiry to encourage understanding of how educational ideas and issues relate to their own experiences in the teacher education program and the larger concerns of the field of education and the use of ICT in society (Krug,
1999). The introduction of critical inquiry into the experiential research intervention marked a change from a strictly interpretivist tradition (Merriam, 1998). Crotty (1998) described how the introduction of critical inquiry into a study sets up a contrast between research that seeks merely to understand and research that challenges, research that reads the situation in terms of interaction and relationships and research that reads the situation in terms of power relations, and research that accepts the status quo and research that seeks to bring about change.

The design of the research intervention in the form of ICT learning sessions was documented through research team meeting notes as they discussed observations from the teacher education classrooms and informal conversations with teacher candidates outside the classrooms. The initiative was designed to provide instructional discourse that would fill gaps the research team assessed as significant if the teacher candidates were to develop ICT dispositions and ICT imaginative capacity that would lead them to teach with ICT on their extended practicum.

3.3.3 Data Analysis

Data analysis employed an inductive process (Merriam, 1998) designed to identify common concepts, meanings and significance as identified by the teacher candidates who participated in the study as a response to the study’s research question.

3.3.3.1 Term 1 and Term 2 In-Class Observations

The original field notes included notations about ICT in each classroom setting, about how ICT was used during the observation time, and about the quality and characteristics of education instructor ICT role modeling. These notations were compiled and coded according to:
1) course subject, 2) chronology of classes, 3) uses of technology (particularly ICT), 4) education instructor role modeling, and 5) my personal reflections. At the end of each report, I added a closing section of conclusions. These were coded under 6) conclusions. As it turned out, the information gleaned from examining the 'chronology of classes' items did not yield data pertinent to this report. Analysis of these reports yielded 349 notations coded into five categories (1, 3, 4, 5, 6). Data analysis was drawn from 349 notations.

I analyzed the observational data reports describing instructional discourse pertaining to ICT. Pertinent observational data was organized into three groupings. First, an inventory was compiled of ICT available in the classroom and how this ICT was used during instruction. Second, the lesson content was recorded along with notes about teaching methods used to teach it. Instructional discourse was considered to be a composite of these first two sets of observations. Third, observations of teacher candidate response to the instructional discourse were noted. In terms of these three groupings, the first two were analyzed for ICT dispositions expressed by education instructors and demonstrations of ICT imaginative capacity. Education instructors’ formation of ICT dispositions included the quality of their emotional and mental states during instruction involving ICT and the characteristics of their engagements with ICT (what they were actually doing with the ICT as an integral part of their instruction). Education instructors’ demonstrations of ICT imaginative capacity were analyzed for examples of their capacity to imagine using ICT to create compelling learning experiences and their capability to implement these imaginings in practice.
The last grouping was analyzed in terms of the observed impacts of instructional discourse. These observations were useful later as a cross-reference with teacher candidates’ contributions in the end of study questionnaire and the end of study focus group discussions.

### 3.3.3.2 Research Intervention

The data for these research sessions is a compilation of email communications, research notes, curriculum outlines and discussions about ICT in practice. From these sources a chronology of ICT encounters is constructed that, as a composite unity, constitute the research intervention that took place Jan – Apr 2008. Descriptions of these ICT encounters include settings, participants, curriculum, topics and learning activities. This account is a qualitative report of the processes that contributed to the design of the research collaborative curriculum and practice. This account ends on April 3, 2008. The research collaborative contributions to the focus group questionnaires and discussions would draw on research collaborative ICT learning sessions up to that date. The data are reported in chronological order beginning with a research team meeting on December 12, 2007 at the end of the first term of the teacher education program.

### 3.3.3.3 End of Study Questionnaire and Focus Group Discussions

Social constructivism complemented by enactive theory was used to analyze questionnaire and discussion data from the teacher candidates. Social constructivism contributed to understanding the relationship between teacher candidates’ experiences of instructional discourse in their teacher education program and their disposition toward using ICT on their extended practicum.
Enactivism provides an explanation of how social constructivism occurs through social interaction conditioned by institutional, sociocultural and technological conditions. Social constructivism and enactive theory provide insight into how instructional discourse contributes to an ‘ecology of learning’ that gives rise to teacher candidates’ disposition toward using ICT in practice.

3.4 Credibility, Dependability and Triangulation

Throughout the course of the study, multiple forms of data collection enabled a constant comparison and triangulation. This along with various member checks as we worked with the participants provided a form of credibility to early or preliminary analyses. Constant comparison and triangulation were extended through the analysis of data and findings. The findings are dependable in this way and in that they were shaped through the research team’s responsiveness to the everyday context of teacher education. The questionnaire was not a validated instrument in the formal sense. Rather, it was generated through a comprehension of the research literature and the necessities of the specific context and theoretical framework. In this sense, an assumption was that the questionnaire was appropriate for the needs of the study and research problem.

3.5 Summary

In this chapter I have described how a social constructivist theoretical framework complemented by enactivism was applied to the research design for data collection and analysis. The setting for this research was on the university campus of a large regional university in western Canada. The research participants were comprised of teacher candidates attending the first year of their two-year teacher education program in the Faculty of Education.
Qualitative data were collected and analyzed in three datasets: in-class observation, questionnaire, and focus group discussion. A research intervention was employed to enact ICT learning experiences that were absent from the regular teacher education program curriculum.

Observation data were analyzed to ascertain the quality and characteristics of ICT instructional discourse in the teacher education program and during the research intervention. Data contributed by the participant teacher candidates’ were analyzed to provide insight into their interpretations of these instructional discourses with regards to their dispositions toward using ICT on their upcoming extended practicum. In terms of ICT imaginative capacity, teacher candidates’ manifestations of these dispositions were seen as indicative of the characteristics of their use (what they had the capacity to imagine and the capability to implement).

In the next chapter I provide detailed descriptions of the content of the datasets and analyze these datasets with regards to key findings arising from the study.
Chapter 4: Data, Analysis, Findings

This chapter reports data analysis and findings from investigation into the research question: “What is the relationship between instructional discourses in a teacher education program and teacher candidates’ dispositions toward using ICT when they teach on their extended practicum?” Data collection provided three points of view regarding this question. First, observational data were collected from teacher education classes. These observations recorded ICT-related instructional discourses as indicative of education instructors’ dispositions toward using ICT in practice, and their demonstrations of ICT imaginative capacity as part of their instructional design.

A research intervention comprised of providing collaborative critical inquiry-based ICT learning sessions was offered on a limited basis in regular teacher education programming and on a more extensive basis on a volunteer basis. These ICT learning sessions caused a perturbation in the field of perception of the teacher candidates that varied depending on whether they were part of the teacher education cohort or self-selected to participate in the research collaborative. Teacher candidates’ impressions of these ICT learning sessions in relation to their regular teacher education program were communicated as part of the end of study questionnaire and focus group discussions.

The second and third data sets came at the end of the study period when the teacher candidates were invited to participate in completing a questionnaire and contributing to focus group discussions. The questionnaires and focus group discussions provided insight into the meanings teacher candidates derived from ICT-related instructional discourse in their teacher education program and the research intervention and how these experiences contributed to their plans to use ICT on their extended practicum.
The primary data collected provided access to a secondary dataset that proved significant to the study. This secondary dataset contributed to knowledge of the conditions within which the teacher candidates’ experiences of instructional discourse took place. This secondary dataset describing key conditions of the study was gleaned from primary data collection activity. The following data report describes and analyzes these three datasets. To contextualize these datasets, I begin by describing key conditions that, from a social constructivist and enactive perspective, structured possibilities for teacher candidates to derive meanings that informed their disposition toward using ICT in practice.

4.1 Key Conditions

Key conditions were identified from the datasets as contributory to teacher candidates’ disposition toward ICT in practice. These conditions were defined in relation to the purpose of the study: institutional conditions, sociocultural conditions and technological conditions. In addition, research conditions are described to provide background to the research process as it was perceived by the teacher candidates.

4.1.1 Institutional Conditions

Institutional conditions are described in terms of two areas of significance: the standard timetable that structured learning experiences in the teacher education program and institutional policy that structured the possibilities for socially constructive interactions pertaining to ICT in education and in teacher education.
4.1.1.1 The Standard Timetable

The standard timetable of the teacher education program necessarily structured scheduling of research activities. The timetable organized the movement of teacher candidates from one classroom to another and in and out of practicum elementary schools. In this study, the structure of the timetable for the two-year elementary teacher education program played a significant role because of the number of hours the teacher candidates were required to spend in face-to-face classes with their education instructors and their elementary sponsor teachers at their practicum schools.

The number of hours the teacher candidates were required to attend teacher education program classes was significant because there was very little time available for out of class research activities. The teacher candidates were required to attend an average of approximately twenty-eight and a half hours in class per week. For each in-class instruction hour, they were expected to complete assignments outside of class hours at an approximate ratio of one hour in-class instruction to a half hour out of class assignment completion.

This schedule did not leave the teacher candidates much time or energy to engage with the research. For example, during the period of the study, from September 2007 to April 2008, the teacher candidates’ attended approximately 737 hours of in-class instructional time, including the guest speaker series. In comparison, the research group was allowed to provide six forty minute in-class ICT learning sessions to the thirty-eight member cohort, inserted into the regular curriculum. This meant the research group had a total of four hours face-to-face learning time with the teacher candidate cohort. This amount of time represented the hours the Faculty Advisors felt they were able to devote to ICT learning in relation to the regular curriculum they had planned for the period of the study.
Given the demands the standard timetable placed on the teacher candidates’ time and energy, it was very difficult to schedule time for the research intervention. The members of the research collaborative attended an additional seventeen hours of ICT learning sessions with the research group outside the dictates of the standard timetable.

4.1.1.2 Institutional Policy

Institutional policy was identified as structuring the environment for instructional discourse pertaining to ICT on several levels. These levels were identified on a local level (instructor based), a faculty level and a provincial level. The provincial level of institutional policy was discernible in three areas: teacher accreditation, provincial educational policy for providing ICT resources in elementary public schools and provincial educational policy conceptions for elementary school ICT-related curriculum.

At the local or classroom level of the teacher education program, different education instructors instituted different expectations for ICT-use. For example, one education instructor, who was considered an exemplary educator by several teacher candidates did not use any ICT during instruction. Another education instructor instituted a policy that only two teacher candidates could have their laptops open during in-class teaching because this instructor stated that she did not want to look at a sea of computers when she was teaching and she didn’t believe they were being used appropriately. In another example, a course requirement was to use a Ning site to facilitate social learning outside of regular classtime. In another course, WebCT was used for distributing course materials and uploading assignments. In another course, teacher candidates were required to submit their assignments on hard copy, not email them as attachments in digital form.
At the faculty level, ICT policy was not specified except to say that individual departments would set ICT use policies based on specific courses, positions and curriculum. In this study, the teacher candidate courses were offered under several departments and disciplines. For example, one department organized the use of a social media site to facilitate discussion. In one discipline ICT was used to integrate concept development, but in several other disciplines, there was no mention of the use of ICT to facilitate learning. In another discipline, ICT was required as part of course assignment content, and in another discipline, ICT was used to manage course work but not mentioned in course content.

During the period of this study, the faculty implemented an e-Portfolio in the form of a blog for teacher candidates to demonstrate their attainment of learning standards during their program. Although the implementation of the e-Portfolio was conceived and administered at the faculty level, the relationship between the e-Portfolio and regular coursework was not clear. Education instructors were unable to provide context or significance to the teacher candidates with regards to the e-Portfolio, particularly with regards to using blogs for teaching and learning.

At the provincial level of institutional policy, teacher accreditation was based on the Attainment of Standards, as described in the *Attainment of Standards Report* (2009) as a Letter of Understanding, are designed to facilitate the process of nominating teacher candidates for registration in the teaching profession upon completion of their teacher education program. The purpose of the Attainment of Standards is to recognize the independent responsibilities of the teacher education program in relation to the provincial college of teachers. The Attainment of Standards provides a credible performance based assessment to measure whether teacher candidates have met the standards and related criteria set by the college of teachers for certification in the province.
With regards to conceptions of ICT in the Attainment of Standards\textsuperscript{17}, there are three mentions of digital technologies in the 33-page document. In Standard 6, Educators have a broad knowledge base and understand the subject areas they teach, teacher candidates are expected to be engaged in a range of experiences designed to assist them in developing their competencies consistent with the demands of teaching and the literacies they need, including various digital literacies. The second mention is also in this standard, stating that teacher candidates will be expected to archive evidence of their effective use of various modes of communication (digital and face-to-face) in their e-portfolios or equivalent. The third mention of the term also occurs in Standard 6 in relation to demonstrating competence in the e-Portfolio by making appropriate and effective use of digital literacies for communication and learning.

Again, at the provincial level of institutional policy, there is no requirement for proficiency in the educational uses of ICT for either entrance or graduation from teacher education programs in the province. The provincial ministry of education is implementing a province-wide education plan that is relying on teachers prepared to teach and learn with ICT, but there is no commensurate preparation of new teachers’ educational uses of ICT in place at either the university or the provincial level. In addition, there is no requirement for specific ICT dispositions or demonstration of ICT imaginative capacity for certification by the college of teachers.

With regards to provincial educational policy for providing ICT resources in elementary public schools and provincial educational policy conceptions for elementary school ICT-related curriculum there were significant issues noted by the teacher candidates and the research group.

\textsuperscript{17} [Large Regional University in western Canada] Attainment of Standards Report, November 2009 (attainment-of-standards-report.pdf)
Many teacher candidates noticed that the provision of ICT resources in the elementary schools was not consistent from school to school or even classroom to classroom. Teacher candidates expressed concern about the lack of access to resources or that the resources available were not reliable enough to attempt teaching a lesson and risking technological difficulties.

During the period of the study the provincial government was implementing a province wide system for digital management of student information. The implementation of this system had caused widespread problems (Kuehn, 2009; Kuehn, 2011; Kuehn, 2011; Kuehn, 2011). This situation had contributed to an already tense relationship between the provincial teacher’s union and the provincial government. In terms of social constructive policies enactive of ICT dispositions and ICT imaginative capacity, the implementation of this program had contributed to negative concepts and perceptions regarding ICT in practice.

With regards to ICT-related curriculum and pedagogy at the provincial level, it is worth noting here conceptions of ICT at the level of the Ministry of Education, were adopted from educational technology standards as defined by the International Society for Technology in Education (ISTE). It should be noted that ISTE concepts of ICT use in education suggest that technology will change education. This approach is known as technologically deterministic, and is therefore problematic. This is because it does not account for sociocultural realities associated with the profession of teaching or historical relationships between educators and digital technologies (for example, the debacle of BCISIS as described above).

These three levels of policy contributed to the institutional conditions within which the research took place. These institutional conditions can be seen as socially constructive of sociocultural and technological conditions enacted within the structure of their environment.
4.1.2 Sociocultural Conditions

Several relationships can be identified as socially constructive of teacher candidates’ enactive experiences. They experienced instructional discourse pertaining to ICT in relation to their education instructors, their Faculty Advisors, and their practicum sponsor teachers. They also reported spending time with students in their practicum teacher’s classrooms, as well as the practicum school librarian and computer teachers (if there was one).

In addition, the teacher candidates were introduced to the research group at the outset of their teacher education program. The teacher candidates became familiar with GRAs sitting in observation of their regular education classes as well as receiving ICT support from members of the research team in the form of ICT learning sessions and incidental tech support.

Teacher candidates experienced ICT-related instructional discourse from their education instructors and from the research group during short ICT learning sessions in one of the education computer labs. The ICT learning sessions in the computer lab allowed the teacher candidates to experience a brief example of learning to use ICT in practice as a process of collaborative, critical inquiry. The ICT learning sessions also allowed the teacher candidates to witness ICT-related discourse by the research group. The verbal performance of this discourse expressed a positive disposition toward using ICT in practice and demonstrated ways to incorporate ICT into learning experiences that imagine innovative learning supported by ICT and implement innovative learning with ICT in a classroom setting.

4.1.3 Technological Conditions

Technological conditions from one classroom to the next were highly variable, both at the university and in the practicum elementary schools. There were no two classrooms that were
identically equipped with digital technological resources. Some classrooms and lecture halls were equipped with state of the art presentation equipment while others only had an AV cart equipped to play DVDs. Wireless connectivity was available, but it was also variable in strength depending on where the teacher candidate was located on the campus and in the education building. LCD projectors were not necessarily available in every class. When there was a projector available, it was not unusual to have problems connecting a laptop. Some of the projectors had a sound system built in, but, it was not unusual to have the speakers not working properly.

In the education building there were computer labs and laptop carts available to be booked for individual classes. These resources were often incomplete. That is, a class set of laptops would likely have a few machines that were not fully charged, or a computer lab would have one or two desktop systems that were out of order. There was a Smartboard permanently installed in one of the computer labs and another mobile unit available for booking into a classroom. The mobile Smartboard was not useful because it required constant re-calibration.

Digital technology provided by the teacher education program, the faculty and the university all operated through different departments. Each of these levels of ICT administration had their own security systems and required separate usernames and passwords. In addition, individual education instructors would use university-based and public domain online resources that would also require separate usernames and passwords.

Software applications available on the university ICT devices were loaded by the department providing support to the equipment. Individual educators could not download and install educational software for their lessons. In addition, saving teacher candidates’ files depended on the devices being used. The laptop carts did not have the capability to save student
files during learning sessions. Teacher candidates had to be equipped with their own personal flash drive to save work from in class learning sessions with the laptop computers.

The Faculty of Education maintained three computer labs in the main education building. Two of these labs were Windows based and the other was a Mac lab. Education instructors needed to know how to use the online booking system to take advantage of booking the labs. Education instructors did not have the authority to install specific educational software, so their uses of software in the computer labs was proscribed by the applications loaded on the machines. Once logged onto a computer lab computer, teacher candidates had access to moderate file storage on the network. It was possible to access this file storage from home, but it required a fairly sophisticated knowledge of file management and online file servers to do so.

The computer labs were generally well serviced and maintained with up to date software. However, it was not unusual to walk in prepared to teach a class and have difficulty getting the lab projector to work. It was also not unusual to have a class of teacher candidates sit down to log into the computers and find one or two of the computers were out of order. It was also not unusual to have one or two of the teacher candidates have difficulty logging into the education system and need to go get help from computing and media services to get their accounts working properly. It should be noted here, that issues with computer equipment in the computer lab required the help from a different office than computing and media studies, so education instructors needed to understand how the system of support worked to resolve technological issues as they arose during a lesson.

Computing and media services also provided class sets of digital cameras or digital video cameras for education instructors to borrow. This equipment was generally in good shape and ready for use, although it was not unusual to find a camera battery charge did not last an entire
lesson. Downloading photographs and video from these cameras was not a seamless process when the equipment was connected to computers in the computer lab. It was not unusual to find compatibility issues between the photographic devices and the operating systems on the computers in the labs. Also, downloading video could present quite a challenge if the video files were much bigger than, to pick an example, 3 minutes long.

In the practicum schools the ICT resources were not the same as what those provided by the university. Many of the elementary schools had computer labs of some sort which were generally equipped with refurbished computers retired from the business sector and sold at a discount to the elementary schools. Software on these computers was administered at the district level and governed by district policy and procedures. The state of equipment functionality in the practicum schools varied greatly. It ranged from fairly up to date computer labs with a part time computer teacher available to help with lesson planning to a small windowless lab where a number of the computers were out of order or not working properly and the mice were gummy and almost non-operational.

4.1.4 Research Conditions

There were several research conditions socially constructive of this study. First, the study reported in this dissertation was carved from a larger three-year study. Reporting the entirety of that three-year study was beyond the scope of this dissertation. Of necessity, this dissertation reports a selection of data from the first year of the larger study. Theorizing for the study reported in this dissertation is original to this dissertation and was not the same as the theoretical framework that constituted the original design.
Second, the members of the research collaborative did not only commit to attending the ICT learning sessions provided in addition to their regular teacher education program. They were also expected to commit to participating in the second and third years of the study. A condition of this commitment was that the participants would be issued a laptop, a digital video camera, access to a class set of digital cameras, an online discussion forum and a research-based server for hosting learning blogs and resources.

Third, although protocols for informing individual education instructors were arranged through department coordinators, there were education instructors who were not informed of the research or the purpose of the research. This lack of information was conveyed to the GRAs as irritation for having their classrooms ‘invaded’ for observation. Irritation on the part of individual education instructors was conveyed to the teacher candidates, and, in some instances, translated into an irritated attitude toward the research on the part of some of the teacher candidates.

4.1.4.1 ICT Learning Sessions as Research Intervention

The curriculum for the ICT learning sessions was developed as an evolving, reflexive response to observations of ICT-related discourse in the teacher education classrooms. The unfolding process of this development has been documented chronologically in Appendix F Chronology of Research Intervention.

Several points of interest to the conditions of the study have been summed up as follows:

1. By the end of the first term (Sep – Dec 2007) the research team reported observations of teacher candidates’ negative dispositions toward ICT in practice;
2. During the second term (Jan – Apr 2008) there was very little time made available by the standard timetable to provide ICT learning sessions;

3. Teacher candidates’ negative dispositions to using ICT in practice appeared to be socially constructive of their lack of development to imagine using ICT to improve learning opportunities and their lack of capability to implement ICT learning experiences in a classroom setting;

4. When provided with the opportunity to participate in collaborative critical inquiry to learn to use ICT in practice teacher candidates’ engagement appeared hampered by their negative dispositions toward ICT and their lack of skills and knowledge with regards to ICT imaginative capacity;

5. The constraints of the standard timetable and significance placed on learning ICT meant the research team had reduced opportunities to forge socially constructive relationships with the teacher candidates and did not have enough time to expand their working knowledge of ICT to encompass unfamiliar linguistic cognitive domains associated with learning ICT to use in practice;

6. The members of the research collaborative invested an additional 17 hours with the research group outside of regular teacher education program to develop their lesson plans and instructional design to teach ICT-based lessons during their upcoming extended practicum;

7. The members of the cohort did not have an opportunity to spend time with the research team developing their lesson plans and instructional design to teach ICT-based lesson on their extended practicum;
8. The research team met for at least an hour on a weekly basis to integrate observations from the education classrooms, conversations with teacher candidates outside the classrooms, and research literature to implement a reflexive, learner-centered ICT instructional discourse that provided hands-on experiential learning in conjunction with discussions about concepts of ICT in education;

9. By the end of Term 2 the members of the cohort had not received instruction on how to set up their WordPress blogs for their e-Portfolios in the teacher education program and were expressing anxiety and confusion, as well as irritation, with regards to this part of their program;

10. By the end of Term 2 members of the research collaborative had set up and authored their own WordPress blogs for teaching, including lesson materials to teach their students how to author their own blog contributions.

4.2 Data Report

The following data were collected between September 2007 and April 2008. Term 1 took place between September and December 2007. Term 2 took place between January and April 2008. Three datasets are reported herein that make up the data corpus for this study: 1) Term 1 and Term 2 In-Class Observations; 2) End of Study Questionnaire; and 3) End of Study Focus Group Discussions.

The thirty-eight member cohort was subdivided into two sub-groups. The first sub-group is the group of teacher candidates that did not volunteer to take a more active role in the study. These teacher candidates did not attend the additional 17 hours of ICT learning sessions offered outside the regular teacher education programming. The second sub-group is the research
collaborative. These teacher candidates volunteered to take a more active role in the study and attended an additional 17 hours of ICT learning sessions outside their regular teacher education program. Findings from these two sub-groups suggest a significant difference in their dispositions toward using ICT in practice and their capacities and capabilities to demonstrate skillful know-how with regards to ICT imaginative capacity.

Care has been taken in this data report to protect the identity of the participants. Names and subject content has been omitted, and random changes to gender have been used to further protect anonymity.

4.2.1 Term 1 and Term 2 In-Class Observations

Courses taught in the teacher education program were designed to fulfill the criteria for teacher certification as spelled out by the provincial teacher certification authority\textsuperscript{18}. These standards were interpreted by the teacher education program in the university\textit{Attainment of Standards Report} (ASR) which were used to articulate the ways teacher candidates’ coursework, met or exceeded the standards set by the provincial College of Teachers\textsuperscript{19}. As indicated in Chapter 2, the\textit{Standards for the Education, Competence & Professional Conduct of Educators in British Columbia} do not mention ICT or digital technologies.

Some of the courses we observed specified the performance standards covered by the various assignments required to pass the course. Not all courses specified performance standards

\textsuperscript{18} Standards for the Education, Competence & Professional Conduct of Educators in British Columbia © BC MINISTRY OF EDUCATION 2015
\textsuperscript{19} Note – the only document available online that describes the standards required to graduate the teacher education could be found as a checklist for completing the E-portfolio necessary for graduation. The actual Attainment of Standards Report (2009) that is listed as reading for education instructors in the instructor information package (2013-2014) is not available online.
in the syllabus. Of the courses that did specify performance standards in the syllabus, none of
them itemized Performance Standard 5 as required to pass the course. Performance Standard 5
reads, “Educators implement effective practices in areas of classroom management, planning,
instruction, assessment, evaluation and reporting” which includes the sub-item: “An effective use
of various modes of communication (such as digital and face to face)”.

In terms of course content, there was no teacher education course that specifically taught
concepts of ICT in education as a topic of instructional discourse either as an integral part of
studying the subject/topic of the course or as an integral part of learning the subject/topic of the
course. There was one lesson on cyber-bullying in an educational psychology course. Although
ICT was used in all the courses, none of these uses could be considered integral to the
preparation of teacher candidates’ ICT dispositions toward developing skillful capacities or
capabilities with ICT imaginative capacity in practice.

Each observation event noted the ICT available in the classroom. These notes have been
summarized in the description of technological conditions under Key Conditions. Uses of ICT
demonstrated by education instructors were noted in the observation field notes. These notations
were divided into two sections. One section was an inventory of the devices, software
applications and network infrastructure that were observed in use during the course of
instruction. This inventory is listed in Appendix E ICT Observed in Instruction.

checklist.pdf
4.2.1.1 Description and Analysis

Instructional discourse was seen to be socially constructive of teacher candidates’ disposition toward using ICT in practice. Education instructor dispositions, in the form of anxious emotional state (comportment) and frustrated behavior (composure), were observed to negatively affect teacher candidates’ dispositions toward using ICT. The absence of substantive discourse about ICT in terms of learning to use it for teaching, learning to teach about ICT, and learning disciplinary content with ICT were also observed to negatively affect teacher candidates’ disposition toward using ICT. In addition to education instructors’ negative disposition toward ICT and absence of substantive ICT discourse in education classes, there was a lack of education instructors’ demonstrations of capacities to imagine using ICT to improve learning experiences and a lack of demonstrations of the capability to implement ICT imaginative capacities in practice. Previous research within this setting generated similar findings (Guo, 2006; Petrina et al., 2008).

The combination of negative instructional discourse, absence of substantive discourse pertaining to ICT, and lack of demonstrations of ICT imaginative capacity had the combined effect of enacting teacher candidates’ negative dispositions toward using ICT in practice.

In-class observations of instructional discourses recorded an inventory of devices, software applications, network infrastructure and online resources used as part of education instructors’ teaching (see Appendix E ICT Observed in Instruction). The use of this inventory of digital technologies was seen as marginal, or an add-on to instruction, rather than integral to instruction.

AV carts were used to play videos, most often these videos served as ‘guest lectures’ or a documentary about learning a topic related to the discipline of the course. CDs were used to
distribute digital versions of forms and checklists for the teacher candidates to use on practicum. In one course, a CD player was used to teach a self-assessment activity of knowledge based on audio cues. Data projectors were most commonly used to teach PowerPoint assisted lectures. Lectures were usually slides of notes, however in one case the PowerPoint slides were used to show visual images to illustrate the work of artists. In another class the instructor had embedded video links in the PowerPoint slide and used them to add mixed media content to the lecture. One instructor demonstrated an exemplary use of digital photography combined with PowerPoint as an assignment to demonstrate theoretical concepts. Another instructor collected digital versions of the teacher candidates’ lessons plans submitted as course assignments and compiled them on a CD. Each teacher candidate was given a copy of the CD, so that they all had copies of a wide range of grade level and science topic lesson plans to take with them after the course ended. Digital video was used by one instructor as a course assignment. The teacher candidates were required to demonstrate performance of teaching a concept for the course. These videos were presented for the entire class as a culminating learning activity at the end of the term.

An example of teacher candidates’ negative disposition toward ICT was observed in a class when a teacher candidate suggested videotaping a creative movement lesson for her records. A vocal group of teacher candidates objected to the videotaping and the idea was abandoned.

A few education instructors were observed using laptop computers, typically to present PowerPoint lectures. One education instructor used laptop carts to teach a lesson on navigating the Ministry of Education instructional resource packages and prescribed learning outcomes available online. In another case an education instructor used a WebQuest learning activity
combined with a worksheet to teach teacher candidates to find course related instructional
resource packages online.

There were no observations of education instructors booking any of the computer labs
and teaching a lesson in the lab.

A number of online learning resources were used for course management and
communication. These included WebCT for disseminating course materials and submitting
assignments, Ning for fostering discussion outside of class time, DrupalEd for accessing course
presentations and wikis for group projects, Moodle for uploading physical education lesson
plans, e-portfolios for accreditation, and in one case, an education instructor website for
accessing reading materials. Email was used extensively throughout the program, primarily for
communication, in some cases to submit assignments as email attachments.

The teacher candidates had to keep track of each of these online resources usernames and
passwords depending on the IP address and author. They required a Campus Wide Login to
access university high speed Internet, email, WebCT and Wi-Fi, Computing and Media Services
username and password for accessing computers in the labs, individual usernames and passwords
for Ning, DrupalEd, Moodle, and WordPress e-Portfolios.

Education instructors’ dispositions toward ICT were observed and recorded with regards
to their interactions with ICT in-class. No two education instructors expressed identical
dispositions toward ICT in terms of their comportment and composure. In addition, instructional
discourses pertaining to ICT was different for each education instructor. Education instructors
demonstrated a ranged of ICT imaginative capacity to bring ICT into their classes. These
demonstrations ranged from not mentioning ICT or using ICT; through mentioning ICT as
important in education but not providing any in-class demonstrations of ICT imaginative
capacity; to teaching a PowerPoint lecture in every single class; to introducing teacher candidates
to use PowerPoint and digital photography to teach theoretical concepts from everyday
surroundings.

One commonality was observed across all the instructional discourse during the period of
study: there was no substantive discussion about how, when, why, what or where a teacher might
decide to make ICT an integral part of their instruction. When education instructors included ICT
as part of their instructional discourse, they often expressed a quality of ICT disposition that
conveyed anxiety, frustration, irritation or displeasure. In terms of the characteristics of their
engagements with ICT, if they used it at all, it was often in the service of curriculum delivery, in
the form of a PowerPoint lecture or using WebCT to manage assignment distribution and
submission. Some instructors used email to communicate course-related management concerns.
There was an example of two education instructors who did not fit this pattern. However,
although they expressed ICT-positive dispositions in terms of providing specific uses of ICT for
learning their subject matter, they did not provide opportunities to discuss the significance of
their professional choices to do so.

Given the significant lack of ICT-related instructional discourse, it is no surprise that
demonstrations of ICT imaginative capacity were also lacking. For example, there was no
demonstration of how ICT could be imagined and implemented to foster reading and writing
skills in the primary grades; no brainstorming idea of how young students can author their own
PowerPoint projects to build vocabulary and reading comprehension. Similarly, education
instructors were not observed devoting any class time to facilitating teacher candidates’
brainstorming ideas for using ICT to create compelling learning experiences for their practicum
students, and no opportunities to discuss the significant learning issues and opportunities entailed
by these ideas. In addition, there were no observations of opportunities to discuss how innovative ICT learning experiences might be implemented, or how the teacher candidates might support each other in their efforts to incorporate ICT in their teaching practice.

This lack of substantive instructional discourse about the significance of ICT in education and learning to implement ICT-based learning experiences meant the teacher candidates did not have an opportunity to critically inquire into the realities of teaching with ICT in educational institutions. This lack of inquiry meant that they did not have an opportunity to develop in-depth awareness of the issues, the challenges, the possibilities and the rewards of using ICT in professional teacher practice. There was neither opportunity for teacher candidates to research instructional design for ICT-based curriculum nor opportunities for them to practice developing, designing and implementing their own ICT-based lessons. There was no opportunity for teacher candidates to practice routine uses of ICT for teaching, much less develop innovative uses of ICT to enable, enrich and enhance learning. There was no critical discussion about how the teacher candidates had seen ICT used in education and what they considered exemplary uses and what they considered problematic uses. There was no opportunity for teacher candidates to discuss the inevitable barriers to ICT use that they will encounter in their teaching, and how they can develop efficacious responses to these barriers rather than simply decide not to use ICT because it ‘extra work’. There was no discussion about the ubiquitous use of PowerPoint lectures and how these lectures structure learning.

This lack of substantive instructional discourse pertaining to ICT in the teacher education program showed up in the planning and teaching of the ICT learning sessions with the teacher candidates. In the research team planning for these sessions, the notes reflect concern about how to make a meaningful connection with the teacher candidates in the computer lab when they have
no programmatic instructional discourse context to value the experience as significant or important to their development as teachers.

The absence of substantive instructional discourse pertaining to ICT in education meant the teacher candidates did not have a chance to develop supportive social networks they could access when they ran into difficulties. The education instructors modeled emotional distress and avoidant behavior when they ran into difficulties with ICT in the teacher education classes. The teacher candidates did not have an alternate instructional discourse to access in response to these inevitable difficulties. Lack of knowledge of a username or password could prove enough to derail a lesson plan. Difficulty connecting a laptop to the internet or to a digital project could add many minutes of delay to the start of a class.

This situation (of absence of substantive ICT instructional discourse leading to absence of demonstrations of ICT imaginative capacity contributing to negative dispositions toward using ICT in practice) set up a self-referential feedback loop for negative dispositions toward using ICT. There were no opportunities to discuss and learn what it means to use ICT in educational settings. Uses of ICT in educational settings are specifically complex and potentially difficult. Without adequate emotional and mental preparation, these inevitable difficulties are experienced as significant unpleasant events that form value-loaded memories about using ICT in education. The intensity of these value-loaded memories was reinforced when education instructors responded to unexpected ICT difficulties with anxiety, frustration or irritation. Thus, teacher candidates were reinforced to be negatively disposed toward ICT by the lack of instructional discourse and memories of unpleasant and difficult events that informed future imaginings of using ICT in education.
The following observations from the study illustrate how instructional discourse related to teacher candidates’ dispositions toward ICT. The teacher candidates attended a series of guest speaker presentations by educators and researchers discussing their specific areas of interest in the field of education. The first presenter was a well-known academic in his specific field. This presenter had asked the education instructor to set up a laptop and digital projector for his presentation.

At the beginning of the presentation the presenter asked the teacher candidates if they had all received the reading for the presentation and if they had read it. The teacher candidates responded that they had not received the email and so had not read the reading material to prepare for the presentation. This led to some discomfiture on the part of the presenter who implied that someone other than himself was to blame for this oversight, then launched into his presentation.

As the presentation got underway, the presenter was standing at the back of the class talking to the students. The education instructor interrupted the presenter’s introductory remarks to remind him that the laptop and projector were set up for his to use. The presenter replied, “A good teacher doesn’t use technology” and proceeded to deliver his presentation without once using the technology provided. Later, when the class gathered to debrief the presentation, the education instructor expressed confusion about why the presenter had asked her to go to the trouble of setting up the technology but then had not used it.

In one education course the teacher candidates were expected to produce a PowerPoint assignment that involved taking digital photographs of local environs and using these

21 Identity has been changed to protect anonymity of the presenter.
photographs to teach subject-related concepts. This could be considered an innovative use of ICT to teach subject-related concepts, especially if the students are creating their own PowerPoint presentations of representing these concepts from their day-to-day lives.

However, this assignment entailed several forms of digital technology, including a digital camera, a laptop or desktop computer, PowerPoint software, photo editing software, WebCT, file uploading protocols for WebCT, and file management. This one assignment utilized ICT devices, software applications, network infrastructure, and course management software. The expectation was that the teacher candidates would accomplish this assignment without explicit ICT instruction or support.

For some of the teacher candidates, this meant going to extraordinary lengths to accomplish the task. They needed to purchase the software, learn how to use it, learn how to download digital photographs and edit them so they were the right size for the PowerPoint file, and learn how to export their PowerPoint file so it was the right size and format for uploading into the course management system.

Although the intrinsic value of the learning experience of using digital photography, PowerPoint, and course management software was somewhat self-evident, the effort to implement and complete the assignment was not. When considered in the context of K-7 education, the possibility of the teacher candidates trying to teach this lesson during their practicum would be very challenging. In fact, if the teacher candidate had experienced an extraordinary amount of anxiety and frustration to complete the assignment on time, they would probably not be disposed to consider attempting such an exercise under the watchful eye of their practicum sponsor teacher.
In another education course there was an ICT-based assignment as well. The teacher candidates were expected to create an iMovie demonstrating their knowledge of subject-related concepts learned during the course. In this instance it was expected that teacher candidates’ would have a working knowledge of digital video filming, file management, video editing, publishing, and burning video files to CD. These processes entailed the use of a digital video camera, connecting the digital video camera to a computer to download the files, having the computer hardware recognize the digital video camera and allow the video files to download, downloading and managing digital video files that were large and difficult to share across devices, in some cases the video files exceeded the file allocation space provided by the university, learning video editing software on a Mac or in Windows Moviemaker, safely saving large video files and backing up projects in progress, exporting finished videos to external storage devices, and finally burning a CD with a number of video projects stored on one disk.

In this case, the education instructor was not familiar with the technology required to accomplish the assignment. She was unprepared to provide leadership or support to the teacher candidates as they encountered a wide variety of technological challenges in their efforts to accomplish this assignment. Rather than inspiring the teacher candidates to use digital video in their teaching, many of them expressed a negative response to this ICT encounter in their program. In the observation notes from this event, the graduate research assistant noted, “Students are a little anxious about this project”, “The problems with this project continue, as teacher candidates try to figure out how to get their edited files onto one large group CD for submission.”, and “There were numerous remarks about the "technology", as if it were a problem, or in a negative context — that it would not work the way the students expected it to.”
In another education course the teacher candidates were given an assignment to produce an ICT-based instructional project for teaching a topic to elementary students. The teacher candidates worked on developing the skills to produce these projects with the Principal Investigator during the ICT learning sessions in Term 2. On the day for presenting these projects, the 38-member cohort gathered in a classroom with a permanently installed data projector and sound system. The class started and the first group attempted to connect their laptop computer to the data projector. There was a problem with the connection and what ensued was half an hour of trying to get the projector to connect to first one, then another laptop. In the end, it was determined that the projector was malfunctioning and a data projector was borrowed and set up in the classroom. The Principal Investigator, who had come to the class to watch the presentations, worked to get a working system in place. Standing off the side, watching the proceedings with obvious frustration, the education instructor said, “Umm… Technology… This is the drawback … You never know if everything is going to work … Or not.” The teacher candidates were already in a restless mood waiting for the presentations to begin. In this situation instructional discourse could be seen as contributory to teacher candidates becoming negatively disposed toward using ICT in practice.

4.2.1.2 Findings

Instructional discourses in the teacher education program did not specifically address the use of ICT in practice. Education instructors’ dispositions toward ICT were commonly conveyed in the form of an anxious, frustrated or irritated emotional state and unskillful behavior with the technology. Examples of positive excitement, significance or confidence when discussing or using ICT were rare. Instructors who did convey confident dispositions with the use of ICT most
frequently used the technology for curriculum delivery rather than social, collaborative learning or critical inquiry into the use of ICT in education. By their uses, they did not demonstrate the capacity to imagine using ICT to improve learning experiences or demonstrate the capability to implement ICT imaginative capacities beyond conventional methods of teaching where the technology is used to transmit information rather than build knowledge-generative learning relationships.

The actual uses of ICT in the teacher education program ranged from non-existent to one or two exemplary uses. In-class observations record far more instances of ICT non-use rather than ICT use and far more instances of unpleasant experiences with ICT when it was used than pleasant ICT learning experiences. On top of that, uses of ICT that were not complicated by technical difficulties were not particularly interesting or engaging learning experiences, but simply the untroubled use of a PowerPoint lecture to present slide after slide of notes while the presenter spoke. There were many observed moments of education instructor discomfort and teacher candidate anxiety and frustration, with regards to the use of ICT. These experiences were not observed to be contextualized with the wider field of concepts guiding the use of ICT in education and/or methods for developing skillful know-how or ICT imaginative capacity.

The in-class observations reported a complex web of technological devices, software applications, network infrastructure and online resources intermingling with education instructors who have mixed dispositions toward ICT capacities and capabilities and generally low skills with regards to ICT imaginative capacities in practice. Teacher candidates’ responses to ICT instructional discourses were observed to exhibit anxiety, frustration, displeasure and boredom. ICT-based instructional discourses, when expressed at all, appeared to be forced, as a
necessity entailed in a department syllabus rather than an individual instructor interest or skill they perceived as important to convey.

Out of 15 education instructors and 7 guest speaker presentations observed in the program, there were a couple of instructors who incorporated ICT into their teaching in meaningful ways. However, they did not contextualize these uses of ICT for the teacher candidates, so although they provided firsthand experience of an exemplary use of ICT, the teacher candidates were not helped to understand how that instructional design was conceived or implemented or how they might generalize those uses of ICT to elementary classrooms.

The absence of substantive ICT instructional discourses left the teacher candidates negatively disposed toward imagining using ICT in practice or developing the capability to implement ICT-based learning experiences. Their overall ICT experience in their teacher education program did not prepare them to take advantage of ICT learning sessions provided by the research group. They did not have prior experiences of participating in collaborative critical inquiry to develop skillful know-how in relation to ICT in practice. In addition, they did not have a socially constructive history of valuing ICT as significant in relation to successful completion of the teacher education program or their future career in teaching.

4.2.2 End of Study Questionnaire

As the first year of the two-year teacher education program drew to a close the research group scheduled a series of five focus groups for the thirty-eight member teacher candidate cohort. These focus groups took place around a large table in a seminar classroom. The first activity, to get the focus group underway, was to have the teacher candidates complete the End of Study Questionnaire. After the members of the focus group had completed their
questionnaires, a research group facilitated a discussion based on the items in the questionnaire. In this section I report the data collected in the questionnaires from these focus groups.

4.2.2.1 Description and Analysis

The End of Study Questionnaire provided a glimpse into teacher candidates’ subjective interpretations of social interactions pertaining to ICT during their first year in the teacher education program. The questionnaires were completed before the attendees to the focus group had a chance to talk amongst themselves about their experiences in the teacher education program. Teacher candidates’ answers to the questions in the questionnaire provide insight into the meanings they derived from instructional discourse in their teacher education program and how these meanings contributed to their disposition toward using ICT as part of their plans to teach on extended practicum.

The teacher candidates did not realize it, but I was able to code the questionnaire responses into two sub-groups; the teacher candidates from the cohort and the members of the research collaborative. Data from this questionnaire was analyzed with regards to the responses of these two sub-groups as embedded cases within the context of the thirty-eight member teacher candidate cohort. The main difference between these two groups was attendance to additional ICT learning sessions outside the regular schedule of the teacher education program. With this approach, I was able to ascertain the role instructional discourses played in their disposition toward using ICT in practice, as well as discern differences in their expression of skillful know-how and ICT imaginative capacity.

The first question asked the teacher candidates to provide a definition of ICT: “I would define Information and Communication Technologies (ICT) as...” The majority of the answers to
this question conceived ICT as ‘tools’, e.g. “Using technology as a tool to communicate concepts to my students.” or described ICT as digital instruments, for example, “using technology such as computers, projectors Smartboards, etc. in communicating information to others”, “technology that can be used in order to find out new things and share them with others (internet, cell phones, Ning, Facebook, etc.)”, and, “using computers, internet, projectors, etc”. It was interesting to note that none of the responses conceived of defining ICT in terms of sociocultural concepts or the possibilities for social collaborative learning cultures.

The next question asked the teacher candidates if they felt well-prepared to use ICT in their upcoming extended practicum, “I feel well prepared to use Information and Communication Technologies (ICT) for teaching during my extended practicum: strongly disagree, disagree, no opinion, agree, strongly agree”. None of the teacher candidates selected “strongly disagree” in answer to this question. However, a majority of the members of the cohort selected “disagree” or “no opinion”. A minority of the members of the cohort group (less than one quarter) selected “agree” or “strongly agree”. In the case of the members of the research collaborative group, all of them selected “agree” or “strongly agree”.

Some of the teacher candidates from the cohort group provided additional comments to describe why they did not feel prepared to use ICT in their extended practicum. The reasons they described included:

- Professional choice, for example, “I could include it but it will not be an option I will explore”, “I don’t feel comfortable setting up my own projector.”, “honestly, don’t intend to use any ICTs in my extended practicum”;
- Practicum teacher does not provide support: “I know how to use tech, but my practicum teacher doesn’t like using it in class.”, “I feel very confident using tech but
my teacher does not, so I likely will not.”, “My teacher (sponsor advisor) does not use technology while class is in session.”, “I don’t know how appropriate it will be, given that it is not my classroom. I am a guest in the practicum classroom and I must respect my sponsor teacher’s practices.”;

- Primary grade bias against ICT use in class: “I am teaching kindergarten and I feel using technology takes away their fundamental skills. (writing, drawing, etc.)”, “I don’t know how I could work it into a kindergarten setting.”, “I am in a kindergarten class and at this point I would not use, but the class does go to a computer lab where there is a teacher.”;

- Inadequate resources in the school: “I would, but my school lacks funding.”, “The one time that I was going to use the internet for a lesson my teacher said that it was unreliable in the school”.

The members of the research collaborative offered comments that indicated instructional discourses from the ICT learning sessions positively disposed them to plan to use ICT during their extended practicum: “I have some background in this field, but still not up to date [but still planning to use it]”, “I feel excited and motivated too.”, “mostly prepared, I need to know more”, “I am comfortable using it and already have done so in my short practicum”, “Because of [ICT learning sessions] I feel like I have a lot of support”, and “The [ICT learning sessions] … were the most helpful to me.”

The data from this item shows a pronounced difference between members of the cohort group and members of the research collaborative with regards to their disposition toward using ICT on their extended practicum. It is interesting to note that members of the cohort interpreted instructional discourse in the teacher education program as socially constructive of a negative
disposition toward using ICT that was supported by dissuasive comments about why they would not use it while members of the research collaborative interpreted the combination of instructional discourses from the teacher education program and the ICT learning sessions as socially constructive of a positive disposition toward using ICT that was supported by persuasive comments about why they would use it despite the known difficulties.

The next item asked the teacher candidates if they believe they will use ICT during their extended practicum: “I believe I will use ICT for teaching during my extended practicum: yes, no”. To this item, the majority of the members of the cohort group answered that they did not intend to use ICT during their extended practicum. The division of yes and no on this question was approximately as 40/60 split (8/22 respondents felt prepared to use ICT, 14/22 respondents did not feel prepared to use ICT). The members of the research collaborative all responded yes to this item indicating that they all intended to use ICT on their extended practicum. This item provides an indication of teacher candidates’ disposition toward using ICT in practice at this point in their program. Less than 40% of the members of the cohort planned to use ICT on their extended practicum. All the members of the research collaborative planned to use ICT on their extended practicum.

Teacher candidates’ response to this question indicates instructional discourse in the teacher education program relates to teacher candidates’ developing a negative disposition toward using ICT in practice. Instructional discourses in the ICT learning sessions indicate a relationship to members of the research collaborative developing positive dispositions toward using ICT in practice. The responses to this item indicate a significant relationship between instructional discourse and teacher candidates’ dispositions toward using ICT in practice.
The next item asked teacher candidates to describe their preparations to use ICT on their extended practicum to which some responded: “I am planning to use ICT to teach during my extended practicum in the following ways: subject(s), connections to learning, connections to teaching”. The purpose of this item was to provide an opportunity for teacher candidates to demonstrate their skillful know-how and ICT imaginative capacity with regards to their imagining using ICT on their extended practicum.

Teacher candidates’ responses to this question were analyzed for indications of the level of planning, or forethought, they had put into preparing to teach with ICT on their extended practicum. The analysis of the answers followed a simple rubric, was the teacher candidate planning on using ICT on their extended practicum? If the teacher candidate was planning to use ICT, did they provide any semblance of a plan for this use? If they did provide a semblance of a plan, was it a minimal plan or an actual plan that showed research and investigation to support it?

The members of the cohort group opted out of any planning at a rate of more than half of the group. Of those who said they intended to use ICT most of those intending to use ICT had a minimal plan on how they intended to use it. These plans were described as follows:

- Intend to use ICT but demonstrate no plan: “all subjects, all interaction, all presentation”, “all subjects, give presentations”, “maybe PowerPoint presentation”, “ANY [subject], internet for research, word for assignment write-ups, research for resources + ideas, communication w/ sponsor teacher”, “all subjects, to help me prepare my lessons but not to help me teach the class”; 
- Intend to use ICT and demonstrate minimal plan: “PowerPoints, research on internet, typing up assignments, etc.”, “music, internet, recording, making CDs, accessing videos off YouTube”, “science, math, view images/videos, games, learn through
different media, online math games”, “art, knowledge of diff. types of art”, “center
time, time for the students to play/explore in less structure”, “art, English, science,
PowerPoint, visual medium”, “video’s slide shows, games / cd rom”, “music, laptop
= music source”, “art language arts other, PowerPoint of instructions/examples, talks
in front of camera, use for listing mind mapping, dig. camera for pictures”;  

• Intend to use ICT and demonstrate having a plan: “Math, CAPP [career and personal
planning], Language Arts, SS, using applets, creating resumes, project work, images
linked to stories”, “math, science, language arts, reader’s theatre, PE, word problems
with photos, computer literacy, library research, output assist, student editing, show
kids themselves as readers, document skills development, use photos to make book of
games”, “music, all subjects, many subjects, art, recording, playing Garageband,
PowerPoints, and movies, digital images, unit overviews, reflections”.  

It is interesting to note that the group that did not intend to use ICT on their extended
practicum was made up entirely of members from the cohort group. The group that intended to
use ICT but did not have a plan was made up largely of members from the cohort group with one
member from the research collaborative. The group that demonstrated they had a minimal plan
or a plan was made up of members of the research collaborative. 

Findings from this item indicate that there is a relationship between instructional
discourses and teacher candidates’ dispositions toward planning to use ICT in practice. The
instructional discourses from the teacher education program appeared to lead members of the
cohort to think they might use ICT in some way in their teaching on extended practicum, but to
not have well-formulated plans in mind to accomplish this task. The instructional discourses
from the ICT learning sessions attended by the research collaborative, while not resulting in
extensive plans (there had not been much time), had led to the development of some formulation of an actual plan to use ICT in their teaching.

The next item asked the teacher candidates what they would need to be able to teach with ICT on their extended practicum, “In order to use ICT to teach during my extended practicum, I will first need to: a), b), c), d), e)”.

The teacher candidates submitted 53 items that they considered they would need to be able to teach with ICT on their extended practicum. These needs were grouped according to topics arising from the list:

Curriculum – appropriate use (appropriate uses of ICT in curriculum),
ICT resources – other (other than those available in practicum school),
ICT resources – school (ICT resources available at practicum school),
ICT skills and knowledge – professional (what the teacher candidates consider their ICT skills and knowledge that need improving),
ICT skills and knowledge – students (ascertaining the ICT skills and knowledge of the students they will be teaching to determine what ICT they can plan to teach with),
Permission – practicum administrator (getting permission from the school principal to use ICT during their practicum), and
Permission – practicum teacher (getting permission from their practicum teacher to use ICT in the practicum teacher’s classroom).

When the perceptions of needs were analyzed for weight of interest or concern, it was interesting to note that members of the cohort did not place their ICT skills and knowledge – professional as highly as did the members of the research collaborative. On the other hand,
members of the cohort placed a high weight on ICT resources available at their practicum school, compared to the members of the research collaborative, who did not put any weight on this item.

This finding can probably be attributed to the fact that the members of the research collaborative knew that they were going to be provisioned with a basic teaching kit of ICT resources that they could bring with them into the school while members of the cohort would be more dependent on school resources for their use of ICT and to date, their experiences in their practicum schools did not give them confidence that this need would be adequately provided by the school.

It is interesting to note that contributions to this list indicate teacher candidates’ skillful know-how and ICT imaginative capacity in terms of their capacity to imagine using ICT on their extended practicum and their capability to assess their needs for implementing these imagined lessons. When the contributions were analyzed with regards to indications of skillful know-how and ICT imaginative capacity, the members of the research collaborative contributed list items at a rate of 3/1 compared to contributions from the members of the cohort group.

Findings from this item indicate the instructional discourse in the teacher education program did not develop teacher candidates’ skillful know-how and ICT imaginative capacity with regards to being able to assess their needs to implement ICT-based lessons during their extended practicum. Instructional discourse in the ICT learning sessions attended by the research collaborative demonstrated developing skillful know-how and ICT imaginative capacity with regards to assessing needs for teaching with ICT on the extended practicum.

The final item asked the teacher candidates to rank their understanding of the factors that would help or hinder their use of ICT during their extended practicum: “Based on my current understanding, I believe the following factors will hinder or help my use of ICT in my teaching
during my extended practicum: a) teacher education program; b) self confidence; c) in-class teaching support (mentoring); d) sponsor teacher support; e) sponsor school resources (hardware, software, infrastructure): greatest hindrance, hindrance, neither help nor hindrance, helpful, greatest help.”

Members of the cohort’s contributions to this item were sorted and analyzed for indication of what they considered the greatest hindrance to using ICT on extended practicum to the greatest help. This analysis yielded the following results:

- Greatest Hindrance: Practicum Teacher
- Hindrance: Teacher Education Program
- Neither Help Nor Hindrance: In-class Support
- Helpful: Practicum School
- Greatest Help: Self-Confidence

The results from the members of the research collaborative were similar in ranking their perceptions of greatest hindrance to greatest help: they also considered the greatest hindrance to their use of ICT was their practicum teacher and the greatest help was their own self-confidence.

It should be noted here that one of the members of the research collaborative had a practicum teacher that was expressed such a negative ICT disposition toward [his] use of ICT during practicum teaching that he ended up cutting his practicum placement short and repeating his practicum teaching the following year.

The teacher candidates all found the teacher education program a Hindrance, and commented critically on their education instructors role modeling with ICT, “TEP Instructors and profs do not have a handle/are not comfortable with the tech components required. At times
nobody seems to know what’s going on / what is required WHY”, “shows technology failing constantly and too much pressure”, “it never worked for any of our profs and caused large gaps in time”.

Teacher candidates who selected Neither Hindrance nor Helpful with regards to the teacher education program commented, “I feel like the [teacher education program] program doesn’t provide proper guidance for teachers in using ICT.”, “there was some attention to ICT in the general curriculum but not enough to teach me anything I couldn’t have done on my own” and “I have not learned any new skills with regards to technology”.

Some teacher candidates selected Helpful with regards to the teacher education program. Teacher candidates’ commented that they found it helpful that ICT was required in some classes and that they appreciated preparing lessons and receiving help and ideas. Research collaborative members commented that participating in the research collaborative let them get direct help. In particular, “Most difficult was when [methods] class called for assignment in PowerPoint. I had no experience with it and it was early in semester 1. I bought the program and a book and muddled through. Would like to see a support class/session for specifically first assign like that.”. Research collaborative members commented that, “I have learned some new ways to integrate [ICT] into the classroom”, and that their ICT encounters in the teacher education program, “provided some ideas of how to use technology - we had some assignments in PowerPoint or to be submitted on Moodle”.

One member of the research collaborative found the teacher education program Greatest Help. This person commented that it made a difference that his Faculty Advisor fully supports it and that he perceived the teacher education program admin supportive of it as well.
On the self-confidence factor, neither the teacher candidates nor the research collaborative indicated that their self-confidence using ICT was a Greatest Hindrance. Both teacher candidates and research collaborative indicated their self-confidence was a Hindrance. Teacher candidates commented, “There is so much ICT that I do not understand”, “There should just be a course on using technology. I didn’t even have the hands-on chance to learn about how to plug-in the projector. I’m not very confident in doing it still”. A research collaborative member commented, “Still feels a little bit nervous using it. I feel like it will not work when I need it to (have seen this so many times!)”.

Five teacher candidates selected Neither Hindrance nor Help for the self-confidence factor but none of them left a comment explaining their choice.

Self-confidence factor ranking Helpful received the most responses from both groups. Teacher candidates’ commented, “I am pretty confident with my skills with technology”, “I am competent at ICT”, and, “in terms of what I feel comfortable with, self-confidence is always an asset”. Members of the research collaborative commented, “self confidence may be low with regard to teaching but I feel confident about ICT”, “I feel confident using ICT”, and, “not lacking in that ability/willingness to fail, try again.”

In the self-confidence factor ranking Greatest Help three teacher candidates indicated they fit in this category. One of these teacher candidates commented, “[I am] confident in my abilities”.

In-class teaching support factor ranking Greatest Hindrance was not selected by either teacher candidates or research collaborative. Two teacher candidates selected in-class teaching support was a Hindrance. They commented, “my teacher doesn’t even use email”, and “having another presence in the classroom would just complicate matters”. Both teacher candidates and
research collaborative indicated they perceived in-class teaching support as Neither Hindrance nor Help. Teacher candidates commented, “I don’t think this exists at my school”, and, “I don’t know where I will be in Sept. My teacher before was very tech savvy”. Research collaborative members commented, “unknown - I don’t know my placement yet, SA — unknown factor, school unknown” and, “not sure who my teacher is so I don’t know”.

Both teacher candidates and research collaborative indicated they perceived the in-class support factor as Help. Teacher candidates commented, “with respect to our cohort IT ppl [people], I felt [Techcoach1] and [Techcoach2] were helpful and I would contact them if needed”. A research collaborative member commented, “It’s always nice to have someone there who can help if it goes wrong”.

One research collaborative member selected in-class support factor Greatest Help. This person commented, “[Techcoach1] has been a valuable resource” (2657).

Practicum teacher support factor was a Greatest Hindrance for one research collaborative member. He commented, “My teacher is REALLY, REALLY [sic] skeptical and I believe, somewhat against, the use or pro-active learning of ICTs.” Two teacher candidates indicated their practicum teacher was perceived as a hindrance. They commented, “this is not an objective we have set for the extended practicum; ...nor is it a pressing objective that my teacher and myself have decided on for my extended practicum”, and, “very hesitant” (this was the teacher candidate who commented earlier that his practicum teacher does not use email).

Both teacher candidates and research collaborative indicated they perceived their practicum teacher as Neither Hindrance nor Help. Two teacher candidates commented, “we never even discussed it; we have 6 computers in our class but I feel the kids are already on them too much” and, “my sponsor teacher would support me, but probably wouldn’t be too helpful w/
technical details”. Research collaborative members commented, “unknown”, “my teacher is fine with me using it, but cannot offer technical support”, “not sure what to expect, I know I can ask for help from [research group], though”, and, “she was on leave during my practicum”.

Both teacher candidates and research collaborative indicated they perceived their practicum teacher as Help and one teacher candidate indicated they perceived their practicum teacher as Greatest Help. There was one comment submitted by a teacher candidate who perceived her practicum teacher as a Help, “my school advisor/her husband, provide my school w/ a lot of their tech. support, so she is very useful in this regard”.

Practicum school support was considered a Greatest Hindrance by two teacher candidates. They commented, “the computers are very temperamental and do not always work.”, and, “my school does NOT have the funding!” Both teacher candidates and research collaborative perceived practicum school support a hindrance. Two teacher candidates commented, “my school does not have the resources to make use of this in the classroom; this is not an avenue that my school can equip me with the tools needed” and, “we have 6 computers in our class but I feel the kids are already on them too much”. One research collaborative member commented, “ICT teacher not well liked by other staff”.

Practicum school support was considered Neither a Hindrance nor a Help by both teacher candidates and research collaborative. One teacher candidate commented, “not sure if resources available”. Two research collaborative members commented, “I am unsure of the infrastructure at my school”, and, “not sure what school I’m at”.

Both teacher candidates and research collaborative indicated their practicum school support was a Help and also a Greatest Help. Two teacher candidates commented, “Help teach using basic computer skills to other colleagues” and, “we have some resources but not a lot... the
little that we do have is helpful”. One research collaborative member commented, “I used the school’s projector, it was always available”.

When the contributions from the members of the cohort and the members of the research collaborative were compared, the members of the research collaborative had a more positive view of the helpfulness of their experiences in the teacher education program.

The last two items elicited comments from the teacher candidates pertaining to their experiences in the teacher education program in the past year and their experiences learning about ICT in the teacher education program for the same period. These items yielded a collection of comments that were analyzed and grouped according to their content.

Three main interests were identified from these comments: curriculum, role modeling and the ICT learning sessions. These interests were sorted by volume of comments assigned to each interest to provide a sense of the interests that carried the greatest weight for the teacher candidates. The interests showed that role modeling was most commented on, followed by the ICT learning sessions, and curriculum was the least commented on. The comments were further analyzed for indications of positive and negative comments. By far, the negative comments outweighed the positive comments.

When analyzed by contribution, the members of the cohort negative comments outnumbered those from the members of the research collaborative. Members of the cohort made twice as many negative comments about role modeling in the teacher education program than as the members of the research collaborative. They made all the negative comments about the ICT learning sessions and three times the negative comments about teacher education curriculum than did the members of the research collaborative.
4.2.2.2 Findings

Several findings can be deduced from teacher candidates’ individual reflections of their experiences of instructional discourse pertaining to ICT in the teacher education program at the completion of their first year of study. Findings from this questionnaire are sorted into two groups of responses, those of the members of the cohort, and those of the members of the research collaborative.

The first finding is significant for both groups. At the end of the first year of their experience of instructional discourse in the teacher education program they defined ICT in instrumental and technological terms. They were neither able to conceive of ICT in education as sociocultural phenomena nor define ICT in terms of the role it plays in learning and forming learning relationships. Neither were they able to conceive of a definition of ICT that described the significance of ICT in the profession nor define ICT with regards to learning and practice.

A second finding is that instructional discourse in the teacher education program was not socially constructive of ICT dispositions willing to use ICT-based learning during the extended practicum. The majority of teacher candidates did not intend to use ICT on their extended practicum, and those who did intend to use it had not demonstrated skillful development of plans as to how they intended to use it, why they were selecting its use, and what, exactly, they were going to use.

A third finding is that the members of the research collaborative, who experienced ICT instructional discourse in a weekly series of ICT learning sessions, developed dispositions willing to use ICT on their extended practicum. All of the members of the research collaborative felt prepared to use ICT on their extended practicum and intended to do so. They demonstrated
skillful know-how and ICT imaginative capacity in terms of preliminary planning as to what ICT they planned to use, why they were planning to use it and how they would implement this use.

A fourth finding from this questionnaire is that instructional discourses played a role in teacher candidates’ ability to assess their needs for using ICT in practicum school settings, and, more importantly, their views on the degree of difficulty to do so. The members of the cohort reported a higher degree of negative impacts of ICT instructional discourse and a tendency to not engage with ICT on their extended practicum compared to the members of the research collaborative, who were more likely to show a positive ICT disposition even as they encountered the same instructional discourse in the teacher education program.

4.2.3 End of Study Focus Group Discussion

After completing the End of Study Questionnaire, the research group facilitated focus group discussions based on the items from the questionnaire. The purpose of these discussions was to provide an opportunity for shared experiences and shared meanings to be brought forward by the teacher candidates. The social process of recalling experiences and discussing significance of past events served as a reflexive communicative event, where cues of comportment, composure, and skillful know-how and ICT imaginative capacity could be brought up for discussion. In this way, each teacher candidate had an opportunity to socially constructed shared memories from the previous year with their colleagues. Through this process they could shed light on events that were significant or meaningful during the past year and contextualize them in terms of the upcoming extended practicum.
4.2.3.1 Description and Analysis

The transcript collection was comprised of recordings from five focus group sessions. These transcripts totaled 259 minutes of recordings, which amounted to 32,901 words. Where possible, the speakers were identified in the transcripts. For example, it was easy to identify the voices of the Principal Investigator and the graduate research assistants. It was also easy to identify the voices of the members of the research collaborative, because many hours had been spent together in ICT learning sessions. The rest of the voices of the members of the cohort were not so easy to identify. These voices were grouped under one collective code.

Being able to identify the voices of the members of the research collaborative and the members of the research team made it possible to identify the members of the cohort as a group. In this way, it was possible to analyze contributions to the discussion as originating from members of the cohort or members of the research collaborative.

The first pass over the transcripts identified content referring to ICT in the teacher education program spoken by the teacher candidates. This analysis yielded 336 records for further analysis. The average word count per record was 47 words. ICT-related content in the transcripts amounted to approximately 15,800 words. This ICT-related text of 15,800 words comprised the transcripts that were used for further analysis in this section.

The second pass over the transcripts identified teacher candidates’ descriptions of ICT hindrance grouped into the factors from the questionnaire:

a) Teacher education program,

b) Self-confidence,

c) In-class support,

d) Practicum teacher,
e) Practicum school.

A third pass over these factors analyzed for sub-factors within the main factor. For example, identifying whether a hindrance was discussed in relation to curriculum or role modeling under factor a) teacher education program. These three passes yielded collections of texts that re-iterated comments already reported in the questionnaire analysis. This line of analysis was discontinued because it was not bringing any new information to light.

A fourth pass over the data analyzed teacher candidates’ descriptions of specific ICT encounters that were significant enough in their memories to warrant recall and discussion. This analysis focused on negative impacts of instructional discourse because the questionnaire data had already shown that the instructional discourse in the teacher education program manifested non-use of ICT dispositions in teacher candidates by the end of the first year of the teacher education program. At this point analysis of the focus group discussions was intended to provide more information about the relationship between instructional discourse and teacher candidates’ manifestation of ICT dispositions. This fourth pass provided details of instructional discourse events that contributed to teacher candidates’ manifestation of ICT dispositions, as described by the teacher candidates.

The fourth pass of analysis yielded 101 records out of the original 336 records. These 101 records were analyzed in relation to the hindrance/help factors listed in Question 6 of the Questionnaire. From this analysis 18 records were identified that did not fit into the original 5 factors. These records were analyzed for common content and grouped under a new factor called Belief. These records indicated manifestations of non-use of ICT dispositions that could not be group under the original 5 factors.
This collection of descriptions of significant instructional discourse events were analyzed to get a sense of the proportion of contributions from the members of the cohort group and the members of the research collaborative. This analysis revealed that the members of the cohort contributed an average of 4 descriptions for this collection and the members of the research collaborative contributed an average of 1.75 descriptions. The members of the cohort recalled more than twice as many significant events of instructional discourse that had a negative impact on their manifestation of ICT dispositions.

According to the contributions in this fourth round of analysis, factor a) teacher education program was the most influential instructional discourse experience that contributed to teacher candidates’ negative ICT disposition. Teacher candidates’ comments about the impact of instructional discourse in the teacher education program reflected a broad range of concerns.

First, they were negatively impacted by instructional discourse that placed expectations of them completing ICT-based assignments without providing them with adequate support to learn how to actually complete the ICT-related parts of the assignments. For example, there were many different social media environments used by their different education instructors, but they did not feel adequately prepared to use them for learning, “…we haven’t been introduced to it – we’ve used it [social media] and [we’re] expected to learn it on our own… we haven’t been introduced to it.”

There were many comments about how teacher candidates’ felt dissuaded from using ICT because it was not adequately role modeled by their education instructors: “most of our teachers don’t know how to use the programs they want us to use… we don’t get introduced to it because they are not sure how to do it. A few of our teachers don’t even know how to really properly use a VCR, but they use it to teach”; “I think it was just frustrating, every time a prof went to put in a
projector, it wouldn’t work, over and over, if you did that in a primary classroom and had this big 10 minute gap you would have to start from scratch”; “it just made me not want to do it because that is all that I could think of, if these kindergarten kids [were in that situation] there’d be tears, someone would have fallen, I would never bring a PowerPoint in.”; and another teacher candidate expressed frustration, “I don’t know how much time we’ve wasted throughout this whole program with teachers trying to set stuff up and it not working.”

In some cases education instructors expected the teacher candidates to come to them if they had specific questions about the technology being used, but the teacher candidates did not always find this helpful, they would “try to figure it out themselves and … enter this frustration,” the teacher candidates wanted the education instructors to, “provide guidance, offer something so they don’t have to go to someone… rather than fight it [out on their own].”

One teacher candidate was interested in using social media for learning, “when we first got Ning I played around with it for about a week,” but became disillusioned when “I realized I was going to have to learn all these other systems and I didn’t really bother learning it as well.” She found there were too many sites to manage, “there are so many places to get information from” and that if she, “had one I would work on it,” but after uploading two profiles on two different sites, she was asking herself, “do I really want to make another profile.” Another teacher candidate commented, “I felt there was way too many different sites, three different Ning sites, there’s a wiki site, there’s a Drupal site. It’s like a million different sites and I don’t know what goes for what class.”

Several teacher candidates talked about the pressure they felt from the teacher education program, “everyone in all of our classes” exhorting them that, “you have to use technology, in all of our classes, our e-Portfolio, everything we do, there is some sort of technology”, that “in
everything we do there is a technological edge,” but the effect, rather than inspiring the teacher candidates to pursue innovation with ICT in their teaching, “it kind of makes us,” another teacher candidate finished the sentence, “it kind of makes you anxious”.

The video project in [methods course] had a particularly negative effect. “Someone like our [methods course] teacher, she got us to do a project on technology and she didn’t know what she was doing.” Another teacher candidate added, “That kind of discouraged me because I was thinking I wanted to do a video project with my kids next year and I was thinking it would be really cool if they could make their own videos.” But after witnessing the difficulties encountered by the [methods course] education instructor she lost confidence that her own ability to make her own videos would not be enough to teach her students to make videos. Another teacher candidate agreed, “Yeah, it was really stressful because she didn’t know how to do it at all [in the context of the teacher education program].” One teacher candidate perceived the [methods course] education instructor’s stress about the video assignment:

Our [methods course] prof [she conveyed to us the sense that] ‘they’re really making us do this, we have to do this, that’s the way it has to be, we’re not going to talk about it.’ You could tell she knew how to make videos and she was enthusiastic about it but she also, you could tell she was being pressured into doing it, being forced, she was the most stressed.

Another teacher candidate used the [methods course] video project as an example of time wasted by education instructors who did not know how to use the technology they were using in their teaching, “She had no idea how to play with video, how to edit it, how to set it up. She was stressed out on the day we were filming, it didn’t work.”
Teacher candidates were critical of the results of the final [methods course] video project, “I personally didn’t like the [methods course] thing, I found it tedious. I did not like that at all. That was so useless. She never gave us a good sense about the ideas [behind the project].” The project did not inspire the teacher candidates to use video in their teaching, they found that, “it was too much”, “it just seemed like so much more hassle and work than it was worth, even when everyone was watching them, it was just, you watch two and you went great, and then have to sit and watch ten more, it was awful.”

There were comments that education instructors appeared to force the use of technology when they weren’t adequately prepared themselves, “[the] pressure to use technology, and yet teachers who are [not good with it] and that just frustrates the class.” When technology was used, in some cases, the teacher candidate did not perceive any added value from using the technology, “I could have done it with it or I could have done without, and it probably would have worked just as good without.” Another teacher candidate commented that technology was, “put in where it doesn’t necessarily need to be,” adding, “I don’t think it is something that is necessary.” A teacher candidate added that technology, “…doesn’t substitute for good teaching, it shouldn’t be jammed in like its been done this year.”

For example, with regards to the e-Portfolio, “A lot of teachers aren’t sure how to work it yet, [it’s] one more thing that [has been] thrown on top of [everything else they have to do].” The e-Portfolio was of particular concern to the teacher candidates, in their view, “it just seems crammed in there.”

There were many comments about the use of PowerPoints by education instructors, and how the teacher candidates struggled to make sense of this use, “some teachers post the PowerPoints on the website, so there is no point in taking notes,” and this teacher candidate
found this experience made her feel, “a lot of time the technology just makes it cold, the
information is up there, read it, do your work.” One teacher candidate found the use of
PowerPoints had a negative effect on her learning:

I find PowerPoint presentations redundant, [if there is too much] information on the
slides deters me from taking notes and mentally turns me off. I’m slightly less engaged
than I would normally be. When there is too much on the PowerPoint [slide] I can’t get it
all down and [I say to myself] what’s the point in even trying. [Education instructors put
too much into their presentations and then didn’t have time to cover all the material on
the slides] with too much on [the slides] and saying, ‘Oh well, I prepared this slide,’ [but
I don’t have time to talk about it] click, click, click, ‘in conclusion we won’t deal with
that [extra content] it’s not important’ [this experience] really takes away from the prep
that was put into the slide, or it takes away from, ‘oh well that’s not important’ click click
click’ then why do I have to look at it anyway?

Teacher candidates were concerned about the reliability of using technology to teach on their
practicum after they witnessed malfunctions during their teacher education program:

“I’m probably not going to bring PowerPoint to class because, to get a projector, to make
it function and work properly, [to ensure it is] compatible with my laptop, or whatever I
am bringing in, it’s just too much. I’ve got enough to worry about rather than losing the
kids for 10 minutes. I look less credible that way and it’s a waste of time. Am I going to
be using it? No.”

Only two teacher candidates’ comments fell into the self-confidence factor. One teacher
candidate commented, “I am still not really comfortable using PowerPoint.” Another explained,
“I think there are some people who are really hesitant to use technology, like I am. I don’t find
myself very techie. I’m just really turned off at the idea of it, just because I don’t know what to do. I don’t consider using it.”

Teacher candidates discussed their reactions to in-class supports. One teacher candidate described how an education instructor conveyed bad feeling toward the research at the beginning of the program, “She got really mad. [She said], ‘I should have known that someone was coming into my classroom’” Another teacher candidate described how her first days in the teacher education program felt overwhelming, including the prospect of learning about ICT:

I found it overwhelming, right at the beginning, [with the start up of classes, getting to the bookstore, understanding the schedule and finding classrooms] and now there is this study, and the e-Portfolio, I know they aren’t the same thing, but the way it felt, with all these chat rooms and websites and blogs and wikis. I don’t even know what the words are, and all of a sudden I have ten of them I have to post on, on a weekly basis. That’s how I felt. Then there was the [methods course] [project] [and I am wondering] how it’s going to be useful. [At this point] I’m having difficulty [remembering my own name], slow down.

The teacher candidates had difficulty making sense of the ICT learning sessions they attended with the Principal Investigator:

I found some of the session that we did have in the lab, I was bored, I knew what to do. We want more introduction to what we are supposed to be doing, but if I had been given an hour lecture on how to use PowerPoint, I would have been soooo bored by the end.

However, another teacher candidate had another opinion, “those sessions were completely useless [because] they were too advanced for us, so completely useless for us. I don’t know if anyone really got it.” A teacher candidate commented,
I think it’s assumed that we would use it, you guys are teaching us how to make files.

You are teaching such easy basic things on the computer and then you should have seen how to make PowerPoints. A lot of us don’t really know how to make slideshows or stuff like that so we can make something we can use, like PowerPoint, or maybe Excel.

When asked why the teacher candidates didn’t take advantage of the extra ICT learning sessions provided by the research, one teacher candidate expressed concern about having a mentor in her classroom,

[When I was teaching in my practicum school classroom] I saw my students, when I had my Faculty Advisor in, they would misbehave. The more people that were in the room, the more they would misbehave. I didn’t want more people entering my room. That is why I didn’t [want in-class mentoring support to use technology in my teaching].

One teacher candidate described how the ICT learning sessions had a negative effect on her willingness to teach with ICT:

I felt really comfortable using technology and I was very ready to use [it], but my sponsor teacher doesn’t really want me using technology. Then, when I was in those sessions [the ICT learning sessions with the Principal Investigator], I found myself becoming nervous. [He] was teaching us things that I was originally thinking would be easy to bring in, [but he was] pointing all these things [that need to be considered]. I never thought of it like that. I was so positive about and now I’m thinking about all the things that can go wrong. I guess I didn’t assume it was as big a deal to bring in technology. [But now] it seems there is so much of a focus on it; it really is a big deal. I just thought it was something I would casually do.
Another reason for not attending the extra ICT learning sessions was that it felt like an add-on that one teacher candidate could not afford, “I think it was because it was outside of class time and our areas outside of class time were already bombarded with so many assignments I felt like I didn’t have enough time to commit to something extra on top of that.”

The influence of the practicum teacher was the second greatest negative effect commented by the teacher candidates. There were many comments about practicum teachers dissuading the teacher candidates from using ICT on their practicum.

One reason practicum teachers were not supportive of teacher candidates’ use of ICT was that the technology was considered unreliable:

I wanted to do a lesson where they used the Internet and I was told, ‘well our Internet doesn’t always work.’ Well, I [decided] I can’t do it then, I’m just not going to bother because I’ll have to plan an entire back up lesson in case it falls through. That was the one time I considered using it and [despite the fact that] I feel confident using technology, I don’t feel confident bringing it into my class.

Other practicum teachers discouraged their teacher candidates because they, themselves, did not know how to teach with technology:

My teacher, she doesn’t like technology very much. I wouldn’t mind using it in my classroom, but how do I cater to those [students] who don’t know how to use a keyboard and those who surf the Internet daily? How do I cater to those different levels within a one hour session? [My teacher said], ‘Some people are bored. Some people might need instruction on this.’ That’s why I wouldn’t use it.

Teacher candidates sensed the cultural norms of the school environment and found their practicum teacher expectations to dissuade them from using ICT, “There’s a lot of ‘don’t rock
the boat’ feeling, I don’t think I would be the one [to do that].” Sometimes there isn’t an obvious reason why a practicum teacher does not support the teacher candidate’s use of ICT, “it's even harder when your sponsor teacher is so against it, too. I’m never going to use this in my class because my teacher is so against technology.” One teacher candidate had planned a full lesson on super-heroes and masks and decided this would be a good lesson to use PowerPoint. But she found herself being pressured by her sponsor teacher to just use an overhead instead of a data projector:

I was excited about our presentation because it was on masks and super heroes and I wanted to [create a] PowerPoint on these super-heroes. [My practicum teacher] said, ‘or you could just use the overhead.’ And I said, ‘I thought it would be really cool [to use the PowerPoint]’. And she said, ‘yes, but you know it would be better if you just use the overhead.

Other teacher candidates commented: “[My practicum teacher doesn’t use technology], she doesn’t even use email, her husband emails her stuff for her,”; “my sponsor teacher is very old school too.”; “she’s [practicum teacher] not interested at all, I think, for her, it is really an extra thing, she doesn’t have time.”; “our teachers aren’t trained. Our kids have computers twice a week; we have a really nice lab. I was really excited [to teach a lesson] and my teacher [wanted them to use] all the right type. I said, ‘Can I do something else?’ My teacher said, ‘I usually put them on all the right type because I don’t really know what to do.’” Other practicum teachers don’t use the computer lab at all and the teacher candidate did not see it as an option, “the school I am at right now has a computer lab but our class doesn’t go to computers.”

Teacher candidates expressed their feeling that they were not to try anything that their practicum teacher did not approve
We have to remember that we are their guests. As much as our teachers encourage us to ‘take over the classroom’ that is not what we are there for. We are there to learn from our sponsor teacher, to get as much as we can within the climate of the classroom. That is one of the things that dictates how technology is used. When we discuss what we are going to do [during my three month practicum] I am very much going to take the lead from her because I don’t want to step on her toes or do something weird in her classroom that she won’t continue with.

Another teacher candidate added, “it depends on the teacher, [my teacher] she’s very, ‘you can do whatever you want.’ She basically wants to relinquish the control over to me. Obviously [I] wouldn’t operate without the boundaries; [I] don’t push it too much.” This idea as echoed by another teacher candidate, “My practicum teacher is very much, ‘Oh, do whatever you want.’ But at the same time she [has very strict parameters] ‘students must use pencils to write and colors to color. You don’t mix the two.”

When teacher candidates observed how technology was being taught in their practicum schools, they not impressed with the curriculum or practice:

Another thing [that dissuaded me] as seeing how technology was used for my class. When they went to the computer lab it was totally useless. I thought I could do it more effectively by giving them a piece of paper. They wouldn’t have to be learning about what I am trying to teach them and how to use the [software] program at the exact same time. They would go to the computer lab and do crossword and I thought, why aren’t they doing that on paper? It was totally unnecessary and that was the only use I had actually seen.
Teacher candidates expressed a sense of overwhelm when contemplating the combined effect of ICT in the teacher education program and at her practicum school:

The same kind of atmosphere exists at my practicum school where the computer teacher is a retired teacher. They couldn’t find anyone else to do it? What does that tell you about it? She doesn’t know how to do many things on the computer. If problems arise she doesn’t know how to fix them. That is the model that is being held up for the students, that they can learn more outside of school and they already know more outside of school, than anything they can learn in school. When I get talking about it, I [feel as if it is] too big, [that it is going to] take massive change on every level.

Another teacher candidate had an example of a practicum school computer teacher with very low understanding of what it means to use technology:

I went to our computer teacher at our school and he said he had a lot of cool websites that I should use. I asked him to send me the links, but instead of sending me the links,” he went into every website and started printing out all these web pages, “so I had a stack of paper this thick with a web page on the top. I asked him, ‘Couldn’t you have just emailed me that?’ and he answered, ‘Oh, this way you will have them for a binder.’

Later, this teacher candidate realized the ‘computer teacher’ was not prepared to help her plan a lesson to teach in the computer lab,

I asked him, ‘Since you are in the computer lab today, I’m teaching them about the post office. Can you take them into the post office website? It’s really cool and there is a lot of stuff in there [for them to learn]. He asked, ‘What do you want me to do with them?’ [and I thought] you are the computer teacher? Whatever you want to do, just incorporate it into your lesson. But he wanted me to plan his lesson for him.
Teacher candidates expressed numerous concerns about technology resources in their schools that dissuaded them from planning to use ICT, “We don’t have any computers [at my practicum school]”, and, “My school doesn’t have a computer in my classroom.” One teacher candidate said,

My school, they are not equipped. They don’t have the funding. They don’t have the supplies. Even if I wanted to, I wouldn’t be able to because they don’t have the funding to afford the equipment. I just don’t think I have a choice unless I bring my own laptop and hook it up to speakers that I bring in myself. It’s not going to work.

Teacher candidates thought about using ICT to communicate with parents, but decided against it because they did not feel prepared to deal with the complexities, “It would be more of a parent resource and I don’t know if our parents have access to computers at home, so I don’t know if it would be fair, if you create an online communication site and half the parents cannot access it.”, and, “Setting up a website for your class, we need to know how to do that but I don’t know if there are resources at the schools to teach us that.

They also expressed concern about their students’ use of ICT at their school, “I found it hard to get [my students] to read websites”; “Going into a real classroom, a lot of my children cannot be videotaped or cannot have the camera on them.”; “My class next year will not be allowed [to use technology]”. “I don’t know how you can really do it. All the different levels, which kinds of computers are on and whether most of them in the lab are working properly. Until you have quite a bit of knowledge, you don’t know what you don’t know, so you’re not quite sure what will be helpful.

The focus group discussions brought up another factor that influenced teacher candidates’ ICT dispositions that was not included on the item 6 list. This factor has been identified as
teacher candidate belief about the meaning of ICT in education, about the suitability of using ICT in education, and about the importance of using ICT in education. This factor is not dependent on teacher candidate ICT skill and knowledge, the availability of ICT support, or practicum teacher support or school settings. It could be argued that this factor should have been addressed as part of teacher education curriculum and practice, but it cannot be attributed as an effect of the experience of ICT encounters in the teacher education program. It is possible that the negative ICT encounters in any of the previous factors contributed to hardening the views associated with this factor, but it does not appear that these experiences caused this factor to emerge.

For example, some teacher candidates were not necessarily averse to using ICT later in their careers but were not interested in learning how to do this now, “There is some cool stuff for later on but just not at this point in my career.”; and, “I don’t think I want to use technology for a long time.” Other teacher candidates are not equipped to use ICT at this time, “I don’t even have a laptop, I wouldn’t, on a regular basis, do PowerPoints or anything like that.” Several teacher candidates did not feel it is their responsibility to teach about ICT in the profession. There was a core group of primary educators who firmly believed there was no place for ICT in their curriculum and practice. These teacher candidates’ views remained unchanged from the beginning of the teacher education program to the end of the study.

4.2.3.2 Findings

Instructional discourses pertaining to ICT in the teacher education program showed a relationship to the development of teacher candidates’ dispositions toward using ICT in practice. The top three factors that impacted teacher candidates’ plans to use ICT on their extended
practicum were: 1) teacher education program, 2) practicum teacher and 3) teacher candidate
beliefs and values about ICT in education. Members of the cohort experienced the dissuading
effect of instructional discourse in the teacher education program at a rate of approximately twice
the effect on members of the research collaborative. To be clear, all teacher candidates recalled
instructional discourses that dissuaded them from using ICT. However, the effect of instructional
discourses was enough to lead members of the cohort to decide not to teach with ICT on their
extended practicum, while members of the research collaborative were not dissuaded from
planning to use ICT on their extended practicum.

The teacher candidates felt pressure from the teacher education program and from their
education instructors to use ICT in their practice, but they were not provided opportunities to
make sense of this pressure and learning to make their own professional judgments about when,
where, why and how to use ICT in practice. They reported the feeling of pressure and the lack of
opportunity to discuss the significance and meaning of using ICT in education was anxiety
producing and had the cumulative effect of developing a negative disposition toward ICT in
practice.

Despite the pressure teacher candidates felt to use ICT they were not impressed with the
ways it was used, either in their teacher education classes or in their practicum schools. The
combination of anxiety producing pressure and uninspired modeling of ICT in practice
contributed to manifestation of non-using ICT dispositions.

The teacher candidates did not have an opportunity to discuss their own beliefs about ICT
in education and whatever arguments might be made for including it in practice. In the absence
of substantive discussion these teacher candidates’ beliefs about the significance of ICT in
education and their roles and responsibilities as educators were never challenged or discussed.
These beliefs did not appear correlated with individual ICT skills and knowledge, rather, they appeared associated with what the teacher candidates consider important in the profession, and they do not consider ICT in education a priority.

4.2.4 Summary of Findings

In this chapter I reported key conditions for learning to use ICT in the teacher education program. I have provided descriptions of the institutional conditions, including government and institutional policy conditions. I have defined sociocultural conditions of the teacher education program in terms of the formative relationships that are part of the teacher education program structure. I have described the technological conditions extant in the teacher education program. I have added a brief word about research conditions that may have had a positive impact on members of the research collaborative dispositions and their willingness to use ICT on their extended practicum.

Three datasets have been described and analyzed, with preliminary findings. These three datasets are comprised of in-class observations of instructional discourse during the first year of a two-year elementary teacher education program, focus group questionnaires completed at the end of the first year of the two-year program, and focus group discussion transcripts, collected at the same time the questionnaires were completed.

In answer to the research question (p. 8), the data indicates there is a relationship between instructional discourses and teacher candidates’ ICT dispositions toward using ICT on their extended practicum. In the next chapter key findings from this chapter will be discussed in relation to literature and the theoretical framework. This discussion will explain how
instructional discourses in a teacher education program contribute to the development of teacher candidates’ dispositions toward using ICT in practice.
Chapter 5: Discussion

Sawchuk (2005) argued that the genuinely useful approach to discourses pertaining to ICT is not to refer to it as this or that tool, artifact or machine. He preferred to conceive ICT as social processes rather than devices. He described this conception as: ‘the way we do things around here’ (Franklin, 1990); the ‘organization of resources’ (Hacker, 1991; Mumford, 1964); or, ‘society made durable’ (Latour, 2000). The suggestion here is that any genuinely useful approach to the issue of ICT, work and learning must, then, expand its perspective on technology in order to make it ‘social’. (Sawchuk, 2005, p. 924).

This study set out to investigate the relationship between instructional discourse in a teacher education program and teacher candidates’ plans to use ICT on their extended practicum. In this chapter social constructivist theory complemented by enactive analysis is discussed in relation to the three datasets analyzed in Chapter 4. These three datasets provide an opportunity to explore researchers’ observation of instructional discourses in teacher education classrooms with teacher candidates’ responses to instructional discourses with regards to their plans to use ICT. It also provides an opportunity to juxtapose teacher candidates’ dispositions toward using ICT in practice against the main cohort group of teacher candidates and the sub-group who participated in the research collaborative by attending research intervention ICT learning sessions outside the regular timetable of the teacher education program.

This study addressed the ongoing problem of non-ICT using dispositions toward ICT in practice found in elementary education. In this study I focused on the relationship between instructional discourses during the first year of a two-year pre-service teacher education program and teacher candidates’ dispositions toward planning to use ICT on their extended practicum:
What is the relationship between instructional discourses in a teacher education program and teacher candidates’ dispositions toward using ICT when they teach on their extended practicum?

The findings are organized into five sections discussing five significant findings: 1) discordant discourse conditions in the field of education; 2) instructional discourses as socially constructive of teacher candidates’ dispositions toward using ICT in practice; 3) instructional discourses in relation to teacher candidates’ dispositions toward learning ICT; 4) instructional discourses in teacher education as constitutive of teacher candidates’ ICT dispositions toward teaching with ICT; and 5) instructional discourses as conditioning possibilities for teacher candidates’ demonstrations of ICT imaginative capacity. Each finding is discussed in terms of key theoretical concepts from Chapter 2:

1. Discordant discourse conditions in the field of education are discussed as socially constructive (Crotty 1998) of instructional discourse in the teacher education program. These discordant discourse conditions are also discussed as socially constructive of collaborative critical inquiry to learn to use ICT in practice (Berger & Luckmann, 1991). Deleuze and Guattari’s (1987) theory of territorializing and deterritorializing discourse is discussed in relation to enactive (Varela et al., 1991) concepts of linguistic cognitive domains (Maturana & Varela, 1980) to explain the relationship between discordant discourse conditions in the field of education and instructional discourse in the teacher education program and in the ICT learning sessions research intervention.

2. Instructional discourses as socially constructive of teacher candidates’ dispositions toward using ICT in practice is discussed in relation to Bakhtin’s theory of heteroglossia (1981) and Maturana and Varela’s (1980) theory of autopoiesis. Autopoiesis provides a way to understand how teacher candidates’ subjective interpretations of instructional
discourses, performed within dynamic context conditions, can give rise to different dispositions toward ICT in practice.

3. Instructional discourses understood in relation to teacher candidates’ dispositions toward learning ICT are discussed in relation to Foucault’s theory of sociocultural structures and discourse and the meaning of communicative events (Dreyfus et al., 1983). Foucault’s theory of the verbal performance of sociocultural structures conveyed through communicative events is used to examine the education instructors’ disposition to ICT as catalytic perturbations perceived within the teacher candidates’ field of perception. The significance of these perturbations is discussed in terms of linguistic cognitive domains (Maturana & Varela, 1980) enactive of teacher candidates’ willingness to learn to use ICT in practice.

4. Instructional discourses in the teacher education program was seen to be constitutive of teacher candidates’ dispositions to teaching with ICT in practice as it conditioned the institutional, sociocultural and technological structures of the environment within which the teacher candidates were experiencing the instructional discourse. Deleuze and Guattari (1987) described how language-use, in the form of semiotic systems, services to cohere an organizational entity from fuzzy aggregate to consolidation. They theorized this process as territorializing, that is, the verbal performance of communicative events, in the form of instructional discourse, served to ‘territorialize’ teacher candidates’ conceptions of ICT in practice. These verbal performances conveyed education instructor ICT dispositions in the form of comportment and composure: the emotion, ideas and behavior that constituted the substance of the verbal performance of instructional discourse. The verbal performance of instructional discourse can be understood to
condition the structure of the environment within which the teacher candidates are situated. Brown and Duguid (2002) argued the role of human sociability needs to be considered in the social life related to ICT. To this end, Edelman (2004) theorizes the relationship between the verbal performance of instructional discourse in the teacher education program and the teacher candidates’ disposition, as informed by qualia and their own evolving value category memory system, gives rise to teacher candidates’ disposition toward using ICT in practice.

5. Instructional discourses seen to condition possibilities for teacher candidates’ demonstrations of ICT imaginative capacity are discussed in relation to Gibson’s (1986) approach to perception as conditioned by structures from the environment, and how instructional discourse plays a role in teacher candidates’ possibilities for perceiving and demonstrating ICT imaginative capacity in practice. Gibson’s theory of affordances is supported by Thompson’s (2005) writing on enactive concepts of subjective perception and Varela’s (1999) writing on the relationship between developing skillful know-how and enactive awareness of structures of the environment.

5.1 Findings

5.1.1 Discordant Discourse Conditions in the Field of Education

Discordant discourse conditions were identified at multiple levels in the field of education. Within the teacher education program the teacher candidates perceived a sense of urgency about using ICT in their teaching but they did not receive a commensurate opportunity to discuss the significance of ICT in society in relation to using ICT in practice. At the faculty level the policy was to leave decisions to use ICT up to individual departments and instructors,
while at the same time the teacher candidates were required to demonstrate their attainment of standards for accreditation in an e-Portfolio. Although there was a programmatic requirement for the teacher candidates to complete the e-Portfolio, there was not a commensurate opportunity for instructors to demonstrate skillful know-how of ICT imaginative capacities to provide support to the teacher candidates as an integral part of their coursework. At the provincial level conceptions of ICT in education were being implemented as systemic change in practice without commensurate opportunities for educators to discuss the significance of those changes (for example, BCISIS and arrangements for providing digital technologies in elementary schools). At the level of teacher education in the province, teacher education programs do not require any ICT-related proficiency for either admission or graduation requirements. Teacher accreditation at the provincial level does not mention ICT-related proficiency as a requirement to teach in the public school system. Also at the provincial level ICT-related guidelines are often conveyed as technologically deterministic, that is, the use of ICT will change education.

Crotty (1998) explained how meaning is constructed socially, that meaning is indeterminate and actively negotiated ‘generated’ between subjective experiences and the objects in the environment they encounter. In view of the discordant discourse conditions found in this study, we have to wonder how education instructors make sense of their subjective meanings of these conditions, particularly as they are directed to certain objects (in this case, ICT in education). The meanings education instructors derive from these discordant discourse conditions will be varied and multiple, there will be no singular notion of ‘truth’ about the use of ICT in education (Crotty, 1998).

The discordant discourse conditions described above do not foreground the importance of teacher as central to sociocultural understandings of the significance of ICT in society. In a
technologically deterministic approach, teachers are seen as instrumental conveyors of ICT-based learning experiences. Instrumental concepts of ICT in teaching reflect a larger issue in the field of education, the instrumentalization of the role of the teacher. This is a long-standing area of tension in the profession – concepts of teachers as professionals who make complex decisions and plans for the education of students versus concepts of teachers as technicians delivering curriculum and assessing results. The instrumentalization of teaching ICT in education implies the role of the teacher as a dispensable technician overseeing curriculum delivery and assessment through the central function of computing machines (Petrina et al., 2008).

In the day-to-day realities of teaching, instrumental concepts of ICT are seen as add-ons to existing teaching practice, that is, education instructors have taught for many years without ICT, it is not central to their concerns as educators preparing a new generation of teachers. For them, the social construction of ICT in education does not register as significant or meaningful in their practice because they do not identify instrumental concepts of ICT as significant or meaningful in the profession.

Crotty’s (1998) three key assumptions of constructivism can be used here to understand the relationship between discordant discursive conditions and instructional discourses. The first assumption is that human beings construct meanings as they engage with the world. This assumption is supported by Maturana and Varela’s (1980) theory of autopoiesis, that is, living organisms, including education instructors, are continuously self-creative to sustain their connection to the structure of their environment. In this case, we can understand that education instructors perceive the discordant discourse conditions that structure their environment and the instrumental language that is used to describe the use of ICT in education. They construct meanings associated with these discordant discourse conditions and the instrumental concepts
that would define their role as teachers. In the case of this study, the education instructors construct a lack of significance to teaching ICT-related topics or engaging substantive discussion about ICT in education. This makes sense, as they perceive it as an add-on that is discussed in terms of ‘tools’, and they are professionally tasked to individually decide whether ICT is important in their particular course (Arntzen, Krug, & Wem, 2008). In the case of this study, most of the education instructors appeared to decide that, although they were told to tell their students ICT was important, they were not expected to actually teach substantive content relating to ICT.

Crotty’s (1998) second assumption is that humans engage with their work and make sense of it based on historical and social perspectives. This assumption is supported by Edelman’s (2004) theory of value category memory systems, that education instructors’ instructional discourses are informed by their history of controversy about conceiving of the role of the educator in terms of instrumentalism, and their efforts to have the profession of teaching respected. The assumption that education instructors make sense of ICT in education through historical and social perspectives can be seen in the observation notes from the teacher education classes and the comments from the teacher candidates. Although there was not a comprehensive programmatic approach to instructional discourses pertaining to ICT, it is surprising how individual education instructors’ instructional discourses were consistent in a lack of substantive engagement across the program.

Crotty’s (1998) third assumption is that the generation of meaning is always social, constituted through interaction within a human community. This third assumption is supported by Maturana and Varela’s (1980) theory of autopoiesis and linguistic cognitive domains. This assumption speaks to the relationship between instructional discourses and teacher candidates’
dispositions toward using ICT in practice. If we accept that the discordant discourse conditions in the field of education lead education instructors to not place significance or substantial meaning on the use of ICT in practice, then we can understand why there was no opportunity for substantive discussion about ICT as an integral part of instructional discourses in the teacher education program. Thus, education instructors did not position ICT as significant or meaningful enough to discuss, and teacher candidates did not notice the lack of substantive discussion because they were interacting with their education instructors and forming connections with their program through the discourse conditions enacted by their instructors. The discourse conditions of non-ICT related instruction were constructive of the linguistic cognitive domain of each education instructors’ course. The teacher candidates responded to these discourse conditions to ensure a strong connection with their program and their instructor, a connection that was necessary to graduate and succeed in the field.

This discussion provides insight into how discordant discourse conditions in the field of education contribute to instructional discourses in the teacher education program, and, consequently, to teacher candidates’ dispositions toward using ICT in practice. The next part of this discussion provides insight into how participation in the research intervention ICT learning sessions gave rise to members of the research collaborative dispositions to using ICT on their extended practicum.

Berger and Luckmann (1991) explain how subjective interpretations give rise to the emergence of identity, both in relation to objects in the field, and to others (interlocutors). In the case of the research collaborative, their participation in the extra hours of ICT learning sessions, provided them with additional interactions with objects (ICT provided during the ICT learning
sessions) and interlocutors (spending time with the research group engaged in collaborative critical inquiry about using ICT in practice).

Berger and Luckmann (1991) suggest the emergence of identity takes place within the context of subjective and social processes. This idea is supported by Maturana and Varela’s (1980) theory of autopoiesis and linguistic cognitive domains. When the members of the research collaborative attended the extra ICT learning sessions, they experienced collaborative critical inquiry looking into using ICT in practice. They were tasked with developing ICT instruction for their future practicum students and developing instructional resources for teaching lessons that integrated ICT in the learning activities. The structure of the learning sessions was such that conversations about the significance and meaning of ICT in education were taking place while other tasks of developing learning resources, including learning to use the ICT themselves, so they could teach with it. As participants in these learning sessions, the members of the research collaborative were entailed to connect with the research group and the ICT objects in new ways. In order to succeed in these processes, they needed to expand their own linguistic cognitive domains pertaining to ICT in education. This expansion had a reflexive effect: the more they expanded their ICT-based linguistic cognitive domain, the more they connected to different, positively oriented dispositions toward using ICT in practice. The more they positively oriented their disposition toward using ICT in practice, the more they were able to actually participate in conversations imagining using ICT in their practicum classrooms. As they imagined using ICT in their practicum classrooms, they were able to identify the skillful know-how they would need to implement their imaginings. The more they improved their skillful knowhow to implement their imaginings, the more they connected to the research collaborative and the to the research group.
Berger and Luckmann’s (1991) theory of subjective interpretations give rise to identity and new relations to ICT and collaborative relationships, can also be understood as how socially constructed experiences contribute to possible expressions of cognition (Baerveldt & Verheggen, 1999) (in this case expressions of dispositions toward using ICT in practice and ICT imaginative capacities). The structure of the environment, in the form of members of the research collaborative, members of the research group, access to ICT resources, and substantive discussion about the significance and meaning of ICT in education, can be seen to contribute to the emergence of members of the research collaborative disposition toward using ICT on their extended practicum. In this case, the discordant discourse conditions were not an impediment to developing a positive disposition toward using ICT; rather, discordant discourse conditions provide ample topics for discussion, to determine significance and meanings associated with a variety of aspects that are involved with using ICT in education.

5.1.2 Instructional Discourses as Socially Constructive of Teacher Candidates’ Dispositions toward Using ICT in Practice

The second finding in this study discusses how instructional discourses can be understood as socially constructive of teacher candidates’ dispositions toward using ICT in practice. Bakhtin theorized dialogism and the dialogic imagination (Bakhtin & Holquist, 1981) to explain how language use is ephemeral and meaning is constantly in flux. Bakhtin theorized the role environmental conditions play in meaning construction and coined the term, ‘heteroglossia’ to refer to the multiple meanings one utterance can carry across different communicative events. It is interesting to note the similarity across many communicative events in the teacher education program that conveyed unpleasant emotional, mental and behavioural associations to ICT in the
minds of the teacher candidates. The dynamic contextual conditions of the teacher education program (different buildings, different classrooms, different courses, different instructors, different technological resources) constituted similar ICT-related learning events: frustration, irritation, disappointment, dismissal, invalidation, avoidance; as an overall significant impression on teacher candidates’ disposition toward using ICT on their extended practicum.

Bakhtin’s (1981) theory is helpful to understand instructional discourses as communicate events embedded within dynamic contextual conditions that carry to potential for heteroglossial interpretations. However, in the case of the members of the cohort, these heteroglossial interpretations were similar: they were not disposed to use ICT on their extended practicum. In this case, there were multiple meanings associated with not being disposed to use ICT on extended practicum, but they all amounted to the same result.

Now add the case of the research collaborative to the discussion. The members of the research collaborative experienced the same communicative events as the members of the cohort, but instead of being dissuaded by these experiences, they planned to use ICT on their extended practicum. In the case of the research collaborative, their heteroglossial interpretation of communicative events amounted to a different result from the members of the cohort, but the same result within their small group.

5.1.3 Instructional Discourses Understood in Relation to Teacher Candidates’ Dispositions to Learning ICT

The research group was allowed to offer limited ICT learning sessions to the thirty-eight member cohort as part of their regular teacher education program. This time was necessarily short – 6 x 40-minute sessions in the computer lab spread across Term 1 and 2. The research
group designed the sessions as a counter point to ICT-related instruction observed in the teacher education classes. To this end, the research group designed these 40-minute sessions as collaborative critical inquiry into topics pertinent to current coursework. The research group was somewhat surprised at the teacher candidates’ negative disposition to learning ICT in these sessions. This negativity was reflected in the End of Study Questionnaire and Focus Group Discussions.

In the previous section I discussed how instructional discourse in the teacher education program was socially constructive of members of the cohort negative disposition toward ICT, but not constructive of a negative disposition toward ICT in the members of the research collaborative. In terms of time allotted to each learning experience, it is easy to see a big differential in the amount of time available to socially construct dispositions toward ICT between the teacher education program and the ICT learning sessions. In this section I want to discuss how instructional discourse in the teacher education program was socially constructive of teacher candidates’ disposition toward learning ICT.

Foucault theorized sociocultural structures of discourse and the meaning of communicative events were relative and varied according to the statement and the way it was handled (Dreyfus et al., 1983). Foucault theorized the statement as a verbal performance taking place within contextual conditions. Depending on the use that was put to the verbal performance, the form of the verbal performance and the contextual conditions within which it occurred contributed to the meaning ascribed to it.

Foucault’s theory is complemented by Maturana and Varela’s (1980) theory of linguistic cognitive domains. Maturana and Varela theorized linguistic cognitive domains as the semiotic systems of coherence that enactivism between a living organism and the structure of its
environment. In the case of instructional discourse and teacher candidates’ disposition to learning ICT in practice, the verbal performance of instructional discourses can be seen to condition the meanings of communicative events and the way they are handled in terms of how teacher candidates form a meaningful relationship to their education instructors and the teacher education program. The verbal performance of instructional discourses pertaining to ICT constituted a linguistic cognitive domain through which each teacher candidate must connect to form a meaningful connection to their program.

In this study instructional discourses can be seen as a form of verbal performance carried out in the context of two environmental conditions – the teacher education program and the research intervention. The ICT learning sessions can be seen to be carried out in two environmental conditions – the members of the cohort experienced the ICT learning sessions within the environmental conditions of the teacher education program and the members of the research collaborative experienced their ICT learning sessions within the environmental conditions of the research intervention. The verbal performances of instructional discourses in these two settings were perceived as perturbations in the field of teacher candidates’ perception and the quality and characteristics of these perturbations were interpreted in very different ways.

The members of the cohort perceived the significance and meaning of ICT use in education through instructional discourses from their education program classes. They interpreted the significance and meaning associated with ICT in education in terms of sustaining their relationship to their education instructors and their teacher education program. Their affiliation, and drive for connection was focused on the education professionals who had the power to determine whether they graduated from the program and acquired certification to teach. The sociocultural relationship between the members of the cohort and the education
professionals could be seen as conditioned by a power differential that placed the onus of positive performance assessment on the members of the cohort.

Members of the research collaborative experienced the same instructional discourse conveying significance and meaning about ICT in the context of a power differential in the learning relationships in the teacher education program. In addition, they experienced instructional discourse conveying significance and meaning about ICT in practice in the context of a power equality of learning relationship with the research group as members of the research collaborative. The members of the research collaborative understood the significance of ICT use in education with the context of their teacher education, and, in addition, within the context of the research intervention.

Within the context of the research intervention the members of the research collaborative experienced their learning relationships with the research team as collaborative and critical. The learning relationship dynamic was not conditioned by a power imbalance, rather, it was conditioned by shared commitments and intrinsic interest to learn and develop ICT skills and knowledge in practice.

From a social constructivist perspective the two groups came to the ICT learning sessions with very different perspectives about learning ICT, and feelings of allegiance or loyalty within the program. It makes sense that the members of the cohort were not disposed to form a meaningful relationship with learning ICT because they did not have an instructional context that would support learning ICT in their teacher education program. The members of the research collaborative were inspired by the research intervention and developed an appreciation for any opportunity to improve their skills and knowledge with ICT.
Despite dissuading instructional discourse from education professionals in the teacher education program, the members of the research collaborative pursued their interest in learning ICT-related topics for teaching. Despite their lack of confidence in their education professionals’ ICT dispositions and demonstrations of ICT imaginative capacity, they were able to transcend these conditions to develop their own sense of what it means to use ICT in practice, and why it might be significant to do so. As members of the research collaborative they were in a position of power equality to contribute and learn about using ICT, leading them to develop an active relationship to learning ICT in their profession. Their active relationship to learning ICT conditioned their possibilities for learning ICT, which, in turn, conditioned their possibilities for developing the capacity and capabilities to form a meaningful relationship to learning ICT. They formed a meaningful relationship to learning ICT because they had an instructional context that supported their ICT learning in relation to their teacher education program.

It is highly doubtful that if any individual education instructor was asked if they sought to actively dissuade teacher candidates from learning to use ICT for teaching that they would answer in the affirmative. Which begs the question, how do we explain the relationship between instructional discourses and members of the cohort negatively disposed toward learning to use ICT in practice? Foucault’s theory of verbal performance, dynamic contextual conditions and sociocultural structures of discourse provide a way to understand that there is a relationship between instructional discourses and teacher candidates’ dispositions toward learning ICT. To understand the unintentional relationship between instructional discourses and teacher candidates negative dispositions toward learning ICT we can look at the function of linguistic cognitive domains as enactive of teacher candidates’ dispositions toward learning ICT.
The unintended effect of instructional discourses in the teacher education program was to dissuade teacher candidates from learning to use ICT. The verbal performance of instructional discourses in the teacher education program conveyed meaning of communicative events as both the absence of significance or meaning associated with ICT, but also a power differential in the learning relationships. As such, it was in the members of the cohort best interest, in the absence of an alternative view of the situation, to align their emotional states, mental attitudes, and behaviours with those of their education instructors, so as to be seen to be connecting with the institution and their education instructor.

The reason the unintended effect of instructional discourses from the teacher education program did not dissuade the members of the research collaborative was that they had a larger pool of affiliations to draw from and to support their pursuit of their interest in ICT. For example, one of the members of the research collaborative had a practicum sponsor teacher that was very negatively disposed to the use of ICT in her classroom. The research collaborative member realized he was not going to be able to pursue his interest in developing this aspect of his teaching. Rather than have that situation dissuade him from learning to use ICT, he chose to take his practicum place over again the following year. This example, while technically out of bounds of the study reported in this dissertation, does show how a supportive pool of affiliations can serve to dispel the effect of a seemingly overwhelming dissuading force.

5.1.4 Instructional Discourses in Teacher Education Program as Constitutive of Teacher Candidates’ ICT Dispositions to Teaching with ICT in Practice

In the previous discussion I described how discordant discourse conditions provide conditions wherein education instructors do not develop instructional discourse that includes
substantive discussion or demonstrations of the significance or meaning of ICT in education. I showed how this lack of substantive discussion contributed to teacher candidates’ lack of development of positive dispositions to consider using ICT in practice. I discussed how the combination of a lack of substantive discourse, coupled with a lack of positive disposition toward using ICT in practice contributed to teacher candidates’ unwillingness to learn to use ICT in practice. In this finding I discuss how these previous findings can be seen to contribute to teacher candidates’ dispositions toward teaching with ICT in practice.

Vygotsky (1978) theorized that one of the social functions of speech is that it serves as a method by which an individual can guide themselves to conform to social standards. In this study social standards were conveyed through instructional discourse and teacher candidates used that instructional discourses to guide their conformance to social standards for teaching with ICT in practice. Instructional discourses have been shown to be socially constitutive of teacher candidates’ dispositions toward using ICT and learning ICT. It stands to reason that these discourses would also be constitutive of teacher candidates’ dispositions toward teaching with it in practice.

According to social constructivist theory and enactivism, the possibility for instructional discourses in the teacher education are conditioned by the structures of the environment. I have described the structures of this environment as comprised of institutional, sociocultural, and technological conditions. The field of education, and the profession of teaching, as an organizational entity, is in a continuous process of connecting or responding to the larger field of society, government and the economy, while simultaneously defining itself as an organizational entity within the field of higher education. Deleuze and Guattari (1987) described the process of autopoietic definition as movement from fuzzy aggregate to consolidation through territorializing
semiotic systems. Luhmann (2005) described the process of cohering organizational entities as the autopoiesis of social systems. Both of these theories rely on the significance of language-use as interactive communicative events. Interactive communicative events serve to cohere the organizational entity of teacher education and the teacher education program in relation to the field of education and higher education, while, at the same time, autopoietically constituting its own organizational identity from fuzzy aggregate to consolidation in the people whose interactions constitute the organizational entity of the teacher education program.

The verbal performance of instructional discourses can be understood as a process of territorializing teacher candidates’ concepts of education and the professional responsibilities of educators as a shift from fuzzy aggregate to consolidation. In this sense, the verbal performance of instructional discourses is essential to constituting the teacher education program as an organizational entity. In this study I conceive the verbal performance of education instructors’ instructional discourses as constitutive of teacher candidates’ dispositions toward teaching with ICT in practice.

The teacher candidates reported many instances where the verbal performance of teaching with ICT by their education instructors made a negative impression. They did not report the many instances where the absence of verbal performance contextualizing ICT in education and in practice did not occur because it was not something that they were aware of as a possibility. The teacher candidates’ could be understood to form a network of memories associated with teaching with ICT in relation to the comportment and composure of their education instructors.

During the End of Year Focus Group Discussions, teacher candidates had no problem recounting communicative events from the year previous that had made a strong impression on
them with regards to education instructors’ use of ICT for teaching. The members of the cohort interpreted the emotional intensity and avoidant behaviours as significant and meaningful enough to dissuade them from using ICT during their extended practicum. The verbal performance of these communicative events of instructional discourse can be understood as constituting teacher candidates’ dispositions toward teaching with ICT from fuzzy aggregate to consolidation.

In essence, the function of instructional discourses pertaining to ICT could be seen as an process of socially constructing a new generation of teachers who do not use ICT for teaching, of, if they do, it plays a very limited, non-significant role in practice. This function makes sense of the discordant discourse conditions in the field of education are socially constitutive of instrumental or technologically determinist notions of the role of teachers in relation to digital technologies. In a sense, the function of conditioning non-ICT using teachers serves to ‘put technology in its place’ that is, as subordinate to the profession of teaching (i.e., “technology is just a ‘tool’”).

The ICT learning sessions attended by members of the research collaborative constructed a positive, relaxed learning environment for developing skillful knowhow for using ICT in practice. The members of the research collaborative did not have to choose between connecting with the teacher education program or the research group. The research group encouraged them to strengthen their connection to the teacher education program while collaborative and critically examining the conditions and dispositions associated with ICT that they encountered. Discussions facilitated by the research group, as part of the learning experience in the ICT learning sessions, asked the members of the research collaborative to bring up topics from their experiences with ICT and instructional discourse to identify key points of significance or
meaning. In this way, the verbal performance of instructional discourses in the ICT learning sessions provided an opportunity for substantive discourse to make sense of instructional discourse in the teacher education program and make plans for using ICT in the future.

The instructional discourses in the ICT learning sessions can be seen as deterritorializing in relation to the regular teacher education program, but not to be so abrupt as to rupture members of the research collaborative connection to the teacher education program. In this way, the social system or ‘teacher education program’ was not interrupted. Instead, the members of the research collaborative, as they continued to participate in the teacher education program concurrent with their participation in the research collaborative, broadened the possibilities for ICT-related discourse in the teacher education program and deepened the possible demonstration of ICT imaginative capacity in their teacher education classes.

5.1.5 Instructional Discourse as Conditioning Possibilities for Teacher Candidates’ Demonstrations of ICT imaginative capacity

Social constructivism complemented by enactive analysis has discussed the relationship between instructional discourse as teacher candidates’ dispositions toward using, learning, and teaching with ICT. In this last finding I discuss how instructional discourse conditions the possibility of teacher candidates demonstrating ICT imaginative capacity.

Demonstrations of ICT imaginative capacity through instructional discourse in the teacher education program can be discerned through analysis of in-class observations and teacher candidates’ self-reports in the End of Study Questionnaire and the End of Study Focus Group Discussions. These demonstrations can be qualified as emotionally intense, frustrating, irritating and disappointing. The teacher candidates described cognitive dissonance between what they
were told to do as teachers (to be well prepared to teach) and what they observed their education instructors practiced with ICT (it often did not work or caused delays in the lessons). A fairly extensive list was compiled from the observation field notes itemizing ICT devices, software applications, online resources and network infrastructure used as part of instructional discourse. The observations also recorded education instructors encountering difficulties using these ICT resources and teacher candidates reporting they observed many issues with the use of ICT, including issues with uses that appeared ill conceived or disconnected from meaningful learning.

When members of the cohort were asked to demonstrate their capacities to imagine using ICT for instruction, if they listed any ideas at all, they listed ways of using ICT that they had seen demonstrated as part of instructional discourse in their teacher education program. There was not one instance of a member of the cohort demonstrating an imagined use of ICT that had not been observed in the teacher education program. When members of the research collaborative were asked to demonstrate their imaginative capacities for ICT imaginative capacities they all listed ideas they were interested in pursuing. Of the ideas they listed, some of them were drawn from instructional discourse in the teacher education program, and some were drawn from their collaborative critical inquiry during the research intervention ICT learning sessions.

Similarly, when members of the cohort were asked to demonstrate their ability to implement ICT imaginative capacity in the form of identifying needs for teaching ICT during their extended practicum, they demonstrated a rudimentary conception of what is needed to be able to teach with ICT in an elementary school. When members of the research collaborative were asked to demonstrate the ability to implement ICT imaginative capacity they had a more
developed sense of what would be needed to successfully implement teaching an ICT lesson in their elementary classrooms.

Members of the cohort and the research collaborative had different capacities to imagine using ICT on their extended practicum and capabilities to implement ICT in elementary classrooms. These two groups had different structures of environment from which to individually and collectively make meaningful discoveries. Both groups were interactive with different sets of relationships from which they could create ideas and explore skill development toward implementing those ideas.

In this study, teacher candidates’ subjective perceptions were embodied in their entire organisms and embedded within the teacher education program, and in the case of the research collaborative, in the research intervention ICT learning sessions (Thompson, 2005). Both groups were embodied and embedded in the teacher education program, and this experience constituted what it was possible for them to imagine about using ICT in education, and how well they were prepared to implement these imaginings. The research collaborative, however, had the added benefit of experiencing the research intervention ICT learning sessions. In this way, they were embodied and embedded in a structure of an environment that provided them with an opportunity to broaden their creativity with regards to using ICT in practice, and an opportunity to deepen their understanding of the institutional, sociocultural and technological conditions significant to implementing these imaginings in an elementary classroom.

I have mentioned the concept of skillful know-how as discussed by Varela (199). This idea is significant when considering ICT imaginative capacity as a demonstration of skillful perception, that is, the ability to perceive the possibilities for ICT imaginative capacity within the specific structures of certain environments. This point is worth mentioning because several
members of the cohort commented on the lack of resources at their elementary schools as a reason not to use ICT in their teaching. Their perception of ICT imaginative capacity was socially constructed on expectations of certain forms of ICT resources being made available to them. However, in the research collaborative, part of the discussion about using ICT at their practicum schools focused on their perceptions of ICT resources available, and collaboratively inquiring into what actual resources were needed or could be made available to use. For example, in one case, a member of the research collaborative was able to source a digital projector at her elementary school that was rarely used by the other teachers and not immediately in her field of perception. By asking about ICT resources in her elementary school she learned there were ICT possibilities at hand.

5.2 Summary of Findings

In summary, five findings were discussed with regards to the relationship between instructional discourses and teacher candidates’ dispositions to use ICT in practice. The first finding discussed the relationship between discordant discourse conditions in the field of education and ICT-related instructional discourses in the teacher education program. A theory of social constructivism complemented by enactivism was used to explain how discordant discourse conditions in the field of education give rise to an absence of ICT-related discourse in the teacher education program.

The second finding discussed the relationship between instructional discourses and teacher candidates’ dispositions toward using ICT in practice. Bakhtin’s theory of the dialogic imagination and heteroglossia complemented by Maturana and Varela’s theory of autopoiesis
explained how the absence of ICT-related discourse in the teacher education program is related to teacher candidates’ disposition to not use ICT in practice.

The third finding discussed the relationship between instructional discourses and teacher candidates’ dispositions toward learning to use ICT in practice. Foucault’s theory of verbal performance and the relative meaning of communicative events was complemented with Maturana and Varela’s theory of linguistic cognitive domains to explain how the verbal performance of ICT-related instructional discourses (or the absence of) was constitutive of teacher candidates’ connection to their education instructor and their teacher education program. Wherein teacher candidates’ discerned that learning ICT was not significant or important to their successful completion of coursework, or graduation from the program, teacher candidates’ were negatively disposed to learning ICT in practice.

The fourth finding discussed the relationship between instructional discourses and teacher candidates’ dispositions toward teaching with ICT. This finding was theorized using Deleuze and Guattari’s theory of territorializing discourse complemented by Luhmann’s theory of autopoietic social systems. This finding explained the relationship between instructional discourses of non-ICT using teacher candidates serves to sustain the organizational entity of the profession of teaching and teacher education. At present educators do not consistently engage in substantive discussions about the significance and meaning of ICT in education. As such, conceptions of ICT in education tend to fall into instrumental technological determinism. Concepts of ICT implementation as instrumental technological determinism carry with them the idea that teachers are not professionals, but rather technicians trained to deliver curriculum and assess results. The conflation of ICT, instrumentalism, technological determinism, and the role of the teacher as technician is not discussed or re-contextualized in terms of institutional, sociocultural and
technological conditions in the field, nor the development of a professional, coherent response to these conditions. Instructional discourses, as performed in these conditions, socially construct teacher candidates’ negative dispositions toward teaching with ICT.

The fifth finding discusses the relationship between instructional discourse and teacher candidates’ demonstrations of ICT imaginative capacity. This finding was discussed in terms of Varela’s theory of skillful knowhow as skillful perception. This study showed that the absence of substantive discourse pertaining to ICT, coupled with individualistic conceptions of ICT in education, created conditions where the teacher candidates did not have an opportunity to develop their capacity to imagine using ICT in their teaching, nor develop the skillful confidence to implement their imaginings in practice.

To conclude this chapter, those findings indicate that there is a complex relationship between instructional discourses and teacher candidates’ dispositions to use ICT in practice. This relationship was seen to be conditioned by discordant discourse conditions in the field of education, and involved in whether teacher candidates are disposed to use ICT, to learn to use ICT, and to teach with ICT. These findings also show a significant relationship between instructional discourses and teacher candidates’ demonstrations of the capacity to imagine using ICT in their teaching and their capability to implement these imaginings in elementary school classrooms.
Chapter 6: Conclusions and Implications

This study investigated the relationship between instructional discourses and teacher candidates’ dispositions toward using ICT in practice. Specifically, the research reported in this dissertation studied the first year of a two-year teacher education program. The study participants were comprised of a thirty-eight member teacher candidate cohort. This group was subdivided into two sub-groups: the main cohort group and a small group of eight teacher candidates who volunteered to take a more active role in the research. These eight teacher candidate volunteers participated as members of a research collaborative who attended a research intervention comprised of collaborative critical inquiry ICT learning sessions offered outside the regular teacher education schedule of courses.

This study collected data from observations of instructional discourse in teacher education classes and self-reports from the teacher candidates in the form of an End of Study Questionnaire and End of Study Focus Group Discussions. These three datasets formed the data corpus for this study. Analysis of this data focused on empirical data documenting communicative events pertaining to ICT. Social constructivism complemented by enactive analysis provided a theoretical framework for examining the data and discerning findings from the study.

Key elements from the study were identified during the analysis process. First, the teacher candidates reported cognitive dissonance between what they were told about ICT in education and what their education instructors demonstrated, in the form of ICT imaginative capacity. The teacher candidates perceived pressure to use ICT. This pressure can be identified as a preponderance of ICT devices, software applications, online resources, and network infrastructure as evidenced in Appendix E ICT Observed in Instruction. At the same time, the
teacher candidates perceived that ICT was not actually important to teaching, that it was unreliable, that it was an add-on that did not warrant significant or meaningful discussion. Teacher candidates commented on their confusion regarding this situation.

Another element that was identified during the analysis was the role perceived power differential played in teacher candidates’ dispositions toward ICT in practice. They described how their education instructors had the power to impact their success in the program, graduation, and getting certified in the profession. They expressed confusion about their relationship to these education professionals, on the one hand, they are expected to ask for help when they need it, but on the other they are expected to perform the tasks of learning to be a teacher, and teaching, for assessment and approval. These are very difficult relationship dynamics to integrate. These difficult relationship dynamics were particularly evident in teacher candidates’ perceptions about using ICT in their practicum schools. There were many comments about how a practicum sponsor teacher’s comments or beliefs about ICT dissuaded a teacher candidate from planning to use it on their extended practicum.

One last element that was identified through data analysis as a pattern of instructional discourses notable in absence, was any substantive discussions about the significance of ICT in the profession of teaching or in the practice of teaching in elementary schools. This absence of substantive discussion was remarkable in its consistency across university course and at the practicum elementary schools. It was also remarkable because there was no overarching policy governing discussion pertaining to ICT in the teacher education program. The pattern of non-discussion appeared to be a spontaneous phenomenon indicative of a pattern of ICT non-use or non-engagement across the university courses and at the practicum elementary schools.
Sumara and Davis (1997) developed enactivist theory in relation to community learning in an effort to make sense of the contingent and complex nature of their own action research. It was propitious that I was able to attend Dr. Sumara’s course on Consciousness, Curriculum and Aesthetic Experience in May 2008, at the end of the data collection reported in this study. I was grappling to make sense of the limitations of subject-centered research orientations, (demonstrations of ICT fluency, literacy, integration) and culture-privileging accounts (teacher candidates’ acceptance, resistance or opposition to ICT). In my case, it was how conceptions of ICT, teaching and learning were structured and conditioned within the teacher education program to give rise to experiences of learning that were constitutive of teacher candidates’ ICT dispositions.

Davis et al. (2008) found an ecological approach to the diffusion of ICT innovation in education was highly rated compared to centralized computer-assisted learning with access to trainers online. They recommended that ICT teacher training be designed to support evolution of each teacher’s classroom, school and region, as well as training ICT teacher trainers. Sawchuk (2005) described the intersection of ICT, work and learning as a contested social phenomenon, one that is being played out as professional educators grapple with what it means to use ICT in practice. Sawchuk’s description, like Petrina et al. (2008) supports the idea that the use of ICT in education is a contested social phenomenon, not the instrumental or technological challenge that has been portrayed. As such, based on the findings from this study, a sociocultural response to the situation appears to show promise for addressing the problem identified in this study.

Watson (2001) discussed the central dichotomy of practice teachers face when it comes to teaching and learning with digital technologies. Watson framed the dichotomy in a question: Is ICT taught as a subject in its own right, with a conceptual knowledge and skill base, or is it a
tool to be used mainly for the learning of other subjects? For the purposes of this research, this dichotomy can be seen as a false construct. If teachers conceive of their educational settings, learning relationships, and technological resources as constituting a social constructivism of learning, there is no dichotomy between teaching about ICT and teaching with ICT (not to mention learning about ICT and learning with ICT).

6.1 Conclusions

Findings from this study suggest that changes can be made in teacher candidates’ dispositions to using ICT in practice can occur by implementing modest interventions in teacher education instructional discourses.

6.1.1 Absence of Substantive Discourses Pertaining to ICT in Teacher Education

There was apparently an absence of substantive discourses pertaining to ICT in the teacher education program and that absence contributed to the social construction of new teachers who were not disposed to using ICT in practice. Instrumental or technologically deterministic discourse pertaining to ICT in the field of education is recognized as a problem for professional educators. However, in this study, that problem was rarely, if ever, discussed, nor was there any discussion about the significance or meanings associated with ICT in education or in professional practice. At the same time, the incursion of ICT into the field of education and into educational practice is obvious. Thus, the data from this study indicate that technological perturbations were being registered in the teacher education program but there was no coherent response, as an organizational entity, to address this aspect of the structure of the environment.
The absence of substantive discourses pertaining to ICT in education and in teacher education means there is no opportunity to develop professional policies, positions, or practices in response to ICT incursions from the field. It means there is no response to enactively structure educational environments that are positively disposed to using ICT. It means educators, including new teachers, are negatively disposed toward ICT in practice, and, no intrinsic effort to develop demonstrations of ICT imaginative capacity. In the absence of efforts to develop demonstrations of ICT imaginative capacity, educators continue to labor in states of unskillful know-how about ICT in their field. This lack of skillful know-how means educators, and new teachers, are unprepared to respond to ICT changes in the structure of their environment. The absence of substantive discourses pertaining to ICT in education means the field of education, as a profession, fails to evolve or, better yet, lead, changes in education promulgated by societal engagements with ICT.

When substantive instructional discourses were included in the teacher candidates’ collaborative critical inquiry ICT learning sessions, we noticed a difference in their dispositions toward ICT in education and in their practice. As they were disposed to use ICT in practice, they were interested in learning to use ICT in their elementary classrooms. Their interest in learning to use ICT was reflected in their plans to teach with ICT on their extended practicum. Based on the findings from this study, substantive instructional discourses pertaining to ICT clearly contribute to teacher candidates’ dispositions toward teaching with ICT on their extended practicum.
6.1.2 Instructional Discourse and Teacher Candidates’ Disposition Toward ICT in Practice

This study suggests that instructional discourses are socially constructive of teacher candidates’ dispositions toward ICT in practice. This conclusion points to the need for a coherent organizational response to the structure of ICT in the environment of the teacher education program. The faculty policy of leaving it up to individual departments and instructors to use ICT at their own discretion resulted in a haphazard implementation of various ICT devices, software applications, online resources and network infrastructure. The teacher candidates were not able to develop their own coherent professional response to ICT in practice because they were not provided an organizational entity enacting a coherent response from which they could autopoietically develop their own disposition of practice.

The members of the research collaborative demonstrated social constructivism in their disposition to using ICT in practice. Despite the lack of coherent organizational responses to ICT, they were able to autopoietically develop their own sense of the significance and meaning associated with ICT in education. Despite a faculty policy that appeared haphazard and like ICT was ‘crammed’ into coursework, the members of the research collaborative did not develop a negative disposition toward learning to use ICT in practice. In this study the research intervention provided an organizational entity enacting a coherent response to making sense of ICT in practice. They were able to autopoietically develop a disposition toward ICT that inspired them to use it, learn to use it, and learn to teach with it.
6.1.3 ICT Learning Experiences

The structure of the environment for learning ICT in the teacher education program, as exemplified by instructional discourses, could be well served by collaborative critical inquiry ICT learning experiences. The lack of substantive ICT discussions, lack of a coherent organizational response to ICT in the field of education and in society, and the lack of dispositions toward using ICT in practice modeled by the education instructors conspired to leave the teacher candidates indisposed to learning ICT in the ICT learning sessions. In particular, because the pedagogy of collaborative critical inquiry was not a part of their experience of learning in other education classes, they had a very difficult time taking ownership of their learning and adopting a role as collaborative participant in knowledge generative learning rather than simply finding out what the course content is and completing assignments accordingly.

The linguistic cognitive domain of the teacher education program did not include instructional discourses to develop breadth and depth of knowledge about ICT in education. This seemed to translate into teacher candidates who were not disposed to use ICT in education, they did not perceive a value in learning ICT for inclusion in their teaching practice, and they did not plan to teach with ICT.

The combination of an absence of collaborative critical inquiry as a familiar structure for learning, and a lack of emphasis valuing the learning to use ICT combined to make it very difficult for members of the cohort to structurally couple with the research group during the in-class ICT learning sessions. The time together was very short compared to the length of time in the rest of the program, and the semiotic system of the ICT learning sessions constituted such an
abrupt change as that the members of the cohort were not able to sustain a meaningful connection.

6.1.4 ICT Dispositions in Teacher Education

Whether by design or happenstance, instructional discourses in the teacher education program conveyed non-ICT using dispositions to the teacher candidates. I conclude this situation revealed an undeveloped conceptualization of ICT in education, and further, a lack of understanding sociocultural aspects of ICT in the profession.

In this study there were examples of instructional discourses demonstrating instrumental uses of ICT, non-use of ICT, poorly planned uses of ICT, poorly executed uses of ICT, and poorly conceived uses of ICT as curriculum and pedagogy. The intensity of instructors’ emotional and mental states, as reported by teacher candidates as making a lasting impression, reveal a discordant connectivity in terms of education instructors relationship to ICT in practice.

There is a pressing need for education instructors to participate in substantive discussions about ICT in education, and their own professional engagements with ICT in practice. These substantive discussions could be scheduled on an annual or semi annual basis in recognition that the structure of the environment for teaching, and for society as a whole, is in a rapid state of evolution. It would behoove professional educators to enact self-sustaining professional learning based on collaborative critical inquiry into topics associated with ICT in education.

6.1.5 Demonstrations of ICT Imaginative Capacity in Teacher Education

In this study, demonstrations of ICT imaginative capacity were typically in the service of teaching curriculum and most commonly demonstrated through the use of PowerPoint lectures.
The e-Portfolio was conceived and implemented as an instrumental use of social blogging software to serve as an online portfolio, a repository for artifacts demonstrating acquisition of the standards necessary to graduate the program and qualify for certification at the provincial teacher regulation branch. In the practicum, elementary classrooms the use of ICT reported by the teacher candidates was generally uninspiring – in some cases, the teacher candidates viewed the use of ICT as antithetical to good learning experiences.

Learning from this study, there is a pressing need for educators to participate in collaborative critical inquiry ICT learning sessions to 1) develop productive dispositions toward ICT in their profession; and 2) demonstrate the capacity to imagine using ICT to improve learning experiences and the capability to implement these imaginings in practice.

6.2 Implications

What was striking about this study was the fact that instructional discourses across faculty advising, instruction and practicum sponsorship consistently conveyed non-ICT using dispositions and very rudimentary demonstrations of ICT imaginative capacity. The quality and characteristics of this discourse was not formally orchestrated for this consistency, thus, it can be deduced that the conditions for ICT related instructional discourse contributed to a similarity of dispositions in the university teacher education classrooms and the elementary practicum school classrooms. This similarity can be traced to educational policy and guidelines influenced by less than imaginative ICT concepts as defined and discussed by the OECD, UNESCO and ISTE (for example). One key question that emerges from this study is how do instrumental educational policy and guidelines pertaining to ICT contribute to non-ICT using dispositions across educational institutions and levels of instruction?
What was learned from this study is that there is a significant need for substantive, facilitated discussions at every level in the field of education to engage professional educators to develop an evolving, well considered response to ICT in education. One educator on an individual basis cannot do professional ICT development. This is a sociocultural problem and it demands a social response. If educators don’t have an opportunity to learn about and with ICT, they are not going to engage with it in practice. That is being proven year after year, as succeeding generations of teachers enter the field. The discordant discourse conditions in the field of education with regards to ICT at this time should be of central concern. There is no coherent response, and in the absence of a coherent response, there is an incoherent manifestation of ICT dispositions that are aversive to using ICT and a profound lack of development in terms of the possibilities for imaging compelling learning experiences for students and the skillful implementation of these ideas in elementary classrooms.

If this study has shown that individualistic approaches to ICT in education practice are not working to change ICT dispositions and ICT imaginative capacity in the field, then the issue of individualism in education should also be addressed. Social conceptions of learning relationships in the profession need to be part of substantive discussion about ICT in education. Teachers need to perceive their learning relationships as socially constructed and constructive of possibilities for social networks of learning relationships. The formation and sustainability of these relationships depend on developing skillful know-how in terms of both communication skills and ICT engagements.

Finally, it is only through substantive facilitated discussion about the significance and meaning of ICT in education that professionals in the field can begin to talk about ICT beyond instrumental concepts of ICT as ‘tools’, ICT and educational change, ICT in relation to ‘good’
teaching, and ICT in relation to the life of students in schools. At present there are entire
generations of students growing up surrounded by the use of digital technologies but with no
cohesive societal support to make sense of them in their lives. Now is the time for teacher
education to take up the challenge and provide leadership, not only to new teachers coming into
the field, but to professionals working in the field struggling to make sense of how to deal with
ICT in their practice.

Teachers would benefit from understanding their professional relationships as socially
constructive of ICT dispositions. From this perspective, they can see how their individual
contributions have the potential of constituting an empowered profession or a passive profession
that is in a chronic state of individualistic reactivity to difficult conditions instead of active
collaborative networks responding to changing conditions. I suggest that an enactive concept of
education, as an ecological system comprised of inter-connected individuals within the larger
contextual conditions of education institutions and government oversight, informs our
understanding of teacher candidates’ ICT-related dispositions. They have the resources at their
fingertips to implement organizational structures that serve the mission and goals of education in
a democratic society.

6.3 Recommendations for Future Research

This study has shown a need to further investigate the relationship between instructional
discourses and developing imaginative capacity in the field of education. The need to develop
imaginative capacity extends beyond when, where, why, how, or what ICT teachers learn to use
in practice. At the same time, it is implicated in whether the field of education develops the
imaginative capacity to learn to teach with ICT, to learn to teach ICT, and to learn ICT to teach
and learn. In developing this capacity, we should see educators at all levels of their professional career demonstrating the imaginative capability to implement their imaginings in practice, and, in so doing, significantly contribute to the emergence of imaginative education.

In particular, this study shows a need for future research into imaginative ecological education, wherein definitions of ‘ecological’ encompass both the natural structures of the environment, and the human-made structures that are so constitutive of our imaginative capacities and our imaginative capabilities (Liang & Chia, 2014). The field of education, and our human societies, would benefit greatly from a better understanding of the relationship between instructional discourse and the emergence of imaginative capacities and capabilities. This study provides a step in the direction of theorizing imaginative capacity as socially constructive and enactively implemented.
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Appendices

Appendix A  Invitation to Participate

Invitation to Participate
Seeds of Possibility Research Project
Phase II (January – December, 2008)

As a teacher candidate in the Diversity Cohort 2007 - 2009 you are eligible to participate in the Seeds of Possibility research project during your teacher education program here at UBC. The Seeds Project is investigating how teacher candidates in the two-year Elementary Program at UBC are learning to use digital technologies. The goal of the research is to identify ways to build sustainable learning communities where teacher candidates can engage with digital technologies within their professional teaching practices.

We are now entering the second phase (January – December, 2008) of the research and during term 2, 2008 all members of the Diversity Cohort will be receiving instruction on using digital technologies through your EDUC 310 and 316 courses.

In addition, between January and April, 2008 our research group (Bonnie, Jenny, and Don) would like to work more closely with a small group of 8-12 of you who are interested in taking a more focused approach to using ICT during term 2 and in your extended practicum. The purpose will be to prepare you for using ICT during your extended practicum, and possibly during your first year of induction into the teaching profession. We hope to identify 2-3 individuals at each of four grade levels (K-1, 2-3, 4-5, 6-8) for a total of 8-12 participants.

Selection Process
We are asking those who are interested to submit a short paragraph outlining your interest in digital technologies and education and why you would like to be selected to participate.

Deadline for submission is on or before Monday, January 28, 2008.

Please submit your 250-word expression of interest to:
Don Krug, Faculty of Education, Department of Curriculum Studies
University of British Columbia, 2118 - 2125 Main Mall
Neville Scarfe Building, Vancouver, BC CANADA V6T 1Z4
email: don.krug@ubc.ca

Version: Contact 0108

page 1/2
Selection Criteria
We will review submissions and select participants based on: 1) Teacher Candidate written expression of interests, 2) number of participants in each grade level. We will also consult with your faculty advisors in order to provide everyone with the best possible practicum experience during their program.

Participation
Those who are selected will be asked to meet seven (7) times (2/7, 2/14, 2/21, 2/28, 3/6, 3/13, 3/20, 3/27) during term 2 on Thursday morning from 9-11 to discuss and practice ways to use ICT within your practicum experiences. In addition, we will also be requesting that you:

1) participate for the full term of this phase of the research (Jan 08 - Dec 08), including attendance at all scheduled sessions.
2) write and post weekly in a reflective online journal.
3) engage in learning how and why to use digital technologies to enhance student learning.

Educational Support
For those who are selected for this research, you will be receiving the following:

1) seven (7) two-hour curriculum development sessions to learn about integrating digital technology into learning activities (Jan - Apr 08)
2) two (2) one-day retreat sessions (9am - 4pm) to prepare digital teaching activities (Apr 24, Aug 28). [two-hundred dollar honorarium, must attend both sessions]
3) extended practicum mentor support for technology infused teaching activities (Sep - Dec 08)
4) four (4) half-day (three-hour) debriefing/planning sessions on a Saturday during the extended practicum to talk, problem solve, and plan (Sept 13, Oct 11, November 15, Dec 20, 2008) [two-hundred and dollar honorarium, must attend all sessions].
5) participation in an online social networking environment to consult, problem solve and plan learning activities.

Equipment Support
Each participant will receive a digital video camera, laptop computer, and additional peripherals as required, to use during your practicum.

Thank you for your interest in this work.

Sincerely,

Jenny Amtzen
Bonnie Wen
Don H. Krug

Version: Contact 0108
Appendix B  Information / Consent Form

THE UNIVERSITY OF BRITISH COLUMBIA

Faculty of Education
Department of Curriculum Studies
2125 Main Mall
Vancouver, B.C. Canada V6T 1Z4
Tel: (604) 822-5422 Fax: (604) 822-4714

INFORMATION/CONSENT FORM
Seeds of Possibility: Integrating Information and Communication Technologies

Many researchers argue that interactive computer technologies may have the ability to provide the space for encouraging students to engage in an active learning environment. However, research indicates that educators are reticent to incorporate new technologies into their practice (for example, Cuban et al., 2001; Cuban, 2002; Zhao & Frank, 2003; Zhao et al., 2002). Furthermore, in spite of the rich tradition of research on classroom teaching and learning, there are few studies on the experience of how pre-service teachers begin to consider incorporating technology into their teaching. Most of the referred literature that is available focuses on the post-secondary experience, not on elementary teaching (i.e. K-7) as this inquiry seeks to do. Research suggests that the effects of technology are significantly mediated by teachers' existing pedagogical knowledge and perceptions (Zhao, 2004). In this research, we will collect data from you during your time in the teacher education program to determine any changes in your perceptions, literacy, fluency, and integration resulting from your program of study.

This research, entitled 'Seeds of Possibility: Integrating Information and Communication Technologies' offers an opportunity for you to engage in dialogue and practices about integrating ICT within your studies and on how to enhance your confidence and competence of using ICT within your own teaching practices (ICT literacies). Specifically, the pedagogical goals are to facilitate your ability to 1) examine the impact of technology on individuals, societies, and the environment, 2) learn how to investigate ideas, issues, and problems by using ICT to conduct inquiry, analyze solutions and problems, and present results, and 3) learn how to use ICT for assessment and evaluation of their own teaching practices, student learning, content selection, and curriculum and program development.

I, (redacted), agree to take part in an educational study within the Teacher Education program, Two Year Elementary Option, entitled Seeds of Possibility: Integrating Information and Communication Technologies.

I understand that, as a participant in the study, I will be asked to participate in using technologies in my own learning and teaching and to respond to interview questions. I understand that participation in the study may involve answering questions about:
- my beliefs about the use of technology in education;
- my experience with technology in education;
- my personal experience with technology;
- my feelings and/or attitudes towards the use of technology in education.

Seeds of Possibility Consent 1  Page 1 of 2  9/25/07
I understand that there will possibly be two to four interviews during this academic year, one early in the year, two midway through, and one after the year's course work has been completed. If selected for these interviews, the first and last interviews will be approximately 45 minutes in duration, while the two middle interviews will each be about 15 minutes. Each interview will occur at a time and place that is convenient for me.

I understand that I am under no obligation to agree to be interviewed. I understand that my instructor will not be informed as to who agrees to participate in the study and who does not, and neither decision will have any consequences for my future education. I understand that I may refuse to answer any questions, to stop the interview at any time or withdraw from the study without consequences. I understand that my specific answers and comments will be kept confidential. I understand that my name will not be identified in any report or presentation that may arise from the study. I understand that only the principal investigator and his assistants will have access to the information collected during the study.

I understand the information gained may assist both researchers and education professionals to better understand the use of technology in pre-service teacher education.

I understand what this study involves and agree to participate. I have been given a copy of this consent form.

Signature ___________________________ Date ___________________________

Dr Don Krug, Associate Professor, CUST  604-822-5318

If you have any questions about your treatment or rights as a research subject, you may call the Research Subject Information Line in the UBC Office of Research Services at the University of British Columbia, at 604-822-8598.
Appendix C  Data Collection Instrument: In-Class Observation Categories

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<th>participantID</th>
<th>TEP_instructor_1</th>
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Appendix D  Data Collection Instrument: End of Study Questionnaire

Seeds of Possibility: Ecologies of Cognition
Year End Interview Questions 2008

1. I would define Information and Communication Technologies (ICT) as
_____________________________________________________________________
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2. I became a member of the Diversity Cohort by:

Please check one position

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<th>Volunteering</th>
<th>Assigned</th>
<th>Other</th>
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Additional comments
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2. I feel well prepared to use Information and Communication Technologies (ICT) for teaching during my extended practicum:

Please check one position

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<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>No opinion</th>
<th>Agree</th>
<th>Strongly agree</th>
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Additional comments
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3. I believe I will use ICT for teaching during my extended practicum:

Please check one position

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<th>Yes</th>
<th>No</th>
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4. I am planning to use ICT to teach during my extended practicum in the following ways:

Please fill in the relevant areas

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<th>Subject(s)</th>
<th>Connections to learning</th>
<th>Connections to teaching</th>
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5. In order to use ICT to teach during my extended practicum, I will first need to:

Please complete the sentence

a)  
b)  
c)  
d)  
e)  

Additional comments

________________________________________________________________________

________________________________________________________________________
6. Based on my current understanding, I believe the following factors will **hinder** or **help**
my use of ICT in my teaching during my extended practicum:

**Please rate the following**

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<th>a) Teacher education program preparation (curriculum, pedagogy)</th>
<th>Greatest hinderance</th>
<th>Hinderance</th>
<th>Neither help nor hinderance</th>
<th>Helpful</th>
<th>Greatest Help</th>
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<th>b) Self confidence</th>
<th>Greatest hinderance</th>
<th>Hinderance</th>
<th>Neither help nor hinderance</th>
<th>Helpful</th>
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<th>c) In-class teaching support (mentoring)</th>
<th>Greatest hinderance</th>
<th>Hinderance</th>
<th>Neither help nor hinderance</th>
<th>Helpful</th>
<th>Greatest Help</th>
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<th>d) Sponsor teacher support</th>
<th>Greatest hinderance</th>
<th>Hinderance</th>
<th>Neither help nor hinderance</th>
<th>Helpful</th>
<th>Greatest Help</th>
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<th>e) Sponsor school resources (hardware, software, infrastructure)</th>
<th>Greatest hinderance</th>
<th>Hinderance</th>
<th>Neither help nor hinderance</th>
<th>Helpful</th>
<th>Greatest Help</th>
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Additional comments
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7. Other comments I would like to share about my experiences in the Teacher Education Program from the past year include:

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8. Other comments I would like to share about my experiences in the Teacher Education Program from the past year in relation to my learning about ICT include:

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Appendix E  ICT Observed in Instruction

**Devices:** AV cart, CD, CD player, data projectors (borrowed, permanently installed, personal property), digital cameras (borrowed, personal property), digital video cameras (borrowed), laptops (borrowed, personal property), laptop cart – Windows, overhead projector, university computer lab desktop computers (Mac / Windows labs), video classroom learning system;

**Software Applications:** movie editing (iMovie, Windows moviemaker), PowerPoint, Word;

**Network Infrastructure:** Computing and Media Services, high speed Internet (home based), University Campus Wide Wifi;

**Online Resources:** DrupalEd, Ministry of Education – IRP / PLO, Moodle, Ning, Online learning sites, WebCT, WebQuest, Wiki, Wordpress, Youtube, and online video links.
## Appendix F  Chronology of Research Intervention

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<thead>
<tr>
<th>Date</th>
<th>Activity / Event</th>
<th>Content of Event</th>
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<tbody>
<tr>
<td>10/1/07</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Teacher Candidates - Forty minute computer lab sessions with teacher candidates divided into 1/2 cohort groups: Introduction to ICT concepts in education - ICT literacy, ICT resources in teacher education, requirements for username and passwords in the computer lab; ICT terminology i.e. flash drive</td>
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<tr>
<td>10/17/07</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Teacher Candidates - Forty minute computer lab sessions with teacher candidates divided into 1/2 cohort groups: sign up for Ning, understanding file space, creating new folders, file management for online resources, using personal storage devices in institutional settings</td>
</tr>
<tr>
<td>12/12/07</td>
<td>Research Team Meeting</td>
<td>The research team discussed end of term observation reports and what had been learned in terms of what would be helpful for teacher candidates interested in learning to use ICT in their teaching</td>
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<td>The team discussed barriers they had observed during the term that were having a negative effect on the manifestation of teacher candidates' ICT dispositions.</td>
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<td>Syllabi were collected from the education instructors to identify what ICT was required in teacher education courses.</td>
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<td>The research team discussed the difference between volunteering to participate to learn ICT and being forced to learn ICT and how these experiences contribute to educational change.</td>
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<tr>
<td>1/6/08</td>
<td>Research Team Meeting</td>
<td>Planning for short practicum school visits so the research team could familiarize themselves with ICT technological and sociocultural conditions in the practicum elementary schools attended by the teacher candidates.</td>
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<td>Planning for a schedule of ICT learning sessions in the computer lab in consultation with the Faculty Advisors - ideally the 38-member cohort would attend compulsory weekly computer lab sessions, the research collaborative would be invited to join and then make a commitment to participate in weekly ICT learning sessions</td>
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<td>Key idea the research group is working on is that ICT dispositions are conditioned by the environment within which they emerge rather than delineated by cause and effect correlations.</td>
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<td>Environmental conditions include technological and sociocultural conditions - how ICT is conceptualized, how it is discussed, and how it is used.</td>
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<tr>
<td>1/14/08</td>
<td>Research Team Meeting</td>
<td>Preparing for ICT learning sessions: philosophical approach, curriculum design, pedagogical processes</td>
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<td>ICT learning session designs draw from sociological and anthropological learning theory rather than psychological theory.</td>
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<td>Learning experiences designed as social rather than individual development - a social constructivist cognitive approach wherein learning relationships evolve as social learning connections over time.</td>
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<td>Discussed the challenge of institutional needs to standardize and operationalize learning and in relation to fostering social, evolving learning relationships that change over time.</td>
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<td>The research approach is to study language as it is used to enact and sustain learning relationships.</td>
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<td>The relationship between discursive practices and the manifestation of sustainable social learning relationships.</td>
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<td>Conceiving of these ICT learning sessions as socially constructive of cognition through language and practice.</td>
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<td>Learning is not conceived as individual acquisition of pre-set knowledge, instead it is conceived as the social evolution of knowledge generation amongst participants in a social learning group.</td>
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<td>Rather than attempting to impose artificial standards or stages for developing ICT engagement, the ICT learning sessions were designed to develop habits of critical inquiry and discussion, examining environmental conditions (institutional, sociocultural, technological), identifying ICT dispositions that inspire or dissuade ICT use, describing demonstrations of ICT</td>
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<td>imaginative capacity in the form of compelling learning experiences.</td>
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<td>ICT learning sessions designed to create conditions for change rather than conditions for replication - if mentoring is offered, where does it occur, what conditions allow it to manifest?</td>
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<td>Not using step-by-step instructions - using critical inquiry research intervention. Use of ICT is integral to the process, learning to use ICT is integral to the process, depending on the kinds of ICT uses that are applicable at any given time.</td>
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<td>Critical inquiry research intervention is an ongoing cyclical process of mentoring, implementation, reflection, deliberation, and problem solving designed to broaden concepts of ICT in education and deepen understanding of the complexities of change and ICT in education.</td>
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<td>The focus of the ICT learning sessions was to apply theory in practice and analyze and assess the results.</td>
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<td>ICT learning session processes form the foundation for enacting constructivist cognition, within the context of the social constructivism of learning, generating ICT knowledge, and consequently educational change.</td>
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<td>The focus of the ICT learning sessions was to continuously seek ways to mentor teacher candidates and members of the research collaborative to prepare to use ICT during their teaching on their extended practicum coming up in September, 2008.</td>
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<tr>
<td>1/15/08</td>
<td>Research Team Meeting</td>
<td>Design for conducting critical inquiry in the ICT learning sessions is drawn from the work of David Kolb and his writing about experiential learning.</td>
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<td>The ICT learning sessions are conceived as a discursive field that create conditions where learning occurs.</td>
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<td>The ICT learning sessions are consistently geared to teach members of the research collaborative to learn to use ICT for teaching, learning to teach ICT for learning, designing compelling lessons that utilize</td>
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<td>1/18/08</td>
<td>Research Team Meeting</td>
<td>The Invitation to Participate is drafted and prepared for circulation to the teacher candidates after they return from their short practicum placements.</td>
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<td>The deadline to submit a 250 word Expression of Interest is January 28, 2008</td>
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<td>1/30/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Teacher Candidates: 40-minute lesson in the computer lab 1/2 cohort group.</td>
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<td>Introductory videos - The Story of Stuff, and Wiki's in Plain English; introduced to DrupalEd site.</td>
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<td>Teacher candidates form small working groups to set up their own wiki site for an upcoming group project on global citizenship.</td>
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<td>2/4/08</td>
<td>Research Team Meeting</td>
<td>A disappointing response to the letter of invitation, only 6 out of 38 teacher candidates wrote an Expression of Interest to volunteer to take a more active role in the study</td>
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<td>2/5/08</td>
<td>Research Team Meeting w/ Tech Coaches</td>
<td>Discussing the use of social media in the teacher education program with the tech coaches - how these uses should guide the design of the ICT learning sessions for the teacher candidates.</td>
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<td>DrupalEd and Wordpress are being used in the program, we brainstormed with the tech coaches the best approach to introduce Wordpress to the teacher candidates - the tech coaches caution, &quot;The easier, the better.&quot;</td>
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<td>Tech coaches report that the use of Ning has fizzled out because there was no sense of ownership or permanence on the part of the teacher candidates to the account and the network.</td>
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<td>2/6/08</td>
<td>ICT Learning Session -</td>
<td>Teacher candidates - time is limited to a 20 minute session in the computer lab with 1/2 the cohort at a time.</td>
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<td>Computer Lab</td>
<td>Focus of the session was learning to use visual space for educational purposes. Teacher candidates were asked to discuss how they can design learning activities that foster inquiry learning by using ICT.</td>
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<td>Session closed with technological instruction - how to insert images, videos and text into their Wiki group space</td>
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<td>2/7/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - first meeting of prospective volunteers for the research collaborative. Seven teacher candidates in attendance.</td>
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<td>Introduction to theory and method that will guide the research collaborative learning experiences. Most importantly, members of the research collaborative will contribute to the design of the ICT learning sessions as we move forward.</td>
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<td>Attendees discussed their technology interests and needs and compiled a list of sixteen items of hardware, software and online resources that they were interested in researching and developing for use in their lesson plans on extended practicum next fall.</td>
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<td>Attendees discussed using blogs in their teaching and clarified the relationship between the requirement to produce an e-portfolio for certification with the college of teachers and using a blog for their own teaching.</td>
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<td>The rest of the session was devoted to learning how to set up a Wordpress blog on the research server that could be used for teaching on the extended practicum next fall.</td>
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<td>2/7/08</td>
<td>Research Team Meeting</td>
<td>The research team had developed a schedule of ICT learning sessions they hoped to offer the teacher candidates on Wednesdays and the research collaborative on Thursdays.</td>
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|        |                   | The design for the ICT learning sessions continued to integrate what the teacher candidates were encountering elsewhere in their program to ensure the
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<td>time spent in the learning sessions was relevant to their needs.</td>
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<td>A schedule of 8 ICT learning sessions was planned for the teacher candidates, but in the end they were only able to attend 4 due to competing needs from the teacher education program.</td>
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<td>A schedule of 7 ICT learning sessions was planned for the research collaborative and they were completed successfully with full attendance.</td>
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<td>An informational blog about the research was set up to provide information about the research and the ICT learning sessions as they unfolded.</td>
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<td>2/11/08</td>
<td>Research Team Meeting</td>
<td>At this point there are three ICT learning sessions scheduled for the week: Tech coaches, teacher candidates and research collaborative. There are 2 - 3 websites and blogs to organize, a research site, the DrupalEd site, and a mentoring site for the research collaborative to access resources.</td>
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<td>The research group discussed the issue of sustaining change after a research intervention ends. Part of the purpose of the ICT learning sessions with the research collaborative members is to build strong social connections amongst the group members so they will continue to communicate with each other as a self-sustaining network for professional learning.</td>
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<td>2/13/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Teacher candidates - session pre-empted for other programming in the teacher education program</td>
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<td>2/14/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - plans are underway for full day research collaborative retreat 2008-04-14</td>
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<td>Research team is helping with ideas development and skill building, research collaborative members are encouraged to work with us as a group, to participate in a collective effort to develop ideas for instructional</td>
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<td>design and implementation.</td>
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<td>E-portfolio blogs have been set up by the teacher education program.</td>
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<td>Research team discusses the different ways an online software like Wordpress can be used for different applications, for example, as an e-portfolio for teacher education and for teaching a lesson on super hero masks to a class of grade fours.</td>
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<td>Research collaborative members participate in a brainstorming session to develop ideas for Webquest activities. Everyone is encouraged to share their idea development using the email listserv set up for the research.</td>
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<td>Learning how to modify images in photo editor and create custom image header for their Wordpress teaching blogs.</td>
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<td>2/26/08</td>
<td>Research Team Meeting</td>
<td>Planning for lesson content for ICT learning session tomorrow with teacher candidates.</td>
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<td>Challenges for lesson planning include figuring out what is possible to do with them given the limited amount of time we have with them, the demands placed on their time by the teacher education program, and the current state of their ICT dispositions (not engaged or interested)</td>
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<td>Principal investigator mentioned that the Faculty Advisors have communicated to him that they see the ICT learning sessions as a waste of valuable learning time.</td>
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<td>It is difficult to plan ICT learning sessions for the teacher candidates because they are not developing the capacity to imagine using ICT for teaching, and, if they have given it any thought, they do not know what ICT resources they will have available in the practicum school in the fall.</td>
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<td>Another difficulty discussed by the research team was that the teacher candidates were manifesting negative attitudes toward the use of ICT in practice, and that they were not being given a chance to discuss the changing role of the teacher, of the student, and of learning, when ICT is an integral part of teaching practice.</td>
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<tr>
<td>2/27/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Teacher candidates - discussed the difference between creating learning experiences for passive or active learning, reviewed what learning processes the teacher candidates were designing into their global citizenship projects, and introduced concept mapping software and using it for collaborative concept development. The session served as an opportunity to learn concept mapping and to use concept mapping software.</td>
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<tr>
<td>2/28/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - further discussion on what constitutes passive or active learning experiences, and how to design active learning experiences with ICT.</td>
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<td>Discussed the role of authoring in active learning.</td>
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<td>Worked in their teaching blogs developing WebQuest lessons to use on their extended practicums.</td>
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<td>Research collaborative members authored their own blog page outlining a WebQuest activity and then designed learning activities for their students that would allow them to author blog pages as part of the WebQuest learning process.</td>
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<tr>
<td>3/6/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - work continues on setting up their blogs for teaching, setting author privileges for their students, learning to administer their own blog sites.</td>
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<td>Work has begun on building the technical skills to carry out various ICT-related tasks during extended practicum: designing a lesson that incorporates ICT in the learning process; designing a lesson to teach their students the ICT skills to carry out the learning process; developing video skills to shoot video of their teaching with ICT during extended practicum; and</td>
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<td>shoot a short instructional video teaching an ICT skill their students will need for their main lesson.</td>
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<td>3/13/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - the new video cameras have arrived.</td>
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<td>Research collaborative members broke into working pairs to shoot short instructional videos for their students that taught ICT concepts for using the video cameras.</td>
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<td>A new online discussion forum has been set up for the research collaborative to post their thoughts, designs, and resources leading up to teaching with ICT in September.</td>
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<td>3/17/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Teacher candidates - 30 minute introduction to Sillouette - report card software used in the local school district.</td>
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<td>3/27/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - the group has settled to eight members who will carry on in the next phase of the study.</td>
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<td>Everyone logged into the discussion forum and continued learning how to participate in a discussion forum as part of the development of lesson plans.</td>
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<td>Members of the research collaborative reflected on their learning ICT to date and their preparations to teach with ICT in September.</td>
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<td>3/27/08</td>
<td>[Jane] Teaches Science Lesson</td>
<td>One of the members of the research collaborative decided to test her burgeoning ICT knowledge and skills by teaching an ICT-based micro-lesson in her science methods course.</td>
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<td>4/3/08</td>
<td>ICT Learning Session - Computer Lab</td>
<td>Research collaborative - the pressure of course deadlines and presentations has taken its toll on the members of the research collaborative members. Three of them attended this session, while the other five sent regrets due to illness, and deadline pressure. We had an opportunity for informal discussion about using ICT and plans for the upcoming retreat and teaching with ICT on the extended practicum. As we were chatting, all three of the members of the research collaborative were working on presentations for their science class. They were all using the concept mapping software we had introduced as part of the ICT learning sessions.</td>
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