TECHNOLOGY INTEGRATION
AND THE SCHOOL CHANGE PROCESS

by

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ABSTRACT

There are often many elusive psychological and sociocultural influences that affect the implementation of new initiatives in a school improvement process. The purpose of my dissertation work is to use technology integration as a catalyst to apply cross-disciplinary methods and viewpoints.

I present a qualitative, interpretive study that is designed to explore how one school district, Torro North School District (pseudonym), has chosen to invest energy and resources in making technologies an important part of their schools. I present a review of research on technology development in schools, as well as a review of research on school change. I then provide a review of three theoretical perspectives that have shaped various strands of educational research — social cognitive theory, sociocultural theory, and symbolic interactionism — to provide multiple lenses to view the role of technology in the school improvements efforts of Torro North. I then provide a synthesis of all of the reviews that acts as my conceptual framework for analyzing my data.

My goal was to capture the experiences of the teachers, administrators, and other school professionals in the Torro North School District. Therefore, semi-structured, in-depth interviews served as the primary source of data. Other sources of data, such as demographic information, curricular guides, learning goals, classroom/district websites, and classroom observations, were collected to create a story of technology integration at Torro North. This story highlights aspects of the district that have been essential in the effective integration of technology, and includes a portrayal of the leadership, a
description of supports for teachers, and a consideration of the often elusive psychological and sociocultural influences that affect teachers, leaders, and administrators as they attempt to facilitate change.

Descriptions and analyses of the data are explained from a primarily psychological perspective, although I do not ascribe analytic primacy to either individuals or society. I complement the psychological explanations with sociocultural explanations in order to highlight the dynamic relations among individual, institutional, and cultural influences that shape the process of change in Torro North. I contend that the entire school district organization, from the political infrastructure to the routine ways of doing, thinking, and interacting in the schools and district, dynamically shapes the effort that teachers put towards effectively utilizing technology-supported learning activities.
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CHAPTER ONE: INTRODUCTION

*The essence of technology is by no means anything technological.*
– Martin Heidegger, *The Question Concerning Technology.*

Educating our children is becoming increasingly complex. We are challenged to create new learning environments that facilitate student-centered learning, collaborative work, information exchange, inquiry-based learning, the use of a variety of different media, and a host of other innovative learning activities. This is particularly true in the 21st century, considering the rapid integration of technology into our schools. Sophisticated developments in computing and telecommunications technologies provide access to a wide variety of educational resources that allow new possibilities for teachers and learners – possibilities that might progressively change the landscape of schooling.

Technologies are tools, and tools do not, on their own, engender change, they simply suggest possibilities that can help teachers and learners engineer their circumstances to meet their needs (Halverson & Gomez, 1998). Utilizing these new tools represents a very sophisticated change for the teachers, learners, and administrators who work with them (Fullan, 1999a). An array of factors influence and shape practitioner behavior and to fully understand the impact of computing and telecommunications technology in the schools it is essential to analyze the *process* of technology integration – as opposed to a focus on *outcomes*. What is needed is an examination of the most effective uses of technologies, under what circumstances, and how interactions among students, teachers, and administrators might contribute to this effectiveness.
But how can this process of change in education be studied? To date, we lack substantive scholarly research and guidelines for the most constructive ways to study computing and networking technologies in the schools. As a starting point, however, we do know that computing and networking technologies, in and of themselves, do not directly transform teaching and learning (Gilbert, et al, 1998; Herman, 1994; Office of Technology Assessment, 1995). Therefore, our findings will likely be enriched if we focus on the ways that technology is incorporated into the school culture.

My dissertation research is an attempt to advance this focus. I present a qualitative, interpretive study that is designed to explore how one school district, Torro North School District (pseudonym), has chosen to invest energy and resources in making technologies an important part of their schools. The study is designed to capture the experiences of the teachers, administrators, and other school professionals in the Torro North School District. Therefore, the primary source of data is semi-structured, in-depth interviews. I further explored other sources of data, such as demographic information, curricular guides, learning goals, classroom/district websites, and classroom observations in order to create a story of technology integration in Torro North. This story is about aspects of the district that have been essential in the effective integration of technology that includes the following: a portrayal of the leadership; a description of supports for teachers; an explanation of professional development opportunities; and a consideration of the often elusive psychological and sociocultural influences that affect teachers, leaders, and administrators as they attempt to facilitate change.
Descriptions and analyses of the data are explained from a primarily psychological perspective, but I do not attribute analytic primacy to either individuals or society. I complement psychological explanations with sociocultural explanations in order to highlight the dynamic relations among individual, institutional, and cultural influences that shape the process of change in Torro North. I contend that the entire school district organization, from the political infrastructure to the routine ways of doing, thinking, and interacting in the schools and district, dynamically shapes the effort that teachers’ put towards effectively utilizing technology-supported learning activities.

I do this first by investigating, primarily through in-depth interviews, how members of the district’s professional community perceive the current and potential roles that technology plays in supporting and improving the schools in their district. As well, I highlight promising behaviors and practices and identify key obstacles experienced by the teachers, administrators, schools and the school district itself as they attempt to make use of telecommunications and networking technologies.

The purpose of such a dynamic analysis is to capture the ways in which information about the role of computing and networking technologies in this particular district is, or was, experienced by the participants, and also how the technologies might have been imported, created, developed, and appropriated by participants to form the current practice of technology use across the district.

To understand the experiences of the participants calls for an in-depth questioning as to how the meanings and purposes of technology and teaching are dynamically shaped by the district, by colleagues, by students, and by influences from the society-at-large.
One way we can capture this information is by exploring the origin and development of technology-based curriculum and questioning the participants' assumptions about teaching, learning, and technology in general.

To help capture such a wide array of information, multiple lenses are needed. In chapter two I present a review of research and development of technology in schools. In chapter three I present a review of research on educational change. In chapter four I present a review of three perspectives that have shaped educational research: 1) Bandura’s (1986) social-cognitive theory, 2) Vygotsky’s (1978) cultural-historical theory and; 3) ethnographic perspectives on schooling, including a description of symbolic interactionism. In chapter five I present a synthesis of the reviews that forms the conceptual framework for analyzing my data. Combining the reviews and perspectives into a coherent whole provides a framework for viewing and articulating the many influences that potentially shape the process of technology integration and school change in Torro North. The combination of viewpoints provides a variety of languages to articulate and contextualize different events, practices, and participant structures. Viewing multiple perspectives allows me to gain a broader understanding of the strands of influence that shape the introduction and development of technology integration in Torro North.

Teaching with innovative technological tools calls for a change in the ways that teachers and administrators think and act, a change that requires learning – learning about the assumptions, rationale, worth, purpose, possibilities and constraints of technologies. New technological tools, as with any new initiative, necessarily cause school personnel to
question just where this new thing "fits" with respect to their daily planning. Prior research in the cognitive sciences has made it clear that learning is about situating information within meaningful contexts in order to help learners (whether students or teachers) transform it into knowledge. Current research on educational change suggests strongly that the success or failure of a new initiative depends upon how thoughtfully the local context and individual settings are considered. Furthermore, when complemented with ethnographic perspectives, the webs of social and cultural factors that shape classrooms, schools, and pedagogical practices can be understood more thoroughly.

In chapter six I provide a description of my research questions. In chapter seven I outline the qualitative procedures used in my dissertation and discuss their importance with respect to my research questions. I discuss briefly, but carefully, how internal validity in qualitative, interpretive studies can be addressed and I detail the guidelines that I've used for ensuring validity in my research efforts.

In chapter eight I provide a 'story' of technology implementation in the district: what happened, how it happened, and what the teachers and administrators thought about it. The insights of the school district leadership are revealed and provide a catalyst for focusing on the role of leadership, support, and change. In Chapter nine I provide an analysis of the findings and suggest recommendations for future research and future technology implementations with a focus on facilitating and reshaping the school culture.
CHAPTER TWO:
TECHNOLOGY RESEARCH AND DEVELOPMENT
IN THE SCHOOLS

In this review I trace the development of technology research and development in schools over the last 30 years, beginning with seminal studies that focused primarily on learning outcomes of individual students working directly with computing machines. I feature research on technology integration in the schools that has been selected to demonstrate the range and dimensions of current work. The purpose of this review is to identify and describe the conditions and resources that are most important with respect to promoting and sustaining effective uses of technology in schools – as well as barriers and potential solutions to challenges. My intention, however, is not to critique studies nor to provide a comprehensive summary of them. Rather, I intend to present selected studies of technology integration to highlight the importance of examining a host of factors that dynamically shapes the way technologies are integrated into schools. These factors include not only learning outcomes, but social, intellectual, technological, and administrative infrastructures, the professional growth of teachers, and connections between school and the wider community. Caveats and search criteria are discussed in Chapter 7.

Technology Research and Development in the Schools

Researchers, curriculum designers, and practitioners have been struggling to define the best roles and functions for computing and networking technologies in educational settings since computers first arrived on the school scene in the mid-1960s
Early studies focused on the emerging uses of computers in the schools and especially the learning outcomes of individual students working directly with the machines (Papert, 1980). Though there were few learning applications to be studied, whether in school or in the lab, initial studies revealed improvements in student scores on tests that were closely related to the material covered in computer-assisted instructional packages (Kulik & Kulik, 1991). Necessarily, the findings were tied specifically to the particular applications used by the subjects involved in the study (McMillan, Hawkins, Honey, 1998).

During the 1970’s and early 1980’s, technical innovations brought increasingly diverse and more powerful technological tools into schools. Technologies were typically text-based, stand-alone computer-assisted instruction applications. Early studies were tied very specifically to assessing the impact of these technologies or software on student learning (McMillan, Hawkins, & Honey, 1998).

During the late 1980’s and early 1990’s these technologies were enhanced or replaced by graphics-rich and networked environments. The majority of the studies, many of them specific to particular software applications, continued to assess impacts on student learning and achievement. Few studies contributed to our understanding of potential roles that technologies might play in addressing key challenges of teaching and learning, and about optimal designs for such technologies (Honey & McMillan-Culp, 2001).

Throughout the 1990’s the pace of technological innovation increased dramatically and the availability and diversity of new technologies accelerated rapidly.
Accessibility and lower costs facilitated the introduction of new technologies into educational settings. The introduction of telecommunications and networking technologies, sophisticated graphics and multimedia capabilities, higher speeds, and user-friendly applications rapidly changed the potential for technologies in education (Hawkins, 1996; Koschmann, 1996; Sabelli & Barrett, 1993).

Along with these new possibilities for education came questions regarding the purposes and need for technologies—questions and conceptions that are continually and currently being refined and challenged. Many educators and scholars throughout North America see one or two distinct reasons for acquiring technology (see Cuban, 1993). The first is simply the fear that, without appropriate technologies in the schools, students will not be prepared to compete in the job market. School reformers continually remind us how important our schools are to the viability of a nation and its economy. The second, and more complex, reason is the potential of interactive and telecommunications technologies to be used as tools to help educators reshape the traditional curriculum and create new learning environments that emphasize student-centered instruction, collaborative work, information exchange, active, inquiry-based learning, and the use of a variety of different media. These affordances, as we will see, soon became explicit goals for school improvements as set forth by the U.S. Department of Education in 1998.

To meet these goals for school improvement and discuss potential roles that new technologies might play in approaching them, a number of scholars and experts representing a range of disciplines came together to address strategies and define the next steps for technology use in education, including principles that underlie effective and
appropriate technology use. In 1993, the National Science Foundation (NSF) released a report (see Sabelli & Barrett, 1993) suggesting a number of topics for study, including:

- the most effective ways to integrate technology into the curriculum;
- the role of technology in educational reform;
- role models of the uses and implementation of technology;
- innovative ways of financing technology;
- professional development and teacher learning;
- the role of leadership in the introduction and dissemination of technologies for school change;
- discovery of a set of common tools and modes of technology integration; and
- incentives and self-sustaining mechanisms for continual dissemination and development

The studies that followed the NSF recommendations essentially documented the challenges that schools and districts were having with technology integration. With few role models available, many schools and districts were, and still are, essentially implementing new information and telecommunications technologies on a trial and error basis. Many studies, both local and national, documented the challenges of figuring out the most effective and appropriate uses for technology. Teacher resistance, insufficient funding, lack of administrative support, and inadequately prepared teachers were just a few of the key factors found to affect the successful integration of technology use. Over time, the cumulative findings indicated that integrating computing technologies into a school’s infrastructure meant incorporating sustained professional development for
teachers and administrators, adequate and accessible technical assistance, and a clear, agreed-upon understanding of the purposes technology should serve with respect to the larger teaching and learning goals of the school (Gilbert, et al, 1998; Hawkins, 1996; 1993; McMillan, Hawkins, & Honey, 1998; Sabelli & Barrett, 1993).

Responding to the cumulative findings in technology research, the U.S. Department of Education, along with the International Society for Technology in Education (ISTE) and the Milken Exchange on Educational Technology, produced the National Education Technology Standards for Students (1998). This document suggests that new learning environments should prepare students to:

- communicate using a variety of media and formats;
- compile, organize, analyze, and synthesize information;
- draw conclusions and make generalizations based on information gathered;
- use information and select appropriate tools to solve problems;
- know content and be able to locate additional information as needed;
- become self-directed learners;
- collaborate and cooperate in team efforts;
- interact with others in ethical and appropriate ways.

Educators and scholars began to realize that to accommodate the above goals means to fundamentally change the ways that teachers teach and learners learn. With respect to the utilization of information and communications technologies, this means educators must go beyond teaching basic hardware and software operating skills. Creating new learning environments that incorporate both innovative pedagogy and new
technological tools represents a very sophisticated and difficult change for teachers and administrators (Fullan, 1999a). Employing complex, inquiry-based, collaborative activities in school settings generally requires extended periods of time for their initial design, development, and implementation — and of course, even more time and support for learning about and creatively using technologies to support such change over time (Fullan, 2001a; Gilbert, et al, 1998).

The kinds of organizational structures needed to support these new activities are often in conflict with the traditional school infrastructure of direct instruction, semester schedules, short blocks of time, and separate subject areas (Cuban, 1993; Hativa & Lesgold, 1996). Organizational and institutional structures profoundly influence how teachers teach, how their students learn, the interactions among adults and children in each classroom and among teachers, and the relationships among colleagues and administrators in each school. After over 100 years of acceptance, traditions, structures, and behaviors are especially difficult to alter. Because of these factors, schools (being the complex, pressured, busy institutions that they are) have learned to tailor new technological tools to fit these constraints, often compromising the original design intentions of the developers (Brown, 1994; Cuban, 1993). In other words, the school organization itself, from its political infrastructure to its routine ways of doing, thinking, and interacting, inevitably influences and potentially constrains teachers' flexibility with innovations in the classrooms — including the use of technologies. To transform traditional classroom approaches, fundamental cultural, institutional, and interpersonal changes need to be made (Dwyer, et al, 1991; Fullan, 2001a). However, the current peer-
reviewed literature on technology integration has yet to be fully informed by the literature on school change (see Methods section for additional information on selection criteria).

New technologies can offer a number of useful tools to help in the process of creating new learning environments and reshaping the traditional political, social, and professional infrastructure of schools. The Internet facilitates easier and faster access to curricular resources than ever before, providing teachers with information that can incite their creativity in the design and development of new activities for learning. New software applications for learners provide tools for scaffolding, feedback, self-regulation, and revision. Communication tools create more opportunities to develop stronger local and global communities that include teachers, parents, administrators, students, and practitioners from the wider corporate and professional community. However, learning about and describing why, when, and how technology-based practices are used and sustained by teachers and schools requires, as Fullan (2001a) suggests, an overall focus on the issue of changing the culture of schooling – or “re-culturing.” This is a focus which calls for a complex, multidimensional study of the institutions, the broader school environment, school practices and procedures, and students and teachers.

*The Study of Contextual Variables*

“For you cannot understand mental activity unless you take into account the cultural setting and its resources, the very things that give mind its shape and scope. Learning, remembering, talking, imagining: all of them are made possible by participating in a culture.” Bruner (1996, p. XI).

To understand better how the school organization shapes teaching and learning – and equally importantly, how new approaches to teaching and learning can reshape the
school organization – many educational researchers are documenting and analyzing contextual variables of schooling. Their belief is that teaching and learning cannot be fully understood or fully appreciated through reductionist methods alone. Consequently, these researchers, frustrated by the limitations of controlled studies, are attempting to find alternative frameworks and methods to enrich their understanding of classrooms and schools.

However, the study of context poses significant challenges. Situated research entails dealing with variables that are dynamic, interdependent, and shaped by social, institutional, and cultural influences. Such variables are difficult to capture and examine. Furthermore, studies of contextual variables vary widely depending upon the perspective taken. For example, definitions and judgments of context vary depending upon whether one takes a cultural-anthropological, sociological, cognitive, or psychological perspective. Each perspective carries with it different theoretical and methodological traditions, assumptions, and methods. Yet, the study of context can offer the important advantage of uniting a number of different perspectives, bringing together many different philosophies and methodologies regarding the very nature of knowledge – all in the name of advancing our understanding of teaching and learning.

In response to these challenges, many researchers are experimenting with a number of research methodologies. Most often, these researchers draw on expertise from different fields (anthropology, sociology, policy, educational psychology, etc.) and utilize various methods and perspectives. Studies of context often lend themselves to the construction of a multifaceted database, and a “mix and match” approach is often taken to
thoroughly describe the phenomena in question (Brown, 1992). Large scale databases can be complemented with a few in-depth analyses of students or teachers; qualitative, standardized measures can be combined with a few narrative case studies, and so on (see Brown, 1992; Collins, 1999).

In short, learning about and describing why, when, and how technology-based practices are sustained by teachers and schools requires a new framework for thinking about technology and school change. Collins, et al. (in press) delineate five levels of focus that are relevant with respect to technology use in classrooms, schools, and school districts: the cognitive level, where issues of representation and explanation are key to the students' understanding and use of technologies and strategies; the interpersonal level, where issues of interaction, knowledge sharing, respect, and communication are addressed; the group or classroom level, where such aspects as participant structures, group identity, authority, and engagement are taken into account; the resource level, where the availability and accessibility of resources and technical support are considered; and the institutional level, where dynamics among administrators, parents, and supports from outside the school are addressed. These levels provide excellent guidelines for developing a framework to view dynamic relationships among technological tools, pedagogy, school culture, and administrative level initiatives. Depending upon the time allocated to a study, these different elements, as they relate to technology implementation, can be brought to the fore and highlighted while others remain in the background for further and future study.
**Recent Research on Technology Integration**

The last decade has seen rapid advances in the ubiquity and affordability of technologies and many schools have been scrambling to keep up with the pace of progress. Yet, because the pace has been so rapid, many schools have focused on acquiring the necessary technologies without thoughtful long range planning. This long range planning means asking the truly fundamental questions: What is the technology good for? How will it fit in with our existing school culture? How might it afford us opportunities we otherwise would not have? These questions and others are often postponed (or never addressed) until after the purchase of inventory. For the most part, what happens is that the costly equipment then remains unused. The technology coordinators and administrators remain frustrated as to why it was not readily adopted and utilized (Gilbert et al., 1998).

Furthermore, because many technology integration studies in the past were primarily focused on particular technologies, they contributed little to understanding the role that technologies could play in contributing to school change. In the 1970’s and 1980’s, research focused primarily on learning outcomes of students working with machines (Papert, 1980). Though many researchers did in fact find positive correlations between computer-based instructional materials and achievement (see Kulik & Kulik, 1991), to do this they had to partial out everything except the computer and the student scores. This masked pedagogical contexts, teacher practices, student experiences, and other factors that define the complicated life of schooling. In the late 1980’s and 1990’s questions asked in technology integration research and development began to change. Over time, researchers began to identify some of the important mediating factors
affecting student-computer interaction, including the design of the software, the teacher’s practices, availability and access to computers, demographics, and student grouping, to name a few (Kulik & Kulik, 1991; Software Publishers Association, 1996; 1997; U.S. Department of Education, 1996).

While questions remain about how technologies contribute to student learning, there has been increasing awareness that technology can be a key factor in the complex process of school improvement and change. There are several studies that document technology-supported curricular designs that suggest promising ways technology can advance our educational goals (for an overview, see Means, 1994). For example, several groups of scholars have directed their efforts toward

- leveraging technologies as a tool for reshaping the social, cultural, and cognitive aspects of learning environments (e.g. Scardamalia and Bereiter, 1999; Salomon and Perkins, 1996; Brown, 1992; Scardamalia et al., 1989);
- documenting teachers’ beliefs and practices with respect to utilizing information technologies (e.g. Sheingold & Hadley, 1990; Kerr, 1991);
- developing tools to facilitate literacy among at-risk students (e.g. Cognition and Technology Group at Vanderbilt);
- developing innovative assessment tools (e.g. Sheingold & Frederiksen, 1994);
- analyzing the constraints and affordances of computing technologies (e.g. Newman, 1994);
analyzing connections among hypermedia-based tasks and constructivist approaches to learning (e.g. Dillon & Gabbard, 1998; Lehrer et al., 1994);

- highlighting the development of a school’s technological infrastructure (e.g. Gilbert, et al, 1998);
- emphasizing the importance of teacher learning and professional development (e.g. McClurg, 1994; Smith-Gratto & Fisher, 1999);
- and examining the integration of technology from the lens of policy analysis (e.g. Cohen, 1987; David, 1994).

Many of these studies and designs demonstrate the promise that information and communication technologies hold with respect to supporting new teaching and learning practices.

While these types of studies are essential to helping us understand the potential of information and communications technologies to support educational change, such an array of inquiry suggests strongly that the effects of technologies on teaching and learning can be understood fully only as part of the many interacting factors in the busy life of schools. Cumulatively, the findings suggest that the following variables affect the introduction and sustainability technology use for improving teaching and learning:

- teacher and student confidence with computers, networks, applications, and configuring,
- teacher comfort with teaching and classroom management,
- beliefs and attitudes about the effectiveness of technologies for teaching and learning,
• motivations behind sustaining practices,
• supports provided by both school and district administrators (financial, technical, intellectual, social),
• availability of role models and interactions with colleagues,
• teacher knowledge of technology and applications,
• ability to think and use technologies creatively,
• a sense of ownership over the way in which technologies are introduced and used,
• a potential lack of immediate, visible outcomes,
• extent of technology introduction in pre-service training, past professional, and personal use,
• philosophical conflicts between teachers, administrators, and/or districts with respect to the purpose of technologies for learning,
• demographics and cultural make-up of the school,
• comfort with an ability to take risks,
• perceived fit with other classroom and school activities.

With a better understanding of the mediating factors affecting technology integration and school improvement, there is now a growing body of research that demonstrates an increasing consideration of the influential role of social and cultural factors that dynamically shape the introduction and dissemination of technology throughout the professional school community. Invariably, the methodological features of the research are changing. In their 1999 report for the Secretary's Conference on Educational
Technology, Honey and her colleagues (Honey, McMillan-Culp, & Carrigg, 1999) describe some of the methodological changes currently underway. They note the trend toward studies that are primarily process-oriented where the goal is to understand how innovation occurs in schools, not simply an examination of correlations between the technology innovation and outcome. Further, Honey et al. (1999) note that the kind of tools and programs that are interesting to study are those that act as catalysts for changes to teaching and learning. They see the important influence of the ways teachers interpret technologies as tools for reforming schools. But most importantly, Honey et al. (1999) see that a cross-disciplinary approach to understanding the role of technology and school improvement is essential, and they suggest a combination of anthropological, developmental, cognitive, and sociological lenses to view the institution of schooling and school change.

Although there are only a handful of peer-reviewed publications from the 1990’s that focus on the local social and cultural factors in the school or district that affect the introduction and sustainability of technology integration, the findings suggest a promising starting point for future research in this area. Though some of these studies ground their research and suggestions in sophisticated theoretical frameworks on social, institutional, or organizational change (see Ertmer, 1999; MacMillan, et al, 1997), few make an explicit attempt at a cross-disciplinary analysis. Nevertheless, many of these studies focus on the social and cultural factors that mediate the process of technology integration, suggesting a promising direction of research. For instance, a review of the literature demonstrates an interest in highlighting the importance of participant structures for ongoing collegial collaborations between teachers (Zorfass & Remz, 1992), focusing
on the ability of leaders to establish a culture of trust among the professional staff (Heflich, 1998), and analyzing the ability of leaders to establish a coherent vision of the role of technologies in the school change process (Macmillan, Timmons, & Liu, 1997).

These scholars are explicitly addressing social and cultural challenges faced by learners, teachers, administrators, and other school professionals as they attempt to integrate technologies to support school improvement. These researchers suggest that any investigation of school phenomena requires the study of not only particular technologies, classroom structures, and sociocultural dynamics, but also the experiences, perceptions, and interactions of the teachers, students, administrators and others in the immediate educational community. Capturing both sociocultural and psychological information enables us to critically examine the process of reshaping or reculturing schools and districts. The implementation of information and communication technologies to support learning goes hand-in-hand with designing new activities that help educators meet new learning goals. The design of new activities inevitably calls into question our assumptions about learning, about teaching, about pedagogical orientation, about the purpose of schooling, and the changing dynamics of the school culture within the larger fabric of societal changes.

As discussed above, we now know many of the mediating factors that affect the technology integration-school change process, but we still know very little about how those factors can be supported or facilitated to create positive and effective learning environments. Therefore it is important to draw on literature from a variety of different disciplines – most notably, psychological theory, school change, and ethnographic
research – to help us to gain a deeper understanding of the processes and the conditions under which efforts at school improvement affect classroom teaching and student learning. It is also imperative to examine how characteristics of district and local leadership constrain or enable school improvement initiatives and the roles they play in the integration of technology.
CHAPTER THREE: RESEARCH ON SCHOOL CHANGE

The study of technology integration can be thought of as the study of a change process. The literature on school change processes has run parallel to the literature on technology integration. In general, technology research and development has focused on financial and technical obstacles to technological innovation, and specific strategies of introducing technology into schools have been separated from more broad concerns with respect to implementing change initiatives into school cultures. The study of school reform and change in the last decade can provide insight that helps us to understand more fully the dynamics involved in educational change. To understand the role of innovative technologies in the school change process, we need to know more about the behaviors and beliefs of individuals – the perspectives of teachers, administrators, students, and parents. But, we also need to know more about the big picture – interactions among individuals, situations, and those larger institutional factors that influence and shape their experiences of the change process (Fullan, 2001a).

For the last few decades, many if not most U.S. and Canadian schools have struggled with implementing multiple and often competing reform agendas. Schools and teachers have felt a painful overload of innovations and initiatives in the push to achieve large-scale reform (Cohen, 1987; Spillane, 1999). The result, for the most part, has been a mix of ambivalence, resentment, confusion, frustration, and in the end, projects that are implemented superficially – if at all (Fullan, 2001a).
We are now only beginning to understand the complexities of the educational change process. Some of these complexities reflect individuals' diverse interpretations of their experience and their dynamic interactions with others. We know that people are generally ambivalent about change regardless of whether it is sought or resisted (Fullan, 2001a). We know from decades of research on change – as well as from the insights and studies of educational psychologists – that people need to be able to attach personal meaning to their new experiences, to create some “familiar, reliable construction of reality” (Marris, 1975, p. 7). We make sense of our new knowledge and experiences by mapping them to what we already know. Furthermore, our interactions with others contribute to the shaping of our knowledge and beliefs.

It is clear, then, that a focus on interactions and relationships is one of the central issues in the study and/or implementation of any change process (Fullan, 2001a; 2001b). Yet this fact has often been ignored by many who desire change. I will return to this issue later, but first, it is worth considering in greater detail what is meant by “change.”

*Understanding Educational Change*

In *The New Meaning of Educational Change*, Michael Fullan (2001a) challenges us to think about what change really means. Is it something that is imposed upon a system? Or is it something that just naturally “happens.” Is it sought, or resisted? It is helpful to understand change by tracing some of the historical roots of the study of change.

Regardless of the catalysts – whether industrialization, global competitiveness, or the “space race” between the U.S. and Russia – the 1960’s were a time of huge societal
change. Educational institutions were no exception. In the 1950's and 1960's the U.S. Federal Government spent extraordinary amounts of money on major curriculum reforms. The educational system, argues Fullan (2001a), was intentionally flooded with external initiatives with hopes of bringing about desired change.

By the 1970's, however, evidence was beginning to show that there was to be little return on the investment in efforts at change. Fullan (2001a) highlights three major studies that attest to the absence of significant change at the classroom level: Goodlad, Klein, and associates' (1970) *Behind the Classroom Door*, Sarason's (1971) *The Culture of the School and the Problem of Change*, and Gross, Gianquinta, and Bernstein's (1971) *Implementing Organizational Innovations*. Fullan and Pomfret (1977) then launched the first major review of research on the implementation process of these large scale reforms. The findings were clear. Schools were feeling intense pressure to innovate, yet they did not have the capacity to put large-scale changes into practice. Hence, innovations were adopted only superficially—language and surface structures altered but not the deeper practices of teaching (Fullan, 2001a). Their review highlighted the importance of documenting more specifically the social, cultural, and political dynamics of the educational change process.

Around the same time, other researchers were documenting wider societal change, accounts that further highlighted the personal and social complexities involved in any change process. Change is both an individual and social phenomenon, and all social systems have shared senses of meaning (Marris, 1975; Schön, 1971). Researchers, most notably Marris (1975), found that change is always met with some sense of ambivalence.
and uncertainty regardless of whether it is voluntarily initiated or imposed by deliberate reform. Ambivalence necessarily accompanies the process of change in that those involved must reconstruct a shared understanding among themselves. In other words, they need to assimilate changes to their purposes, and to work out, through months or years of analysis and debate, a reconceptualization that makes sense to them. Fullan (2001a) nicely summarizes:

Real change, then, whether desired or not, represents a serious personal and collective experience characterized by ambivalence and uncertainty; and if the change works out it can result in a sense of mastery, accomplishment, and professional growth. The anxieties of uncertainty and the joys of mastery are central to the subjective meaning of educational change, and to success or failure thereof – facts that have not been recognized or appreciated in most attempts at reform (p. 32).

The main theme of this review is a focus on the fact that the implementation of any innovation involves people. Change is experienced by people. Capturing their experiences is one way that we may gain a more complete understanding of the individual, social, and cultural dynamics involved in the change process. I turn to a brief review of the role of teachers, students, school leaders, and district administrators for a closer look at the roles they play.

**Teachers as Agents of Change**

“*It is not the policymakers who determine computer use in schools; it is the practitioners.*” Larry Cuban, “*Computer meets Classroom...Classroom Wins.*” (1993, p. 199)

Over the last several decades many scholars such as Lortie (1975), Huberman (1983), Rosenholtz, (1989), Ball and Cohen (1999) and Stigler and Hiebert (1999) detailed the day-to-day realities of teachers in the classroom. (See Fullan, 2001, for a
comprehensive review of the role of teachers as well as local, district, and government administrators, parents, and students in the change process.) Researchers worked with teachers to understand the dimensions of their day-to-day difficulties with students, colleagues, and administrators. These scholars documented the gap between the formal restructuring requirements set by the reform agenda (for example, "professional development sessions") and the daily subjective reality of the lives of teachers. In general, the researchers were convinced that the busy lives of teachers left little room for reflection or access to colleagues for guidance. Teachers are asked to do much in terms of teaching, learning, and the daily maintenance of classrooms and students, but in general are given little with respect to planning time, psychological and financial support, and constructive collegial discussions.

Fullan (2001a) suggests that one of the best starting points for thinking about change is examining teacher isolation and its opposite, collegiality. Collegiality, or the extent to which teachers interact with each other and engage in mutually supportive relationships, is a strong indicator of successful change in nearly every research study on the subject. Significant change appears only to come about when beliefs, assumptions, and values are challenged which, in turn, can emerge only through personal development in an interactive social context (Fullan, 2001a). To put it another way, Werner (1980, in Fullan, 2001a) explains the failure of an Alberta social studies curriculum: "implementation is an ongoing construction of a shared reality among group members through their interaction with one another with the program" (p. 63).
In the schools with the most successful implementations structures are established that provide opportunities for interactions among teachers. Goldenberg (2002) found that regular interactions help teachers develop norms of collaboration and conversation. Furthermore, as Bryk and colleagues (1998) learned after 10 years following the evolution of reform in the Chicago school system, regular interactions signify a professional community where teachers tend to feel more comfortable exchanging ideas with each other. Over time, these collaborations allow the emergence of both a broader voice in school decision making and a collective sense of responsibility for student development. The ongoing professional exchanges may serve also to provide teachers with benchmarks to help them monitor and calibrate their progress (Goldenberg, 2002).

Likewise, McLaughlin and Talbert (2001) compared schools within a district as well as departments within schools and found that strong professional learning communities were essential to teachers’ willingness to experiment and be creative. They found that teachers who engage in collegial interactions\(^1\) were much more likely to look to their colleagues as resources to figure out, from each other, what works best. In contrast, they found that teachers in weak professional communities express exhaustion and bitterness from struggling alone with the with classroom tensions.

\(^1\) Many researchers have documented accounts where it is entirely possible for teachers to “collaborate” and reinforce methods that are ineffective – making matters worse (Little, 1990; Fullan and Hargreaves, 1992; McLaughlin and Talbert, 2001; Fullan, 2001). It must be considered that isolation and autonomy have vital advantages, and collaboration and interaction can have severe disadvantages. The key is to understand how to establish strong, successful collaborations in schools.
The Role of Leaders

The research of Newman and his colleagues (King & Newmann, 2000; Newmann et al., 2000; Newmann and Wehlage, 1995) provides numerous insights into the inner workings of professional learning communities. They use the concept of “school capacity” to describe how instructional quality and student assessment are affected in the school as a whole. Newmann et al. (2000) delineate five components of capacity:

- Teachers' knowledge, skills, and dispositions
- Professional community
- Program coherence
- Technical resources
- Principal leadership

Viewing the interactive relationships among these components is quite helpful. From their case studies, Newmann et al. (2000) have found that professional development often focuses on the knowledge, skills, and dispositions of teachers as individual staff members. While obviously essential to making a difference in individual classrooms, they argue that such individual development is insufficient. There needs to be a focus on developing the organization to create a school-wide professional community. However, the development of individuals and the creation of a professional community will be insufficient unless they are developed in such a way as to ensure program coherence — the extent that the programs for student learning and teacher professional development are continually coordinated and focused on clear goals — that combats the fragmentation of multiple innovations going on at the same time. Furthermore, school capacity can be
seriously undermined if the push for instructional improvement is not supported by the necessary *resources* (materials, technical support, equipment, time, space, and access to expertise). And finally, the role of the *principal* is essential to holding all these pieces together. Elmore (2000, in Fullan, 2001a) sums it up nicely when he describes the role of school leaders as one that is primarily concerned with

enabling the skills and knowledge of people in the organization, creating a common culture of expectations around the use of those skills and knowledge, holding the various pieces of the organization together in a productive relationship with each other, and holding individuals accountable for their contributions to the collective... (p. 15)

Leaders in the school – principals, assistant principals, department heads, grade level coordinators, and technology coordinators – all play an essential role in developing a sense of collegiality in their school. Leadership is a complex negotiation of various kinds of relationships between teachers, administrators, students, ideas, and projects. As with many relationships, there are frequent conflicts, surprises, and dilemmas and the ways that leaders address these issues determines, to a large extent, the developmental path and sustainability of innovations (Fullan, 2001a). Though the study of school change is well into its third decade, systematic research on the role of the principal and other leaders in the school is relatively new.

Demands on school leaders, especially principals, have intensified over the last decade and continue to increase at a rapid rate (Day et al., 2000; Evans, 1995; Fullan, 1997). Many educators currently are engaged in a concerted effort to improve instruction by increasing activities that foster engagement and motivation – activities where students can really apply and come to understand what they are learning. Such change requires
sophisticated school leadership, leadership that facilitates *reshaping the school culture* so that teachers are working in an effective, collegial way inside and outside the school (Fullan, 2001a). Though many leaders, especially principals, find themselves exhausted and frustrated, there are a number of examples of school principals who, in the face of multiple demands, are incredibly effective at establishing a system of support and accountability among school colleagues. We can learn from their insights and experiences.

Sammons (1999), in her extensive review of principals and school change found that in nearly every study leadership was a key factor in school effectiveness. There are few improving schools that don’t have a principal who is good at fostering improvement. A number of recent studies of leadership across different states (most notably Brighouse & Woods, 1999; Bryk et al., 1998; Day et al., 2000; Donaldson, 2001; Elmore, 2000; Leithwood, 2000; McLaughlin & Talbert, 2001; Newmann et al., 2000) further confirm the role that school leadership and expectations have on shaping the professional school community.

Though such studies document the importance of leadership in school improvement, they also reveal just how complex the task of leadership can be. Fullan (2001a) synthesized some of the complexities reported in various studies of school leadership and summarized the ways in which leadership is challenging. The first is that changes that leaders seek often prove to be much deeper than anticipated. Superficial modifications to traditional practices may have an impact on student learning, but the impact is often short lived (see also Bryk et al., 1998; Gardner, 1999). What is needed are
widespread, sophisticated leadership efforts to change the culture of the school and
district to promote a unified vision by changing, over time, the way that school
professionals think and believe, behave and interact. This often calls for creating new
professional communities where school professionals work in a concerted, continual, and
collaborative fashion, thus restructuring the cultural, institutional, and interpersonal
aspects of schools.

Second, there are inevitably a number of conflicts, directions, tensions, and
dilemmas that arise when deciding how to go about restructuring the professional
community. Leaders often find themselves challenged by balancing democratic and
authoritative approaches, by integrating internal and external demands, and by dealing
with staff who are not progressing (Day et al., 2000; Goleman, 2000). Further, it is also
challenging to value different opinions and disagreements, and respect conflicting ideas
and criticism (Elmore, 1995). Some of the difficulty is in knowing how and when to be
considerate and open-minded in order to be pragmatically effective.

Third, Fullan suggests that leadership is further complicated by the need for
leaders to effortlessly adopt different styles of leadership. Effective leaders – whether in
schools or corporations – utilize a combination of styles depending upon the
circumstances, personalities involved, or phases of the implementation process. Goleman
(2000) confirmed that the most effective leaders exhibit a number of different leadership
styles. These leaders are quite sensitive to the impact that their styles have on others and
are capable of flexibly and seamlessly switching styles as needed. For example, Boyle
(2000) suggests that schools struggling to pull themselves up from a failing status need an
assertive leader whereas schools moving along well need less assertion and more facilitation and coaching. As well, schools that have established professional communities need supports that encourage greater participation and collective problem-solving.

Fourth and finally, advice for leaders is often in the form of guidelines and, as such, there are no available prescriptions or concrete steps for action. The effective leader is one who can thoughtfully consider interaction of the local context with the new ideas or change initiatives, and then comfortably determine the best course of action. There are no salient and reliable answers to the “how?” question with respect to becoming an effective leader.

*The District Administrators*

“It is possible for an individual school to become highly collaborative despite the district it is in, but it is not likely that it will stay collaborative. If the district does not foster professional learning communities by design, it undermines them by default.”

(Fullan, 2001a, p.165)

Much of what was just discussed about leadership pertains to the district administrator as well. Though not all school systems have districts, of those that do the evidence is clear that the district does play a critical role in school change for better or for worse. Though daily roles and tasks vary among district administrators depending upon the size, status, and location of the district, the common types of leadership among effective directors or superintendents are the same: *educational* leadership, where the focus is on instruction and learning; *political* leadership, where the focus lies with securing resources, making decisions on behalf of the institution, and developing
alliances; and *managerial* leadership, where the focus is on developing and utilizing effective organizational and social structures for participation, supervision, planning, support, and problem-solving (Johnson, 1996).

Though the role of the district is vital to school improvement, coordinating, leading, encouraging, and sustaining school improvement across several schools is a challenging job. Rosenholtz's (1989) study of 78 elementary schools found that when districts assumed no responsibility for the needs of principals, the principals could not perform well. They were less effective at problem-solving and collaboration, and were hesitant to seek assistance from the central office. Further, district administrators who lacked a presence in schools symbolically suggested self-reliance and subsequently professional isolation – messages that potentially communicate to principals and ultimately teachers and students – that improvement was perhaps not possible or worth the effort.

Likewise, LaRoque and Coleman (1989) analyzed the characteristics of several British Columbia school district administrators who were considered to have a weak or strong “presence” in schools. Of the school districts in which administrators had a strong presence in the schools, the district administrators used their time in the schools to engage principals in collegial discussion around specific topics such as the development and implementation of school improvement plans or the interpretation of school performance data. The nature of these discussions was collegial and constructive rather than prescriptive. The principals felt that the district administrators were encouraging and helpful, offering their advice and support while respecting each school’s uniqueness and
need for autonomy. In contrast, in school districts where administrators were categorized
as having a weak presence, little, if any, contact was made and no procedures or
participant structures were put in place to monitor or discuss progress.

Furthermore, in many schools there are a vast number of school improvement
projects going on at the same time. There is often the initial excitement from the district
surrounding the introduction of an initiative but, over time, this excitement tends to wane
and support often diminishes – especially during the introduction of yet another new
initiative. In turn, teachers find that the lack of support structures and often conflicting or
competing initiatives communicate the message that the project is no longer important.
Under such circumstances, teachers find themselves skeptical of new initiatives, and of
course, such skepticism about instructional change is not conducive to collaborative
engagement and problem solving among teachers. As a result, few changes are made and
even fewer sustained (Cuban, 1986; Little & Dorph, 1998; Spillane, 1999; 2000).
Effective district leaders find ways to integrate the various components of school
improvement ideas into a unified pedagogy or philosophy that gives meaning and
coherence to the kinds of changes they wish to foster (Fullan, 2001a).

Until recently, very few research studies focused on the role of entire school
districts and very few of these studies examined efforts made to restructure or “re-
culture” the professional district-wide community, specifically focusing on instruction,
meaning, coherence, and capacity (Fullan, 2001a). However, the few studies that do this,
most notably Elmore and Burney (1999), and Bryk and colleagues (1998), observe that
effective districts operate in much the same way as effective schools:
• schools need both autonomy and support;
• professional development is critical;
• participant structures for sharing expertise, promoting collegiality, and recognizing and solving problems are essential;
• consideration of context and local culture when making decisions is vital;
• a strong unified, coherent vision with clear goals and explicit expectations are necessary;
• progress and improvement needs to be continually monitored and supported;
• on-going discussions about conceptualizing the purpose and meaning of change are essential.

**Discussion**

It is clear that school improvement and large scale reform are much more than simply implementing the latest policies. They involve changing the social and cultural landscape of classrooms, schools, and districts. It is important to note the focus on reshaping the school *culture*. Sustainability of any innovation can only be attained once the innovation is no longer novel – when believing, thinking, and doing things associated with the new initiatives become the norm. Good leaders understand what change is, and they are continually highlighting the rationale behind its purpose, design, and process. They articulate and reflect upon their theories of change to forge a unified vision throughout the district (Fullan, 2001a). Such a vision is an essential component in the creation of a unified philosophy and culture of school improvement. But more
importantly, such a vision contributes to a change in the very culture, a change from top down efforts of organizations to a focus on a dynamic and relational environment that includes the individuals who work in them and the relationships they have with each other. This creates a community that promotes agreement on what is worth achieving which in turn facilitates motivation among members of an organization to do what is needed to achieve their goals (Goleman, 2000).

District administrators, students, teachers, principals, related staff, consultants, parents, and community members all are members of the institution that we call school. The beliefs, philosophies, and patterns of behavior all interact and contribute to the social and cultural aspects of the school which ultimately shape the individual and collective experiences of each of the members. We now know that neglecting to understand and appreciate the social and cultural influences that affect how individuals make meaning from their experiences is one of the central causes for the extraordinary failure of most reforms (Fullan, 2001a).

Essentially, for an innovation to be adopted and sustained, the members of the community need to make sense of it with respect to where it “fits” with their beliefs and philosophies. In other words, it needs to be meaningful enough to propel them to invest the effort needed to carry out the change. Change is about learning new things. Regardless of whether one is a student, a teacher, an administrator, parent, or school professional, the fundamental process of learning is relatively the same. Learning and conceptual change occur when information and communication are situated in meaningful frameworks of interpretation and understanding, and fitted into the context of
a person's prior experience. It follows that the task of schools should go beyond focusing on student learning and consider the role of "learning" for all members of the school community, especially the teachers. To ultimately facilitate change, effective social and cultural structures need to be created whereby information and communication can be situated into meaningful, relevant frameworks in order to create the knowledge and learning necessary to challenge a person's beliefs and conceptions.
CHAPTER FOUR:
REVIEW OF CONCEPTUAL PERSPECTIVES

The primary purpose of this review is to present three different conceptual lenses through which to view the process of technology integration and its impact on school change. Because there are many complex and interacting factors that affect the ways that technology is integrated, the study of the integration process may be better informed by a variety of conceptual perspectives that provide means for viewing the process both broadly and deeply. Few, if any, individual frameworks provide an effective means of integrating multiple levels of scale that allow the researcher to be both inclusive and expansive. The granularity appropriate to analyzing individuals engaged with a software program is vastly different from that appropriate to analyzing the social structures of a classroom. Therefore, including a variety of conceptual tools provided by multiple perspectives enables research on technology integration and school improvement to expand and accommodate a wider range of insights – insights that will shape the way that we understand the process of technology integration. The very nature of studying interventions calls for a holistic, systemic approach that, in turn, acts as a catalyst for conceptually bridging information from a variety of subfields.

In this review I highlight 1) social cognitive perspectives on schooling, 2) sociocultural perspectives on schooling, and 3) ethnographic perspectives on schooling. I follow this review, in chapter four, with a synthesis (including the reviews from the previous two chapters) and ultimately provide a framework for analyzing my data.
Social Cognitive Perspectives on Schooling

Bandura's (1986) social cognitive theory provides a dynamic, transactional view of self and society. Internal personal factors (cognitive, affective, and biological), environmental factors, and behavioral factors all operate as interacting determinants to shape and influence each other bidirectionally (what Bandura called triadic reciprocal causation).

The theory accepts that human adaptation and change are embedded in social systems. Personal agency operates within a network of sociostructural influences, and therefore, people are both producers and products of social systems. Hence, the relative strength or influence of interpersonal, environmental, or behavioral determinants vary depending upon tasks and circumstances.

Bandura (1986; 1994) contends that social structures are created by human activity to organize, guide, and regulate human affairs. In turn, they provide constraints and affordances for personal development and functioning but do not determine what individuals do or become in given situations. Within institutional structures, there is much variation in interpretation, adoption, opposition, enforcement, and circumvention (Bandura, 1994; Burns & Dietz, 1992).

Social cognitive theory rejects a dualistic view of personal agency and social structure. It suggests a dynamic interplay between generative, proactive agents and sociostructural determinants. Efficacious people, then, are more likely to take advantage of opportunities, to find ways to create change to improve their circumstances and to bring about desired results. Those who have limited means of personal agency – those
who are less adept at regulating their motivation and behavior – will have less freedom to exploit opportunities and make things happen.

Therefore, agentic influence relies heavily upon the ability to cognitively self-regulate – to reflexively consider options, to appraise abilities to carry out options, to visualize and evaluate potential outcomes, to utilize the knowledge and skills available, and to construct standards to help guide, motivate, and regulate actions (Bandura, 1986a; 1991b, in Bandura, 1994). When considered in this way, reciprocal causation affords opportunities for people to exercise some control over their destinies.

A primary construct in Bandura's (1997; 1986) social cognitive theory is self-efficacy, which he defines as people's beliefs about their capability to exercise some control over particular tasks or events that affect their lives, including learning and performance tasks. These beliefs are a central component of most modern theories of human motivation. According to Bandura, self-efficacy beliefs can have a profound effect on the choices that students make when selecting and engaging in academic tasks.

It follows that the beliefs people have about their capabilities are primary elements of human behavior and motivation. How people behave often can be predicted more by the beliefs they hold about their capabilities than by what they are actually capable of accomplishing, for these self-perceptions help determine what individuals do with the knowledge and skills available (Bandura, 1994; 1986).

When people believe they are able to perform a particular task or activity well, they are more likely to be engaged in it, which in turn, will further the development of
competencies and enhance positive beliefs in their capabilities. In contrast, a lower sense of efficacy will lead students to avoid engaging in critical developmental activities that would foster change and increased competency. Their sense of personal efficacy affects their choice of task, the amount of time and effort they contribute to the task, their ability to persevere in the face of difficulty, and their capacity to effectively manage their responses to failure (Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987). As a result, those with a higher sense of self-efficacy for a task tend to devote time, effort, and perseverance to their activities. Such perseverance typically results in higher performance attainments (Bandura, 1997; Pajares, 1996; Schunk, 1995).

Furthermore, a strong sense of personal efficacy contributes to psychological well being. Those who are beset with low confidence for a task are likely to be unconvinced that sustained efforts will result in increased capabilities. Such beliefs often lead learners to give up easily, which in turn is likely to result in lower attainments.

Efficacy beliefs have been well conceptualized and thoroughly studied. The development of self-efficacy beliefs is known to be a complex process that requires sensitivity and reflection on the part of the learner to make realistic appraisals about competencies and gauge progress. According to Bandura (1986, 1997), such a process begins with the interpretation of information from four sources: a) authentic mastery experiences, b) vicarious experiences, c) verbal persuasion, and d) physiological indexes. The first, authentic mastery experience, is considered the most influential source of the development of efficacy beliefs. Students learn from their successes as well as from their failures. Repeated successes contribute to the construction of higher perceptions of self-
efficacy for a task, whereas repeated failures often lead to a lowered sense of self-efficacy for that task. A resilient sense of self-efficacy beliefs is established through the repeated experience of overcoming challenges through persistent effort. Once students develop confidence in their ability to succeed, they are more likely to persevere when faced with adversity. Constructing a resilient sense of self-efficacy through cumulative experiences requires the development of cognitive, behavioral, and self-regulatory skills in order to synchronize and hone performance capabilities.

The second source of self-efficacy information is vicarious experience. Students observe the achievement of others and make judgments regarding their capability in relation to the model's performance. When students observe the success and failures of others they garner information needed to make judgments about their own capabilities. Vicarious observation is especially influential when students are assessing and comparing their perceived capabilities with the achievements of a model who is perceived to be similarly competent.

Self-efficacy beliefs are further influenced by a third source of self-efficacy information, verbal persuasion. Students are more likely to engage in a task – especially a novel or challenging one – when significant others convey confidence in their ability to accomplish it. Such persuasion enhances the recipients' sense of efficacy by helping them see their strengths and, in turn, re-evaluate their capabilities. That said, however, the framing of the performance feedback is quite important, as it can be conveyed in ways that enhance or undermine self-efficacy. Furthermore, the recipients' interpretation of the persuasion can effect their appraisal. If they have been repeatedly encouraged to try
unrealistic tasks and subsequently failed, their sense of efficacy will likely be undermined. The credibility of the persuader is also a factor.

Physiological information also contributes to the formation of self-efficacy beliefs. How individuals interpret the meaning of the physiological reaction can have an impact on their efficacy judgments. Signs of anxiety, stress, and tension can alter students' beliefs about their capabilities in that some students may view them as vulnerability and weakness— to them, a sure sign of failure. In contrast, other students may view these same physiological responses as a positive energy boost that can contribute to a successful performance.

*Sociocultural Perspectives on Schooling*

Vygotsky's sociocultural theory (1978) provides a framework for understanding the dynamic relationship between individual psychological functions and the larger cultural, historical, and institutional context (Engeström, 1998). Like social cognitive theory, sociocultural theory assumes that human action is not defined either by the individual or by society but is a dynamic, interrelated process.

Vygotsky understood the role of thought and language to be central in the formation of consciousness and believed that cultural artifacts acted as psychological tools that played an integral, mediational role in shaping cognitive development (Davydov, 1995). He argued that psychological development is shaped by changes in the social activities that individuals engage in throughout their lives. Vygotsky believed that social interaction and collective activity play a fundamental role in the development of individual consciousness and personality, with individuals internalizing cultural values.
and meanings that are embodied in the signs and symbols of the social medium (Davydov, 1995). As such, cognitive development depends upon interactions with others and with mediating artifacts or tools such as language, gestures, signs and symbols, as well as concrete, tangible equipment like pencils, notebooks, and computing technologies. These artifacts or cultural resources mediate and shape collective and individual activities. Those involved in activity with these artifacts use them, combine them, and transform them in unique ways (Engeström, 1999).

Further, Vygotsky suggested that language is internalized gradually and becomes a means by which a person’s thought controls activity (Davydov, 1995). Vygotsky ultimately concluded that through the engagement in collective activity, individual consciousness is determined by the interiorization of various signs and symbol systems that are embodiments of the historically developing culture (Davydov, 1995).

Because Vygotsky was concerned with language, discourse, and interactions, he sought to analyze the activity of all those involved in the education of the child: the individual child, the child’s social medium, peers, the child’s teacher, and instructional tools. His purpose was to capture the ways in which pedagogy could be oriented to facilitate optimal psychological development (Davydov, 1995). He believed that adults and peers serve as guides who provide the necessary information and scaffolds for the child to advance intellectually and develop independence (Woolfolk, et al., 2000).

The use of an “activity” as a unit of analysis was first initiated by Vygotsky to explain the development of the child. Dissatisfied with the (then) popular approaches of psychoanalysis and behaviorism, he found himself concerned with the role of thought and
language in the formation of consciousness – as well as the mediational role that history and cultural artifacts play in the shaping of such development (Davydov, 1995). Much of Vygotsky’s work was stimulated by Marx’s historical-materialist philosophy, especially Marx’s *Thesis on Feuerbach*, in which he presented a theoretical and methodological basis for the concept of activity – one that would transcend the prevailing dualisms between the individual and society (see Engeström, 1999). This work provided Vygotsky with a basis for synthesizing his studies in psychology, clinical neurology, cultural anthropology, and the psychology of art (Toulmin, 1981, in Davydov, 1995).

To help explain the way that mediated learning took place, Vygotsky (1978) developed the concept of the *zone of proximal development*, which he defined as "...the distance between the actual developmental level as determined through independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). His ideas gave rise to the idea of a learning environment that provided scaffolding, or guided participation, and cultural appropriation (Rogoff, 1994) through dialogue and interaction.

*Ethnographic Perspectives on Schooling*

Ethnography is the work of describing a culture. The essence of ethnography is the concern with the meaning of actions and events. Many of these meanings are expressed directly through language. Others are communicated implicitly through words and actions. In every society, people make constant use of these complex meaning systems to understand themselves and others, to facilitate their behavior, and to make
sense out of the world in which they live. Such systems of meanings constitute a "culture" (Spradley, 1980).

The study of culture deals with three fundamental aspects of human experience: what people do (cultural behavior), what people know (cultural knowledge), and the things people make and use (cultural artifacts). The core purpose of ethnography is to understand the knowledge base of a culture as an interpretive framework that people use to view their experiences and generate behaviors (Spradley, 1980).

The idea of culture as acquired knowledge is basic to symbolic interactionism, a theory that attempts to explain human behavior in terms of meanings. Blumer (1969) has identified three premises upon which this theory rests. The first premise is that “human beings act toward things on the basis of the meanings that the things have for them” (1969, p. 2). Context, location, movements, behavior, and activities are all symbols that contain special meanings for the members of a particular group.

The second premise of symbolic interactionism is that the “meaning of such things is derived from, or arise out of, the social interaction that one has with one’s fellows” (1969:2). Culture is a shared system of meanings that is learned, revised, modified, appropriated, maintained, and defined in the context of people interacting with one another. People learn the cultural meanings they use by interacting with each other.

The third premise of symbolic interactionism is that “meanings are handled in, and modified through, an interpretive process used by the person dealing with the things he encounters” (1969, p.2). In other words, neither individuals nor groups are driven
solely by their culture to think or behave in certain ways in certain situations. Rather, they use their cultural knowledge as a set of principles or guidelines to interpret and evaluate the circumstances which, in turn, informs the ways they will behave.

Anthropologists contend that social interactions involve complicated patterns of appropriation and negotiation among people that involve a continual process of conflict, resistance, surprise, sharing, confrontation, reflection, analyses, internalization, controversy, adoption, adaptation, and so on. Moreover, such a topic of study requires sensitivity to the interplay of these intrasocial processes. Adopting an interactionist ethic, in turn, encourages people to engage differences in ways that explore possibilities for productive and positive learning from (and about) each other (Fay, 1996).

Ethnographic research and perspectives can help us understand processes of change by drawing attention to the assumptions and rules upon which people think and act. This contributes to understanding practices of communication and dialogue, and in turn, makes it possible for us to engineer or improve participant structures for communicating and interacting. Further, such opportunities for engagement and interaction can enable new avenues for learning and understanding others which, as we've seen, increases self-knowledge and, in turn, enriches the possibilities for our own lives (Fay, 1996; Kegan, 1982). With respect to school improvement and change, then, ethnographic research can help us understand the interactions among educators, school personnel, students, parents, and other members of the school community. New understandings might help us learn how we can create or improve circumstances for
engagement and interaction among members, and in turn, potentially enrich the experiences and daily lives of all those involved in the school community.

Many school ethnographers focus on the relations that bind schools to networks of practice that extend beyond the school infrastructure. The school itself is not necessarily the focus of study but is a “point of entry” (Smith, 1987, p. 157) for an analysis of cultural, economic, and political influences that shape pedagogy, curriculum, and student and teacher experiences (Nespor, 1997). Rather than viewing schools as static entities, many school ethnographers view schools as an “array of intersections” (Rosaldo, 1989, p. 20) to be articulated and made explicit on the path to understanding how beliefs and philosophies are shaped and influenced, how meanings of teaching are assembled and actualized, how innovations are initiated and take shape, how school and district leaders understand their professional communities or environments, how patterns, values, and norms develop over time, how identities evolve, how students perceive and shape their school experience, and so on. In this way schools are viewed not as static entities with a fixed identity, a defined boundary, and a tightly-formed structure but as dynamically evolving communities.

Capturing ethnographic data requires an analysis of multiple, often partial perspectives. Further, it requires one to look at and contextualize different events, practices, and participant structures and discuss them with different theoretical languages (Haraway, 1988; Nespor, 1997). While the particulars of each case study are only truly relevant to the specific district or school, the value of such research lies in readers’ (teachers’, parents’, researchers’, and other school personnel) abilities to re-examine their
experiences and generate questions that will enrich their daily interactions, facilitate their growth and ultimately improve the school for children and the professionals in the school community.
Because children spend the majority of their childhood in school, their educational experiences necessarily influence the kind of individuals they become. Teachers and administrators, therefore, can profoundly impact the educational experiences of children. As such, it makes sense that teachers and administrators feel motivated to continually strive to improve circumstances for themselves as well as their students'. A school's professional community— with all of its influential cognitive, social, cultural, and organizational factors— plays a key role in ongoing school improvement and the adoption of new initiatives.

A comprehensive analysis of the many factors that influence a school's professional community may enrich our understanding of the role that technology integration plays in school change. In turn, we can use this information not only for scholarly benefit but ultimately to find ways to strongly and positively influence the day-to-day experiences of the teachers and students.

Based on the information found in the review of the literature on technology and school change, I suggest that the study of computing and telecommunications technologies in the schools is primarily about the study of instruction, instructional tools, and the instructional context. To extend the study of cognitive and motivational constructs from a predominantly phenomenological view to one that considers contextual influences requires a conceptual framework that is thoroughly developed. The purpose of
this chapter is to provide a synthesis of the information in the review and present a conceptual framework for the forthcoming analysis of my data.

To travel among multiple levels of analysis, however, presents some significant challenges. First, there is the pragmatic difficulty of simultaneously paying close attention to the cognitive activities of a student and the social or cultural practices in a student's learning environment (Bereiter, 1994). There is also a central challenge in conducting theoretically and conceptually sound research. I cannot ignore the serious concern for experimentally-based approaches but, at the same time, I cannot ignore the fundamental questions that are raised by sociocultural frameworks. This essentially calls for the adoption of a somewhat eclectic approach to both theory and method. In order to adopt an eclectic approach to theory, however, I need an eclectic approach to methods that essentially is based upon the pragmatically best choice for my research (see Bereiter, 1994).

Recall that I am interested in capturing the experiences of the people involved in the process of technology integration at Torro North School District. My research questions were designed based on the assumption that change is experienced by people. The implementation of any innovation involves people. Capturing the experiences of the people involved is one way that I may gain a more complete understanding of the individual, social, and cultural dynamics mediating the change process. To enrich the data, I further interpret it within a sociocultural framework. Therefore I take a primarily psychological approach and complement it with larger sociocultural and ethnographic perspectives. I do not attribute analytical primacy to
either the individual or society, rather I utilize the frameworks to help explain the phenomena in question.

Social cognitive theory directs its attention primarily on the learner. Sociocultural theory directs its attention primarily on the learner's environment and interactions. Ethnographic perspectives remind us to consider the webs of social and cultural factors that shape teacher and student practices, classrooms, schools, and communities.

Discussion

Social cognitive theory has a solid tradition of research. There is a large body of research that focuses on the relationship of efficacy beliefs and human motivation and achievement. Findings from diverse studies firmly demonstrate that strong efficacy beliefs heighten effort and persistence, and boost achievement in educational and career-related pursuits (see Bandura, 1997; Zimmerman, 1997). Though many of these studies acknowledge external influences and the role of context, they are often centered on theoretical descriptions of cognitive self-regulation and measures of perceived control with the individual acting in ontological isolation. Furthermore, self-efficacy beliefs are often represented as an outcome or something one might achieve in a developmental sequence rather than as a dynamic and multidirectional process that is shaped by not only a variety of tasks, situations, and relationships but by affordances and constraints from sociocultural and sociopolitical forces.

Though the focus has been primarily on intrapsychological processes, social cognitive theory, as offered by Bandura (1997; 1986) does provide a framework for conceptualizing the "external" origins of efficacy beliefs and the processes by which they
operate that includes both ontogenetic and contextual effects. This is why it was selected as a suitable theory for advancing knowledge of the role of computing and telecommunications tools in instruction and education. Yet few social cognitive studies in education have actually attempted to highlight and understand the aspects of the social and cultural milieu (or, as described by Bandura, the “environmental determinant”). In many ways, the problem is one of finding a way to include both idiographic and nomothetic processes in social cognitive research.

Though methods associated with research in social cognitive theory have been primarily quantitative and reductionistic, Bandura’s theory conceptually can accommodate interpretivist methodologies. Beliefs, goals, motivation, and self-regulation, when viewed from a social cognitive framework, all lend themselves to the addition of qualitative descriptions of the context and environment. Such additions, when carefully researched and committed to the validity and integrity of the work, may contribute to and advance social cognitive theory. So, if the phenomena in question concern the role of motivation, self-regulation, goal orientation, or beliefs with respect to the instructional context and the use of new technologies, I would not hesitate to view them through the lens of social cognitive theory and use both quantitative and qualitative methods.

Vygotsky’s sociocultural theory, on the other hand, provides a framework for thinking about the roles of technology (and any instructional activity) as a “tool” or mediating factor in learning and instruction. Vygotsky was concerned with the interaction of psychological and social factors – or interiorization, as mentioned above. Speech
practices, in Vygotsky’s theory, are central vehicles between the outside and the “inside”
world. External communication becomes self-talk (private speech) and self-regulation. In
terms of scaffolding, the interaction of the learner and the “guide” (teacher, peer,
software, textbook) generates a shared communication and understanding (symbols)
which is gradually and actively taken over by the learner, where it, through self-talk,
undergoes reconstruction. Though some of Vygotsky’s successors place greater emphasis
on cultural and institutional factors of learning (e.g. Engeström, 1997), Vygotsky’s
original ideas of interiorization provide an avenue for considering the transaction
between individuals, tools (technologies/instruction), and social and cultural influences.

Vygotsky’s sociocultural theory suggests that both researchers and practitioners
may gain a more complete and valid understanding of learners by studying them within
their social circumstances. Technologies are invariably a part of a learner’s social
circumstances, and as such, this theory provides a way to interpret the role of
technologies (tools) and instruction with respect to both intra- and interpsychological
factors.

Adopting and combining an anthropological perspective enables us to understand
better the reciprocal influences of our intrapsychological processes with others in a
community and how they might shape technology integration efforts. Educational
sociologists and anthropologists focus on the social and cultural interactions that shape
learning. They generally view “learning as a process of becoming a member of a
sustained community” (Lave 1988, p 65), as a socialization process, one that calls for
considering both our learning and working environments as communities of practice that
accommodate ideas of apprenticeship, engagement, and participation towards a common goal of the community (Lave & Wenger, 1991). We can draw from the findings of such research in order to analyze the ways in which members of the professional school community influence and are influenced by their socialization into the culture of the school.

I want to highlight here the striking similarities among the reviews. Bandura’s theory of reciprocal determinism, Vygotsky’s cultural-historical theory, symbolic interactionism, and much of the literature on school change all emphasize the reciprocal and interactive nature of information and interpretation. Each does so from a particular vantage point and in a slightly different language. When the perspectives are combined, it is easier to speak of and analyze, both broadly and deeply, the many dynamic factors that affect technology integration. It can be said that an individual utilizes cultural information – whether from the “environment,” “professional community,” the “activity” or the particular use of an “artifact” – to interpret their experiences. As most of our cultural knowledge is encoded in linguistic form, the individuals share information through their interactions with each other, drawing on and learning from each others’ interpretations of experience.

“Capturing” Experiences

I mentioned earlier that I adopt, for the purposes of this research, a primarily psychological view. I do this because I want to capture the experiences of the teachers and administrators with respect to their efforts at technology integration. I am focused on
the teachers and the administrators, but at the same time I want to be open to understanding the social and cultural influences that shape their experiences.

Essentially, for an educational innovation to be adopted and sustained, teachers and administrators need to make sense of it with respect to where it "fits" with their beliefs and philosophies. In other words, it needs to be meaningful enough to propel them to invest the effort needed to carry out the change. Yet, as the review of the literature on school change points out, neglecting to understand and appreciate the social and cultural influences that affect how individuals understand their experiences is one of the fundamental causes for the failure of most reform initiatives (Fullan, 2001a). *Beliefs, philosophies, and patterns of behavior all interact and contribute to the social and cultural aspects of the school which, in return, dynamically and ultimately shape the individual and collective experiences of each of the members.*

Recall that both Bandura (1994; 1986) and Vygotsky (1978) assume that human action is not defined either by the individual or by society, but is a dynamic, interrelated process. Bandura suggests that social and institutional structures provide constraints and affordances for personal development and within these structures there are variations in interpretation. In other words, the beliefs people have about their capabilities are essential catalysts of human behavior and motivation. People with positive beliefs about their capabilities, then, are more likely to take advantage of opportunities, to find ways to create change to improve their circumstances and bring about desired results. For Vygotsky, meanings and beliefs are shaped through dialogue and interaction and cultural appropriation. External communications influence self-talk (private speech) and self-
regulation. The interaction among individuals in their setting generates a shared communication and understanding which gradually, through self-talk and reflection, undergo reconstruction.

The work of school ethnographers reminds us to pay attention to the cultural, economic, and political influences that shape pedagogy, curriculum, and student and teacher experiences (Nespor, 1997). They remind us to view schools as an “array of intersections” (Rosaldo, 1989, p. 20), dynamic intersections whereby beliefs and philosophies are shaped, whereby meanings of teaching are assembled and actualized, whereby innovations are initiated and take shape, whereby school and district leaders come to understand their professional communities or environments, whereby patterns, values, identities, and norms develop, and so on. They remind us to view schools as dynamic communities.

For the purposes of capturing the experiences of the teachers and administrators of Torro North School District, I believe it is important to adopt a mediational view of human thought and action. Rather than taking a dichotomous stance on the individual/society antimony, I view cognitive theories and sociocultural theories of mind as being on a continuum with respect to their ability to explain the role of thought and activity. At one end of the continuum, cognitive theorists focus on the individual cognitive structures and agentic processes irrespective of sociostructural determinants. At the other end of the continuum, sociocultural theorists focus on conceptualizing the causes of (individual or group) behavior as influenced by larger social groups, generally irrespective of ontogenetic properties. A mediational, relational approach assumes that
the larger society plays a dynamic role in defining individual agentic properties and vice versa.

Capturing the experiences of teachers and administrators as they restructure with technology requires an analysis of multiple and often competing perspectives. The particulars in this case study are only truly relevant to Torro North School District and its schools. Yet, the potential value of the research lies in the reader’s ability to consider the findings and reflect on their own experiences – possibly generating questions that will enrich their own interactions, facilitate their growth, and ultimately improve schools for students and professionals in the school community.

In other words, learning new information, such as information that comes with introducing a new initiative into a school community, calls for revising and transforming current conceptions and beliefs, formulating new conceptions, creating new beliefs and philosophies, experimenting with new actions and practices, understanding ourselves better, and so on. As such, individuals must associate some kind of meaning with their experiences and make sense of new information as to where it fits in their lives. Learning and change happen when information and communication are situated in meaningful frameworks of interpretation and understanding, fitted into the context of prior experience. Whether learning about a new curricular initiative, learning about culture, learning about the specifics of an academic project, or learning about themselves and others, individuals are essentially undergoing some kind of conceptual change. The perspectives presented provide an array of conceptual tools to enrich the current understanding of the process of implementing a new initiative, tools to help in viewing
the multiple layers and trajectories that dynamically influence and shape the ways that we think and do things.

In summary, I have focused on the similarities among the perspectives offered to link them and highlight the importance of looking at the process of technology integration through several lenses. Doing so has illuminated that there needs to be an overall focus on the *professional school community* with an emphasis upon the ways that the community members learn from and interact with each other.
CHAPTER SIX: RESEARCH QUESTIONS

Categories

There are five broad categories of questions that shape my research in the area of technologies and school change.

First are questions that are qualitative in nature and consider the origin and development of current values and practices, including questions that concern assumptions, beliefs, and expectations about learning and the professional community as well as the perceived role of information and communications technologies in schools.

Second are more concrete questions that concern the technological infrastructure. These include access and availability of software, hardware, and technical supports, the ways in which funding is secured in order to purchase the inventory, and the rationale behind the administration’s selection of technology.

Third are questions concerning collegiality and professional development, specifically those that highlight participant structures that support collaborations.

Fourth are questions about the knowledge teachers and others have about the affordances and constraints of information and communications technologies.

And finally there are questions about the role of leadership, including questions that relate to leaders’ ability to cement a unified vision of change and provide the
necessary financial, intellectual, and psychological supports for members of the professional community.

Taken together, there are three general questions driving my research:

1. How has Torro North chosen to invest energy and resources in making technologies an important part of their schools?

2. What groundwork had been laid prior to implementing technology?

3. What are the promising practices and models currently used in the district?

1) Questions regarding the origin and development of current values and practices.

Change is a dynamic, relational process that involves negotiation, discussion, learning, appropriation, reflection, and revision of conceptions. This category of questions can offer a holistic and tangible way of examining the role of individuals during the process of change, adding additional strength to the assumption that the success or failure of an intervention is, at least in part, strongly determined by the ways in which it is valued and used by the individuals of the institution.

The very act of implementing technology (or other new initiative) into a district, school, or classroom raises fundamental questions and pushes educators to examine their assumptions about teaching, learning, and schooling in general. The kind of assumptions that teachers, parents, administrators and community leaders have about schooling and learning affect the ways that change is implemented. Understanding these assumptions may help us to guide the change process more effectively. Many of the current reform
initiatives and curricular standards convey certain messages about what schooling and learning should be, messages that are often in conflict with other new initiatives, the philosophy of the school, and the scholastic institution in general. It is easier to implement new changes if there is a clear and coherent understanding of the current philosophies and beliefs of the members of any culture (Fullan, 2001a; Rogers, 1995). Philosophical conflicts create huge barriers to change by causing tensions and misunderstandings among members, and such conflict can be thoughtfully avoided by finding ways to bring assumptions to the surface for discussion.

If the process of school improvement or change, then, is about the negotiation and appropriation of beliefs and values, then it is essential to document, as specifically as possible, the social, cultural, and political dynamics of a district’s educational change process. Assuming that behaviors are influenced by beliefs and assumptions, we need to know more about the behaviors and beliefs of the individuals involved – the perspectives of teachers, department heads, principals, district administrators, students, and parents as well as the interactions among the individual situations within the larger institutional factors that influence and shape the change process (Fullan, 2001a). To capture this, we need to investigate the fundamental assumptions and beliefs these members have about the change process, learning, purposes of schooling in general, the ways in which a professional community should function, the role of leaders, and so on.

Along with assumptions and beliefs, it is also important to try to achieve a historical perspective of the district and the schools. This helps trace the potential origin and development of the current culture. I assume that the culture is made up of
generalized beliefs and attitudes that contribute to positive or negative postures towards learning and engaging in specific change initiatives. More specifically, what kind of groundwork has been laid prior to the implementation of technology? What kind of change has a particular district gone through before the technology was introduced? Are members of the district willing and confident? Or are they bitter and resentful of any change because, for example, there is a lack of leadership vision and support? Has there been any change towards innovative ideals, such as the school wide implementation of progressive, constructivist pedagogies, and if so, what and how? For example, are there intensive, ongoing professional development opportunities to assist teachers in the design of constructivist, student-centered activities?

2) **Questions regarding the technical infrastructure and range of uses of technology.**

It has been said that technological problems themselves are rarely the real issue with respect to the essence of technology and change. The real issue is invariably human nature and the ways in which we choose to craft and use our tools (Heidegger, 1977). Nevertheless, most teachers are adamant that change cannot progress efficiently, if at all, if the technological tools are not provided, are insufficient, or are dysfunctional. Schools need a technical infrastructure that works well enough to support what the teachers and students are doing, including a wide variety of applications from which to choose. To be creative and innovative with their instructional designs and uses of technologies, teachers need to be able to select from several possibilities depending upon their interests and ability levels. Therefore, it is essential to gain an understanding not only of the school’s or district’s ability to secure or allocate funding in order to purchase the inventory, but
their efforts to provide access and availability of software, hardware, technical supports, and curricular supports. Further, questions concerning the rationale behind their selection and dissemination will connect the bridge between this category and category one—helping us understand better the role that assumptions and beliefs (knowledge) play in selecting inventory and supports.

3) Questions concerning collegiality and professional development.

It was discussed earlier that collegiality, or the extent to which teachers interact with each other and engage in mutually supportive relationships, is a strong indicator of successful change in nearly every research study on the subject. Again, significant change happens when beliefs, assumptions, and values are challenged which, in turn, emerge through personal development in an interactive social context (Fullan, 2001a). We know that teachers who engage in effective collegial interactions are much more likely to look to their colleagues as resources to help them figure out what works best (see McLaughlin & Talbert, 2001). Likewise, strong professional learning communities are seen as essential to contributing to teachers’ willingness to experiment and be creative.

Therefore, questions in this category are those that can help us highlight collegial interactions that are explicitly put in place to support learning and collegiality. Professional development opportunities are essential to contributing information about the role of technologies in schooling, but one-shot workshops almost always fail to sustain any reasonable commitment (Fullan, 1979; Little, 1993). Consequently, it is reasonable to assume that regular, continual, interactive outlets for learning need to be established in order for any meaningful change to take place. We therefore need to know
both the professional development opportunities provided – how much and the rationale behind the provision – as well as the kinds of ongoing collegial opportunities available.

4) **Questions concerning the knowledge of information and communications technologies.**

When considering the role of information and communications technologies in support of change and school improvement, it is important to examine participants’ knowledge, especially teachers’ knowledge, of the potential (and limitations) of the use of such tools. Effective technology use, as Salomon and Perkins (1996) point out, is partially dependent upon the affordances that particular technologies allow. The possibilities of a particular tool, in turn, often influence the rationale behind instructional design because those possibilities can affect our very conception of what learning and knowledge are.

There is often a considerable range in the knowledge that teachers have about technology basics (setting up email, using the Internet, using particular applications), as well as about how to integrate technology into their curricular activities. Furthermore, we need to know how they use technology, how they define technology integration, how technologies help them meet the needs of their students, what motivates them to integrate technology, what barriers they face, how technology is changing teaching and learning, and what they believe the future holds for technology in education.

Further, administrators’ knowledge of the role of technologies is essential if they are to understand the necessary supports that need to be provided for teachers. Therefore, questions about the knowledge of administrators are a central issue that should be
addressed. By capturing this information, we can highlight how instructional uses of technology are (or are not) justified by teachers and administrators on sound philosophical, psychological, and pedagogical grounds that are themselves independent of technology.

5) Questions regarding the role of leadership

It was mentioned earlier that leadership is a key factor in school effectiveness (Sammons, 1999). Fostering sophisticated school change requires sophisticated school leadership, leadership that facilitates the reshaping of the school culture so that teachers are working in an effective, collegial way both inside and outside of the school (Fullan, 2001a). We know that effective leaders are always searching for ways to integrate components of school improvement into a unified pedagogy or philosophy that gives meaning and coherence to the kinds of changes they wish to see (Fullan, 2001a).

Until recently, few technology integration research studies focused on the role of entire school districts. Furthermore, few studies examined leaders’ efforts to restructure or “re-culture” the professional district-wide community involving instruction, meaning, coherence, and capacity (Fullan, 2001a) – features that are motivated by larger purposes and aims than technology itself. The kinds of questions that make up this category investigate leaders’ understanding of not only the need to, but how to create new professional communities where school professionals work in a concerted, continual, and collaborative fashion. We need to know whether and how they develop a unified vision throughout their district, provide both autonomy and support for principals and teachers, make their choices to support professional development, design opportunities to share
expertise and promote collegiality, monitor and update the progress of the technology initiative, and consider the context and local culture when making decisions. Such information complements the insights of teachers and other professionals in the school/district community, and help us to understand better the way that leaders’ attempt to restructure the cultural, institutional, and interpersonal aspects of their schools.

Conclusion

The primary motivation behind my research is improving the everyday school experiences of children. Children spend the lion’s share of their childhood in school and their educational experiences invariably shape the kind of people they become. Educators are an important part of this process. The social and cultural environment of a school and district influence the beliefs, actions, and motivations of teachers and administrators, which in turn, influence the ways in which educators may or may not continually strive to improve the circumstances for children.

With this in mind, my study aims to identify and synthesize select conceptual advances made in educational research to help us move away from a sole focus on classrooms and learning and toward a broader examination of learning and school improvement for the school community as a whole. I have presented three theoretical traditions from different fields of educational study so as to understand, more thoroughly, current research on both technology integration and the study of school improvement. The primary purpose of this synthesis of conceptual positions is to exemplify the need for a theoretically and conceptually sound cross-disciplinary research program on school change and technology integration – one that bridges insights from cognitive, social,
cultural, and organizational realms of educational research. The unification of these conceptual perspectives provides a set of conceptual tools to integrate multiple perspectives and creates a rich picture of the interactions that invariably affect the role of technology integration and school change. Further, the unification of a variety of subdisciplines in educational research can contribute towards an attitude that will help us transcend any subjective attachment and preconceptions to one or the other, and encourage us to engage in a process of comparison and ongoing responsive, reflective criticism (see Fay, 1994).

As illustrated in this review, the sustainability of an innovation can only be attained when believing, thinking, and doing things associated with the new initiative become routine and part of the norm. District administrators, students, teachers, principals, related staff and consulting professionals, and parents and community members all make up the members of the institution that we call school. Their beliefs, philosophies, and patterns of behavior all interact and contribute to the social and cultural environment, which ultimately shapes the individual and collective experiences of each person. Failing to appreciate the social and cultural influences that affect the way that we make sense of our experiences is one of the central causes for the failure of most reform initiatives (Fullan, 2001a).

Change is about learning new ways of thinking and doing. The focus of schooling, then, should go beyond providing meaningful contexts to help students transform information into knowledge. It should strive to create effective social and cultural structures for all members of the school community whereby information and
communication can be situated into meaningful, relevant frameworks in order to create the knowledge and learning necessary to facilitate change.
CHAPTER SEVEN: METHODS

For quantitative researchers, the highest quality data are reliable and valid. Precise and consistent measures of focal phenomena are essential. Replicability is a central criterion. However, in qualitative, interpretative research the criteria for high quality data are different. Rather than assuming one single objective truth, qualitative researchers interpret experiences within a social context. What the researcher considers as “truth” results from social interaction and interpretation. High quality qualitative data, then, are data that capture processes of interaction (Neuman, 1997).

In qualitative research, reliability and consistency are achieved by verifying, cross-checking data, and triangulating data with other, divergent sources. Qualitative researchers look for other evidence to confirm their observations and insights. Reliability depends to some extent on the credibility of the subjects and their statements, which calls for the need to take subjectivity and context into account. As such, qualitative research is virtually impossible to replicate, so replicability is not a criterion. Validity, then, relies on a careful construction of the analysis. Assumptions, actions, and procedures must be well articulated and descriptions as full and candid as possible (Neuman, 1997). Therefore, to address issues of validity within this qualitative study I have adhered to the following guidelines proposed by Eisenhart and Howe (1992):

- Ensure a good fit between research questions, data collection procedures, and analysis techniques. As detailed in the literature review, I have carefully considered
the need for a qualitative approach to my research due to the nature of the research questions addressed.

- **Effectively apply specific data collection and analysis techniques.** In chapter two, I have made a case for the importance of capturing experiences through semi-structured, in-depth questioning, arguing that it is an effective method for understanding current beliefs, philosophies, perspectives, and actions. Further, in chapter nine I analyze the data using both psychological and sociocultural frameworks, explicitly applying information from the literature review to the final analysis. I have taken care to be as explicit and detailed as possible about my procedures and documentation, both in this chapter and throughout the thesis.

- **Explicitly address theories and assumptions that provide the foundation for the research and conceptual framework.** Methodological considerations were explicitly stated in chapter four, and throughout the thesis I have made explicit the goals of the study, my perspective, and my assumptions. I have been especially careful to represent my research within its appropriate context of a study of one school district.

- **Explicitly address the value of the study.** It is important to address completely my perspective of the importance and usefulness of the study for the larger educational community, and I do so explicitly throughout the thesis.

- **Approaching the study comprehensively.** In order to ensure a study that is relevant and substantial in terms of worth and importance, I do my best to present the procedures, methods, and analysis in a thoughtful, thorough, and comprehensive fashion.
Procedure

Literature review: Selected reports, white papers, books, and peer-reviewed journal articles were used to create a historical trail of technology integration over the last thirty years. In order to delineate a trail of research, I had to work both forward and backward. I began by selecting seminal peer-reviewed literature that documented the methodological struggles of studying interventions, primarily the late Ann Brown's (1992) Design Experiments and later, Allan Collin's (2004) Design Research. (I was working with his draft at the time, prior to publication.) Both articles document the challenges of studying complex interventions, interventions which are invariably complicated by a myriad of dynamically interacting factors.

I then worked from these two publications, drawing on their references (and references therein) to develop a literature report of my own that traces the path that led to such work. Furthermore, Brown (1992) and Collins (2004) discuss a framework for thinking about the many facets of interventions (discussed in the literature review) and I’ve used their frameworks for selecting the current work (1990-2003) on technology integration. There is currently a great deal of research on technology integration in the schools, but an important caveat here is that my documentation of the current research is limited to a search of peer-reviewed journal articles (with exceptions stemming from the historical review search). I’ve omitted articles that are conceptually conflicting, such as those that relate to distance learning (this research is focused on school-based challenges of integration) and higher education (this research is focused on grades grades 1 through 6, as discussed in the literature review).
Many of the current scholars whose work I reviewed feel that a cross-disciplinary approach to understanding the role of technology and school improvement is essential, and they suggest a combination of anthropological, developmental, cognitive, and sociological lenses to view the institution of schooling and school change. Therefore, I have carefully traced research, via peer-reviewed journal articles and their respective references, in each area that is applied to learning (e.g. 'educational psychology', 'sociocultural perspectives on learning') to create a balanced account of the current conceptual perspective.

Once again, the purpose of the literature review is to identify and describe the conditions and resources that are seen as important with respect to promoting and sustaining uses of technology in schools and districts. My intention is not to critique studies or to provide a comprehensive summary of studies. Instead, I present selected studies to highlight the importance of examining a host of factors that dynamically shapes the way technologies are integrated into schools.

Research: To begin my research, I needed to find a district that had made a significant investment (time, effort, finances) in technology use. Around the same time, I was in the process of designing an introductory technology integration course for pre-service teachers. I came across a flyer advertising a talk about 'technology and teachers' at the local university. The talk was to be presented by the Director and Technology Coordinator of the Torro North School District. Hoping to get some ideas for my class design, I attended the talk. The speakers discussed their investment in technology and presented examples of the way that technology was being used in their district. Impressed
by their presentation, I thought the presenters might be able to offer further insights for my course design. I introduced myself to the two presenters and asked if I could meet with them to ask them about the kinds of technological knowledge they would like to see in new teachers. I met with the district director and asked him about the district’s technology plans and their vision of what information new teacher candidates would have. I was so pleased with his enthusiasm and willingness to share his information and time, that upon consideration, I later asked him if he would like to be a participant in my study.

I told him I was searching for a district that could serve as a case study for an investigation of technology integration, with a special emphasis on the culture of the district and its schools. I told him that I would be especially interested in tracing the development of the technology integration process, which would include general inquiries about the role of other innovations in the school. I told him I would like to interview several people at the district office and a number of teachers and principals from a sampling of schools. He was pleased to provide this, and subsequently introduced my study to the principals at a district meeting. Following this, I then contacted five of the nine principals asking if I could conduct my research in their schools. All agreed.

Torro North School District is composed of nine schools. Though the district office and most of the schools lie on the periphery of the city, it is considered a rural school district. The selection of the schools for my study was based on the following criteria. Two of the schools were one-room Hutterite schools, schools which, in my view, are not representative of traditional public schools, so I did not use them. The rest of the
The selection of teachers was achieved by reducing the pool to those who taught within grades 1-6. In my view, technology integration at the elementary level is entirely different from the middle or high school level. In elementary schools, students often remain with one teacher for all subjects. The curriculum is different and it is possible (and often the case) to integrate the various school subjects into holistic projects. Further, extended amounts of time can be devoted to a project on a daily basis, changing the possibilities for the kinds of technologies that can be utilized within this time frame. In high schools, days are broken up into 45 minute subject classes with different teachers, a situation that offers entirely different constraints and possibilities for technologies (for an interesting perspective on this issue see Cuban, 1996).

There are three teachers in the district who provide part-time technology help for all of the schools, known as the ‘educational technologists.’ I interviewed two of the three, Tawnia and Stephen (all names are pseudonyms). Even though they serve the entire district, these two taught part-time at the schools that I had selected, and were therefore easily reached for interviews.

At the district office, I interviewed five administrators: the Director, Harold, who has been with the District seven years; the Assistant Director, Vicki, who has been with
the District five years; the Secretary Treasurer, Mark, who has been with the District over
ten years; the Technology Coordinator, John, who has been with the District four years;
and the Supervisor of Student Services, Sally, who has been with the District for over 10
years. These five people make up the key personnel at the district office.

As discussed in chapter two, a central aspect of my study is to understand the
relations between the district office and the schools. Part of this means encouraging those
at the district level to articulate their beliefs and assumptions about leadership, about
teaching and learning, and then analyzing the ways in which the individual assumptions
and beliefs form a unifying whole (or not) throughout the district office. Their responses
are then further compared and contrasted with the beliefs and assumptions of those at the
school level.

I had asked the principals, teachers, the district technology coordinator, the two
Ed-techs, and the director to suggest names of teachers that I could contact to facilitate
interviews. I was given permission to contact any teacher from any school that I wished.
To help pool my sample and potentially reduce bias, I had asked for names of teachers
that fell along a continuum in terms of their level of engagement with technology-
supported activities, though I was told repeatedly that there were few, if any, on the low
end of the continuum. (This concept is based on the assumption that there is a continuum
of leaders, adopters, and resistors in a culture of innovation. This is drawn from Everett
Roger’s 1995 book *Diffusion of Innovations.* ) To further reduce bias, I interviewed all of
the teachers that were suggested. Ultimately, five principals (1 male, 4 female) and
eleven teachers (all female) were interviewed.
Data

In the previous chapter, I raised a number of questions that I wished to explore with respect to technology integration. These questions call for examining the participant's perspectives of the origin and development of the current values and practices that make social and cultural landscape of the schools and the district to develop their understanding of the big picture. Semi-structured interviews were the primary source of data used to investigate these questions, and interview data were complemented with other sources (discussed further). I have used semi-structured interviews for the following reasons. Structured interviews aim to capture precise data that are relatively codable in order to explain behavior within pre-established categories. Semi-structured interviews, on the other hand, can be used in an attempt to understand the potentially complex thoughts and behavior of those in the district without imposing strict categorization that may severely limit the inquiry.

Descriptive and contrast questions were raised during interviews in order to unpack broader questions and begin an exploration of more specific details. These included questions that pertained to the technical infrastructure and range of uses of technology, questions regarding collegiality and professional development, questions concerning the participants' knowledge of information and communications technologies, and questions that concerned the role of leadership. The questions were designed and asked in such a way as to encourage the respondents to articulate their underlying assumptions and beliefs about their understanding of technology in the district, about their understanding of the pedagogical possibilities or limitations of technologies in education. Many of these questions were adapted from a previous study of technology
integration (Gilbert, et al., 1998). Appendix A contains the full list of the questions used in my research.

All of my interviews lasted between one to two hours. I began my interviews with the administrators at the district office after which I conducted interviews in individual schools. In some cases, I sent the questions to the interviewee beforehand. Because of the nature of the questions (eliciting beliefs and underlying assumptions about technology and education), it was important to me to encourage the respondents to feel as comfortable as possible, and as such, I ensured that the interviews felt more like an informal conversation than a formal inquiry. This meant allowing the conversation to progress in a way with which the respondent was comfortable, fitting the questions into the discussion where suitable, and probing and encouraging elaboration. In some cases, formal questions were read directly from my list of possible topics. From the main list of questions, the interview questions were tailored to specific people and situations. This type of semi-structured interview is consistent with typical field interviews encountered in in-depth qualitative and ethnographic research (see Neuman, 1997; Spradley, 1986). To establish internal trustworthiness and validity, during the interview I repeatedly restated, summarized, or paraphrased responses to confirm that what I had heard or written down was correct. This technique of member checking is discussed by Kuzel and Like (1991).

Furthermore, in all interviews, I actively searched for further evidence that would confirm or disconfirm the findings, which ultimately paved the way for the emergence of
reliable themes (discussed in Chapter 8). This technique is also discussed by Kuzel and Like (1991).

Triangulation of data is also an important technique in qualitative research that lends trustworthiness and validity to the findings (Kuzel and Like, 1991; Eisenhart and Howe, 1992). The interview data were complemented with other sources. Torro North has an extensive website that was useful for me. Technology plans, curricular guides, demographic data, and resources for teachers (including technology-related curricular ideas) were readily available. Many teachers also house their class website there and these home sites also provided data. Upon invitation, I observed students at work on the computers, and perused their technology-supported activities. I have incorporated these data into the analysis.

**Analysis**

The audiotapes of interviews were transcribed exactly from the recordings. Categories and patterns that I observed to be prevalent in the literature I reviewed were used as a guide to search for patterns in the transcripts. Pockets of rich descriptions were provided by most or all of the interviewees. To contribute to the trustworthiness of my analysis, provisional findings constructed from the data in the transcripts were cross-checked with respect to the other sources of data, specifically: other interviews, documents obtained from the school district, and the district’s websites (Eisenhardt & Howe, 1992).

In the Discussion, or final chapter, I link three prevailing themes (Leadership, Dialogue, and Support) tightly to the literature review and conceptual framework. This
analysis is akin to using a magnifying glass to look at a densely populated area on a map and I use this analogy to create an example of how the data might be interpreted within the boundaries and among complexities of a multidisciplinary approach to methods and perspectives.
CHAPTER EIGHT: THE “STORY” OF TORRO NORTH

Introduction

My initial research questions began with the following:

- How has Torro North chosen to invest energy and resources in making technologies an important part of their schools?
- What groundwork has been laid prior to implementing technology?
- What are the promising practices and models currently used in the district?

Yet, as highlighted in the previous chapters, understanding technology in isolation is impossible. There are social, organizational, and cultural dynamics that are continually changing and influencing the implementation.

Therefore, there are two overarching goals of my study. The first is to explore how technology is being used in Torro North, including the range of uses, the amount of money and time invested, and the range of pedagogical practices. The second is to explore the beliefs and understandings regarding technology, education, and change among educators, school personnel, students, parents, and other members of the Torro North community – including how they might have arrived at such beliefs and understandings.

In this chapter I provide an account of the interviews that I had with the teachers, administrators, and other professionals in the Torro North School District. I provide a running commentary and present a narrative of the evolution and role of technology integration in the district – a more thorough analysis and discussion is saved for the next
chapter. In this narrative I describe, in selected snapshots, the technology infrastructure that is in place (at the time of the interviews) in Torro North, including a history of its development. Then I describe the role of the district leaders in the reshaping the school culture. Following that, I describe the teachers’ and administrators’ experience as they integrated and supported technology-assisted teaching and learning activities into their daily practices.

The commentary that is presented is based on a selection of interview responses that, when analyzed, formed recurring themes that ultimately emerged into a story. Certain interview questions elicited strong, elaborate, and articulate responses from multiple interviewees that could be systematically coded or themed. These responses, when cross-checked and corroborated by other forms of collected data (other interview responses, curricular units, observations, demographic data, demonstrations, presentations, provincial learning objectives, and other divergent sources) formed pockets of rich, descriptive, detailed information about particular topics that made it possible to construct an account of technology integration and school change in the Torro North School District.

**Locale**

Torro North School District lies just outside the city limits of Saskatoon, Saskatchewan. At the time of my visit, there were roughly 1900 students in the district. They had nine schools, all located in rural areas. The school that was closest to the city was approximately eight kilometres, while the furthest was approximately 56 kilometres away. Five of them were composed of students in kindergarten through grade 12, and two
of them were composed of students in kindergarten through grade 6. Two were K-12 Hutterite schools.

A Brief History

I tried to construct a history of computer use in the district from all of the teachers and administrators that I interviewed with, regardless of how long they were employed by Torro North. What I found was that the initial integration of computers, approximately 1985, began with Apple IIs (moderately state-of-the-art at the time). Teachers and administrators could see that computers had potential to aid instruction, and they purchased them. But there was no support — technical, pedagogical — for anything. The administrators and technology group leaders (at the time) apparently could not even determine the level of support teachers needed because they didn’t know what they were getting into. At that time computers were still used as a kind of elaborate typewriter. There was no access to the Internet and the available software was not very sophisticated. As in most schools in North America at that time, computers in Torro North schools were used mostly as a game machine. There were no computers in individual classrooms but there were a few computer labs in the district, funded apparently by the community of each school.

In the past, there was the assumption that each school could make decisions around technology and perhaps consult with people at the district for advice, but there was no designated technology person for the district in those days. So, each school made their own choices as to what to go with, how to set it up, and so on.
Over the next few years, the district administration began supporting technology in a limited way. One school would receive an upgrade one year, then the next school the next year, and so on. The result was an untidy implementation. One school might be working with old equipment that could not support modern innovations or developments in software or hardware add-ins. Another school might have the most up-to-date hardware and software. Because of this system, not only were network interconnections limited but there was interpersonal tension among teachers and principals. Teachers and administrators could not troubleshoot with each other or create activities with each other. Invariably there was a bit of resentment by those who acquired less or who received products of lesser quality.

A New Direction

The years between 1995 and 2002 seemed to see a huge staff turnover, especially at the district administration level. Nearly all of the five current administrators were hired during this time. The mission, philosophy, and vision were created and articulated (quite thoroughly) to me. The new, guiding principle of the current administration is “to keep children at the centre of decision-making, focus on instruction, and treat people with dignity and respect in an environment of collaboration and cooperation.”

These key principles guide the personnel as they conduct the daily business of their school district. "Working Together for Student Success" is their motto and their overall goal is to enhance collaboration among educational partners so that each student can succeed to the best of his or her ability. The district administrators pride themselves on their efforts to offer the best, most innovative instructional programs possible for
students and are continually striving to cement a culture of innovation by providing teachers with a progressive environment in which to work (via PD opportunities, extensive supports and resources, opportunities for collegial interactions – discussed later). The administrators believe that the quality of their staff is essential to meet this goal. For example, the director acknowledged,

"I want the best people around me that I can get. I'm not afraid of that. I want the best people, period.... I try to surround myself with as good of people as I can, and then let them do their job, but I also make them feel really supported."

The director has been hiring people who are like-minded (interested in being progressive, innovative) and then works with them to continue to be progressive. In our conversation he mentioned, "when I first came here, most of the hiring was done from outside because there were good people elsewhere and they could stand out at interviews. Now, our people stand out because they know the culture, they know the direction, they can articulate the talk, they've all had lots of PD opportunities, based around lots of stuff...our people are so tuned in to our own initiatives and our way of doing business, that they have a leg-up over everybody else."

Part of Torro North's mission to include the most innovative instructional programs possible for students includes a desire to be on the cutting edge in technology. Their technology team is continually committed to developing effective tools for students and teachers to use to enhance the outcomes of their educational programs.
It seems that the district's interest in technology implementation was initiated by their competition. Given the location of the district, the periphery of the city, Torro North was competing somewhat with city schools, and this competitiveness seems to be what initiated the drive to acquire state-of-the-art technology. They wanted their students to have that "edge," especially the parents of the schools in affluent communities. For example, one principal mentioned,

"in the last eight years, I look back and just think what a remarkable vision has come from our leaders in this school district, from our central office personnel, what remarkable support has come from our district board in terms of financial support, to bring us the kinds of technological and personnel supports that we need."

The new administration decided to centralize the district's schools with respect to a rollout of computing technologies. They made the change from going from one school at a time to everybody. As one principal described it, "[The leaders] said, 'this could work better' and our leaders in our district, through our director, and the people around him, through feedback from people in the district. They saw what people needed to do the best job possible, and doing more than listening, but acting. And saying, 'that makes sense.' So what we do is a clean sweep. Everybody all at the same time. Bang! Then we're all on the same page. We all have the same circumstances. We can all share because we're all working with the same equipment."

In 1996 the district did a full scale implementation, placing Pentium 100 and 120s (state of the art Windows® technology at that time) in all of their schools. In 2000, they put P3-660s (again, state of the art Windows® technology at that time) in all of their labs,
four in each classroom, and in the libraries. The idea was to provide all the classrooms and schools with the same technologies. As the technology coordinator described,

"...everybody's using the same computer and the same technology, everybody's got the same screen, everybody knows what everybody else is doing, so we can bring everyone into the lab and do training sessions together, everybody's got the same stuff." And it erases the unfairness among schools as well, "no one school gets better than any other school. Everybody has the same equipment."

**Money Matters**

In all, the district bought 580 computers in one purchase. The central administration managed to show the board that to "do it well" would not cost them that much more than to do it poorly. The district administrators felt they could bring the cost down by leasing and purchasing in bulk. They argued that they could do it poorly, not get a lot out of it, and still spend the same amount of money. For instance, the director referred to his presentation with the school board members,

"So we showed them how to do it well... then we said, 'everybody's doing technology, no matter where you are, everybody's doing something, so we've got two choices on how to do it: we can do it well or we can do it poorly.'"

The district administrators came up with an idea to lease their computers with a one dollar buyout at the end, allowing them to pay for the whole purchase over four years rather than in one nearly impossible lump sum. As the director described it,
"From a budgeting perspective, it is much cheaper to lease it in bulk, because by buying it back you can actually save on interest costs, too... and from a political perspective, it's only once every four years that you have to deal with it. Whereas, if you're trying to find money every year to buy another lab, then it's a political issue every single year, right? Even for our board members – they can say, 'well, this is in our lease, we're locked into it for four years, there's nothing we can do until the lease is up. These are the payments we have to make..."

**Internet Access**

The director and I talked about the challenges of internet access in rural areas. "We (board members, teachers, principals, administrators) did some 'futuring' and all limits were off. Just future, like just a vision, what would you see? And that's how we came up with the current design. We envisioned high speed Internet access in all these little rural schools, but thought that it was impossible. And then we had it only nine months later."

Torro North was the first rural school district in the province to get a T-1 (high speed access) connection for its schools. They formed a partnership with Sasktel. The director explained, "We dreamed of Internet access, where every computer at every station, and originally, uh, we just couldn't deliver 'cause in the rural areas we didn't have the power, so we sat down with Sasktel and asked them to bring as many senior people to the table as they could, and we said, 'here are our needs, this is what we need to try to do, show us how we can do this, and they gave, we were the first rural school
district to get access. They gave us what they call Quantum Link solution, which was a very slow but an always-on solution... then we dealt with them to buy the T-1 line...”

Community Net

The district now has high speed Internet access in all of the schools and I talked about this with the technology coordinator. “We got some information to the fact that the government was going to be putting things forward called Community Net, and at that point nobody had heard that term before, and that they were going to be paying for everyone’s current access to the internet. Well, we priced out one T1 for every school, like sixteen hundred a month per school, and bought it. Just did it. [The director] took a gamble and paid a bit of money up front, every month, three months, four months, hoping that the application would be approved! And it was and all the T1s were paid for.”

The director found it essential to take a risk and approved the T-1 line without the authority from the board because he had only a small window of time to do it. He approved it, knowing that they didn’t have the budget to pay for it past the end of that year. “So if the Community Net hadn’t come through I probably would have gotten fired (laughs), but luckily, they came through and took over the cost!”

CompassLearning® SOFTWARE

IBM’s COMPASS is the dominant courseware supplemented by a variety of PLATO® software for students as well. Those are the two courseware offerings that they give to the broad population of students. Any teacher can access them and any teacher can provide a student access to them as well. COMPASS is used every morning, right

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across the school district, grades one to four, primarily in language arts and math. As the technology coordinator described,

"we had to find ways to put [technology] in, so it would have the best impact, so we looked around at different models, looked to see what different schools were doing, and we looked for different software application and how they could be used. We went as far as San Diego to look at software and to see how it was used."

In 2001 the administrators ended up piloting COMPASS. The teachers in the pilot school utilized the pod model (groups of four children that rotate to different stations, or "pods") that was recommended by IBM. The teachers took several days off for the workshop lead by IBM consultants to learn to navigate the software. They found that the courseware is based on U.S. standards and did not have any correlation to the Saskatchewan curriculum. The pilot was going well and the teachers liked COMPASS, so the principal and the teachers involved in the pilot project took it upon themselves to make it their job to coordinate the curriculum to the objectives in COMPASS. So now there was a guide that highlights the correlations between the curriculum and the courseware that they have in their school district.

IBM had promised manipulatives and activities to go along with the software, but I perceived that when the district really got to work with the supporting materials they felt that the substance wasn’t there. Nevertheless, they continued with COMPASS believing it was the best catalyst for getting the teachers to become familiar with computer use in the classroom. The district purchased COMPASS, essentially, to provide
teachers with initial resources so they don’t having to spend hours searching for resources just to get started. The technology coordinator described,

"for us, COMPASS is meant to be a bridging courseware to bring teachers into using technology with their students in a meaningful way and then to bridge to using their own materials. That’s the goal. We don’t really want courseware to be the way, you know, we teach, at all. We want it to be just a bridge to integrating technology into teaching, to help teachers see it as one of the resources in the classroom as opposed to a segregation of tools, as in ‘okay, we’re going to do technology now and then we’ll come back.’ The courseware allows them to say, ‘ah, language arts is happening here, here, here, and there, and there, its happening off-line, and on-line, its all happening at the same time, and it all has the same objectives.”

And one of the “ed-techs” (part time technology/curricular support) elaborates,

“COMPASS, being a package program, is not necessarily the greatest thing for learning but it really seems to have had an impact in getting teachers started.”

After the initial pilot, the administration sent out invitations to all of the teachers to asking them to try COMPASS with teachers who were already using it. They offered them a half day of release time. The administrators were surprised by the interest. They got the sense that the teachers who went to the demonstrations were intrigued by the enthusiasm of the teachers who were showing the software.
From there, all teachers were required to allocate several of their professional development days to the training with COMPASS, and there now is a general expectation throughout the district that all teachers use COMPASS in their teaching.

**Web-based Activities and Resources**

Currently, there is an array of technology use across the schools in the district. Most are using COMPASS, but nearly all of the teachers I met with incorporate fairly sophisticated web-based activities into their teaching. Computing technologies certainly do not seem to hold any more weight than any other “tool” that the teachers use. It seems that technologies “fit” rather seamlessly into the district’s mission and philosophy – a focus on professional growth to provide multiple paths for children to learn (I describe this in more detail later). For instance, a third-grade teacher describes,

"I think that our teachers and students approach a computer like one of the tools. So if I’m doing a report on Egypt, I have several different ways I can find information on Egypt. I can interview somebody, I can go to the library, I can go to the computer... it's totally integrated. This was part of the administration's vision, they didn’t say, 'we expect you to abandon all of your teaching strategies'. At the same time that we were learning about technology we were focused on teaching strategies, especially cooperative learning and multiple intelligences."

The district’s comprehensive website hosts hundreds of web-based resources for teachers and students. Furthermore, it houses classroom websites that have been awarded “project of the week” or “project of the month” awards from SchoolNet’s grassroots program.
Much of the district’s business correspondence is done via email and all of the schools utilize email for much of their communication as well. The district has an on-line calendar and they have provided programs for teachers to do all of their marks on-line.

**Support**

“So, if I’m going to ask you to come on board with me, I need to support you and I need to show you that I’m supporting you.” –Assistant Director.

“If you’re going to put in 1.2 million dollars worth of computers on the people’s desks you better put in a plan to get them to use them, ‘cause if you don’t they’re not gonna be used, they’re not going to be integrated into the instructional program.” –Director.

There was a general recognition that the teachers and principals need a kind of support that is going to allow people to have their problems solved without frustration, without feelings of inadequacy or incompetence. And the support would allow them to embrace the new technology with great confidence, because they knew if they ran into problems there would be somebody who would be there to help them. It seems the teachers and principals feel the help made available to them is outstanding. As one principal described,

“At first, it’s a little overwhelming for teachers. Sometimes, when you are faced with the unknown, you have some resistance. But as soon as they see what’s out there and that our district has really shown them support, they recognize it. If you just gave the technology to the teachers and just left it in their room and didn’t help them, then it
wouldn’t get used like it was supposed to. The district recognizes the importance of having a person [ed-tech] going out there saying ‘this is how you could use it and I’m going to help you and support you’ and that has really helped because they have that safety net.”

Curricular Support

“You have to start with the teachers where they are in terms of what they know about technology, and bring them along... You’ve got people at a variety of levels.”

–Principal.

“We looked at what we needed to do to get people using computers. During the time we were piloting we had one of our star teachers going around, working about 20% time, getting teachers to use the labs, showing them how best to use them and getting them doing stuff with the labs. And the teachers loved it. They loved the planning time with that particular teacher, and that seemed to make our labs just hum. They were just going. So when we went to the pods we thought, well, if we had a person in place to help the people use the pods, well, that’s gonna work. So we freed up three teachers at .4, .2, and .8 to help 110 teachers in the schools.” –Director.

The district employs a technology coordinator who oversees both the technical and curricular aspects of the technology-supported activities in the schools. But the administrators noted that the teachers needed hands-on, guided help – help that a technology coordinator alone could not provide. Therefore, one of the more substantial new support roles that central administration created was the position of “educational technologist” (“ed-tech”). Three teachers in the district were chosen to work part time as
teachers and part time as a resource for technology-supported activities. These ed-techs are housed at a particular school, but their job is to travel to different selected schools on a regular basis to work one-on-one with teachers to support them with technology integration in their classroom. The administration recognized that the schools and teachers needed somebody who doesn’t just have the technical expertise but curricular expertise as well. They recognized that novice teachers needed expert teachers to come in and support, appraise, guide teachers using technology in classroom activities.

The fact that the ed-techs are also teachers seems to be the key to making things work better. As the technology coordinator described, "we don’t want them perceived as another person from central office sent to help...sometimes from district office you’re not always perceived as helping. We want them perceived as teachers working with teachers to help them use the technology for the best in the classroom... that has been a very key thing to making the technology happen."

One of the primary jobs of the ed-techs is to coordinate resources to the curriculum to alleviate time consuming searches of web-based resources for teachers as well as for students. Some teachers prefer to do the searching and assembling themselves, but most seem to prefer to work closely with the ed-tech for a more focused and specific search of activities that are both on- and off-line. Oftentimes, the ed-techs spend much of their time searching and assembling resources on their own to provide teachers with “ready-made” resources that match the district’s curriculum and its objectives. The district website alone has enough resources for a teacher to plan around it for an entire year.
"You need somebody who doesn't just have the technical expertise but now you need experts in curriculum. You need expert teachers to be able to come in and support, appraise, guide the way." – Technology Coordinator.

Many of the teachers are encouraged to design and build their own web pages. However, rather than leaving them to figure out how to do it and where to begin, the teachers can book a collegial planning day with the ed-techs who have the expertise and time to sit and develop pages with them. The administration hopes that teachers can develop skills to a point where they can undertake such tasks themselves.

**Technical Support**

The role of the ed-tech is primarily curricular support. The district has created two full-time positions of technical support for both troubleshooting and maintenance. There were no complaints at all regarding technical difficulties. When personnel have technical problems, they simply call the district office and one of the technical support people will take care of it immediately. Everyone I spoke with verified that this was indeed the case. I was repeatedly told that someone from technical support visits every school at least once per week to maintain all the computers. As one of the principals described,

"This is credit of the people, like our district board, who provide the money and the people who provide the vision, and the direction of where it goes. We needed support in terms of personnel. A long time ago, for instance, I was having problems with some hardware in our lab and I could not solve that. As an administrator and teacher, troubleshooting would add another level on to my duties. I'd have to be a techie. I'd have to be everything. It's good to be a generalist, but when you need specific, detailed, highly
professional knowledge, you need a specific, detailed, highly professional person. And now we have that.”

**Professional Development**

Torro North appeared to have a strong professional community. I asked the interviewees about this. There is much emphasis on supporting the teachers as professionals, and the teachers certainly recognize and appreciate this.

“I think it starts top-down, from the central office, they model everything they talk about. It’s not just, ‘I expect you to do…’ they will support you and see it through.” -- Fourth grade teacher.

The district culture itself focuses explicitly on professional development. The ultimate goal in the district’s mission statement is to better the lives of children. The respondents clearly recognize this can only be done by bettering the lives of their personnel, too. They recognize that when teachers are satisfied and happy, they feel more positive about their jobs and, in turn, channel their positive energy back to the students. Supporting and prioritizing teachers’ professional growth is one of the major responsibilities of the district.

“The learning, professional community starts with the teachers. We are always talking about being learners ourselves – in our newsletters, in our meetings, and whenever we get together. Because the district thinks that staff learning is very important, the money they give us for professional development is really good, so they
make it really attractive to go with the 'learners' model. At the district office, we stay with professional development because we want our teachers to be learners.” --Principal.

The administration provides a range of opportunities for teachers to build their technology skills and learn more about ways that technology can support their teaching. Since 2000, nearly every mandatory district-wide PD day has been a technology workshop run by the director, the assistant director, the technology coordinator, or one of the ed-techs. Local PD days or personal days are separate from the district-wide PD days, though the teachers and principals can choose additional follow-ups to these technology workshops if they desire. So, the technology in the district is mandatory. Other district-led topics that are mandatory have included techniques for dealing with difficult people, coping with certain stresses, and so on. But the emphasis has primarily been on technology integration.

The district administrators implemented what they call “collegial planning.” This seems to have a very strong impact on the teachers and the professional community in general. Teachers in this district do not have prep time, so the way to meet with the ed-techs is by applying for “collegial planning.” They may take an hour or a half-day, and the principal will arrange for a substitute teacher. Or teachers can have the ed-tech come in and co-teach with them. These collegial planning periods are not strictly for technology related topics. For example, two or three teachers can apply to work together on a particular task or design. They can apply to co-teach with another teacher as well. All collegial planning time is on a first come, first served basis. Collegial planning time also provides a point of entry for teachers with different levels of experience and different
interests. Teachers who are new at the school (and just beginning with COMPASS) can apply to co-teach with a seasoned COMPASS user. Teachers who have moved beyond COMPASS to web-based resources can sit with an ed-tech to build a web page for a specific project or activity.

"So all of the support – the website, the computers, the technical support, the support for collegial planning, and the professional development, like all that together I think has made it really successful." – Third-grade teacher.

**Laying the Groundwork**

The district director and core administration have invested a significant amount of time and effort towards establishing a culture of innovation and collegiality. I talked with them a lot about this. Beginning in 1995, since the new administrators began, there has been considerable change in the way that Torro North does business. By directing the district toward innovation and collegiality, the central administration more or less laid the groundwork for the implementation of technology. They were already focusing on providing teachers with an array of instructional possibilities, and this paved the way for thinking about technology as a new ‘tool’ rather than another burdensome reform initiative.

"What we believe is that there is a variety of ways that kids learn and, what I like, the approaches we like to see in elementary classrooms involve learning centers, kids rotating through learning centers, where, for example, in math class, some kids might be working with manipulatives, some kids might be working with paper and pencil tasks out of a textbook, some kids might be counting things or measuring things in the
work world, and another might be doing calculations, while another might be working on a computer. They'll all be working toward the same objective, but they'll be changing the tasks to meet the objective.” –Director.

Each member of the administration strives to be progressive and aware of the latest research and best practices regarding many aspects of the school environment – curricular resources, professional development opportunities, leadership structure, collegial environment, community involvement, and special needs issues, to name a few. All of them realize the importance of strong leadership and many of them are up-to-date with the latest research on leadership. They discussed books and journal articles with me and talked about their philosophies regarding learning strategies, professional growth, communication, and change. They were able to articulate clearly the direction and the vision of the district and their role within it. More importantly, they were able to share with me just how important it is to have a clear vision and direction that is shared or at least understood by all.

“It's all vision, and establishing a vision that people buy into, and allowing them to buy into it. But you can't do a lot of work on vision right away because all they know is the old way of operating; they don't know what 'could be.' So if I sit down with a bunch of people and say, 'okay, let's formulate a vision for where we're going,' you know what it's gonna be based on? It's gonna be based on what they know, which is the old way of doing business. So my belief is you work in the district for a couple of years, you show them a new way of doing business, you articulate your vision, you talk about it, you talk about how you do business, the respect, the dignity, the cooperation, all the things, and
let people slowly realize there is another way to do business. And then after you do that you form some key committees and you start to get some 'buy-ins.' And of course you have to stay there long enough to see it through.” –Director.

“Every time I get a chance to talk to people I talk to them about our vision. I talk to them about where we’re going, what our main job is, the role of teachers, and the purpose of teaching...I mean, every chance I get I start talking... I want them to have meaning in their work, and I want there to be a direction that we’re going and that everybody knows what that direction is. The philosophy’s clear, the direction’s clear, and everybody’s going there together.” –Director.

“The trick is to make it comfortable for the people that are going in the direction that you want it to go, and make it somewhat uncomfortable for the others.... The culture has to start going in that direction...and that’s the trick, ultimately, to change the culture here in the organization. –Director.

The administrators started describing their vision by saying ‘this is what we want to do, how we see it, and where we’d like to take it.’ Then they began with a focus on ‘professional growth,’ and so encouraged a lot of professional development. The teachers and administrators I interviewed clearly understood and shared this focus on professional growth. The administrators all shared an understanding that their job is to find ways to encourage and support professional development opportunities among professionals in their school community. In the last several years the teachers have been exposed to a number of workshops and professional development seminars. These include, but are not
limited to, cooperative learning, multiple intelligences, inclusion, a variety of instructional strategies workshops, and of course, technology workshops.

The teachers that I spoke with did not feel inundated with a hodgepodge of the 'latest' initiatives. They felt comfortable seemingly because the administrators have done a good job of pacing the initiatives. I perceive, though, that the comfort has more to do with the way the initiatives were presented, which I will talk about later. One third-grade teacher said,

“It wasn’t like, ‘we’re going to do one day of technology and that’s it, then we’re moving on to our next initiative.’ If you go back and look at our calendar in the last six years you will very definitely see the combination of teaching initiatives and technology working together.”

Promoting an Understanding of Technology

The emphasis in this district on creating a variety of instructional opportunities for students is carried over into the uses of technology. This has played an important role in making technology an important and growing part of the district’s repertoire of teaching and learning practices.

“We live in an age of technology. The whole idea is that we’re teaching children to be part of the world in our society today. Technology is where it’s at. Everybody’s got a computer on their desk. Everything is automated and becoming more automated as time goes on. Our students are technologically literate. We’ve opened up a new way of learning for some kids. And we’re really firm believers in this school district that you
don't just learn by sitting at a desk. Technology helps us include all of the different ways of learning." –Principal.

The administration, through their workshops and presentations, consistently encourages teachers to think about technology as an additional resource or tool that will help them provide students with another avenue for learning. The administrators want to provide the teachers and other school professionals with a crystal clear vision.

"It's not just about getting computers in classrooms. It's about using technology to support student learning. It's about the teacher seeing the technology as their tool...but more importantly, I think how we frame the vision impacts how people see themselves in terms of it." –Assistant Director.

The teachers that I talked with clearly have adopted this way of thinking.

"Another way to maximize the learning experience is to deliver content in different ways and to reach all of the students. So if they've read the story and some of the names and facts in the story are going to stick with them and then they look at the WebQuest and they have pictures of Japan, and they have pictures of the dress, and the music... they'll take more away from it, I think." –Ed-Tech.

"Did this enrich my teaching or add to it? I think so. Yeah, it's added to it. It's another tool, you know, and it's as good as anything, and I think the very best lessons that you teach are when you are very comfortable and you're enthusiastic with the medium...I'm much more comfortable with the technology this year than the first year."

–Third-grade Teacher.
"The key thing, I think, with COMPASS, is the tracking of students. They can do a lot of good activities on the Web, but the advantage of something a little more organized is the tracking and reporting part of it. So, we've got quite a mixture for us and for students. We also have CCC for special-ed. It's not a special-ed program, but that is what we use it for." —Fourth-grade Teacher.

"I see it as a tremendous tool. For so many years we've been talking about individualizing programs... this is one way that I can meet some of the kids' needs." —Principal.

Change and Leadership

"People can't feel that things are being done to them. They'll lose a sense of purpose, a sense of understanding of how they fit into the change. They need support systems, opportunities for dialogue, professional development." —Assistant Director.

The sophistication of the central administration with respect to their understanding of the change process was high. Most of the interviews invariably led to talking about change. The administrators spoke about how important it is that teachers and other personnel find a sense of meaning in the new way of doing things.

"There needs to be a process that allows people to find their meaning within that vision...so it's not, 'here's the change, here's where we're going', but 'here's the change, here's how it will impact you, let's talk about how you see yourself fitting, what supports you need.' So it's not that there's an option about whether we'll go there, but there is an option about how we journey." —Assistant Principal.
The administrators recognized that it was individuals who make the real changes, not the organization. "The organization might provide the vision and the direction and all of that, but ultimately, the journey's an internal landscape, an internal change that people have to go through, and part of that is about them psychologically and emotionally committing to the change." –Principal.

“Leadership means bringing meaning to the work of others. We should all feel like we're part of something that is bigger than ourselves. We should never feel like we're just working to get through the day. We should feel like we're working to make a contribution to the lives of children.” –Assistant Director.

“Most teachers want to make a difference. They don't get up thinking 'how can I slide through my day today?' They get up believing that 'what I do today is going to make a difference', and our role as leaders is, number one, to help them keep that alive, and number two, to give them some of the tools and resources and strategies that they need to be able to make that a reality. And number three, to challenge them when they're not living up to it.” –Assistant Director.

The administrators recognized that if people don't find their allies, supports, or structures, they'll go back to what they were doing before. So they worked hard to put structures in place that encouraged explicit talk about the change process, and the staff's frustrations and needs.

“...if teachers don't feel supported, if they're frustrated, and this is obviously true with any group of people, if they feel something new is going to cause nothing but
frustration for them without it being part of their vision then they're just gonna let it go. There's a multilayer thing in here that you have to work with. If not, teachers are just going to say, 'that's a top-down initiative. I'm not part of it, I haven't been dreaming about it, I don't know anything about it, I don't want it.'” –Principal.

“I think it's okay to say 'the system's going to be making this change,' but then you have to pull people together and talk about what that means. 'What does that mean for you?' 'What are some of your needs?'” –Director.

The teachers and administrators explicitly talked about change at their regular ‘teacher exchange’ meetings. All the kindergarten teachers come together, all the 1-2, 3-4, and 5-6 groups come together, as well as the French teachers, and others. There are 14 different groups of teachers who meet 4 times per year to talk, with the district administrators, about their craft and about issues and concerns. The teams brainstorm together and create their own agenda of what they want to discuss, what goals they want to meet that year. The administrators try to explicitly keep the ‘change’ agenda alive in these meetings. They have listened to the needs of the teachers and responded by putting in place an array of supports, as discussed earlier: the district website, the computers, the technical support, the speedy access, the student portals, the support for collegial planning, and the continuous, relevant professional development.

“It is just amazing what we have at our disposal. The people downtown have put it there for us and made it so easy to find. So if I need subject areas I can click on WebQuests, and our WebQuest is designed by whoever, we've got hundreds of them on our site and you look at Social Studies, you look at Science, or you look at Art, and your
elementary level, and there's this whole list of titles... so you can find something that matches what you want. There are ones on whales, or under the sea... Japanese culture and Japanese children at school and Japanese music, geographic sites, populations, Terry Fox, and hockey players, and all of these neat things." —Third-grade teacher.

"There are tons that you can work from. You don't have to design one. And all of the questions are there, the answers are there... the kids are clicking and exploring links, but it is already very safe and controlled." —Ed-tech.

I had wondered what happens when teachers are comfortable with their style of teaching and not interested in expending the energy to try new approaches. I got the sense that there really are not very many such teachers in this district. The resistant few seem a bit uncomfortable because of the innovation happening around them. The administrators recognized this, and felt that adoption could take place easier if the appropriate structures are in place. The idea is based on the principle of "critical mass" in that the administrators try to encourage the adoption of new practices by capitalizing on the idea that people want to be a part of the activities in their community; that they don't want to be left out. The teachers that I spoke with notice this:

"I'll look at another teacher's web page and go, 'oh, is that ever neat, I like that,' and when you see everybody doing it you feel like you should be doing it too." —Fourth-grade Teacher.
"Maybe I don't have a web page yet for my classroom and everyone else does and it's something you want to get on board with because you want to be where everybody else is." —Third-grade Teacher.

Professional development was important to them with respect to change in the sense that they believed the first thing teachers experience under change is the feeling of incompetence. And they wanted to focus on their teachers feeling competent and connected because of the teachers' willingness to engage and sustain their efforts in changing teaching. This is the reason for the workshops, the collegial planning, the ed-techs, and the technical support.

I talked with the teachers and ed-techs often about the transition, about how in the face of such a big change and so much professional development there seems to be a strong sense of willingness and engagement, and why the process, as a whole, seems to have been quite positively embraced.

"The training component has been key. You can see that every time something is new, the staff is properly trained. We had people who came out from COMPASS to do training, and they revisited, and then we have the [ed-tech] positions, the collegial planning, so that we can do more individualized stuff, and the P.D. is coming around to technology time and time again." —Third-grade Teacher.

All the workshop leaders and support personnel were encouraged to take pride in not making people feel stupid for asking questions. As one Ed-tech described, "they'll never make you feel like it was your fault, they'll never make you feel stupid for asking a
question... a teacher starting out with a simple ‘show me how to use the Save-As function’ as opposed to ‘let’s develop this WebQuest together’ – there is no distinction made between those two teachers. I think that’s one of our greatest strengths.”

Along with the explicit structures is the talk that happens among teachers on a daily basis. Some of the principals I spoke with actively work to promote informal collegial discussion, perhaps implicitly encouraging the ‘critical mass’ idea that the principal spoke about earlier.

“Part of our staff meeting is called ‘teacher talk’, and I ask ‘how’s it going?’ to get them to talk about activities that are frustrating them by taking up too much time, or stalling them because they can’t get something to work, or whatever, and then we’ll brainstorm together and help each other solve things. And we’ll talk about the successes too, like when someone is doing some really neat thing I’ll encourage them to share it, and we learn from each other, and that spills over, it’s just kind of contagious.”

–Principal.

**Pressure and Expectations**

One of the more delicate issues that I talked about with the administrators was the amount of pressure put on the teachers to use technology in their classroom. Administrators tried to find a balance between pressure and support. I got the sense from the teachers that technology, or at least COMPASS, was expected to be used. They were very aware that the district had spent a lot of money on it and that they should use it and come away with something.
“It’s kind of interesting. I don’t know how explicit it is, at the administrative level, but I know administrators feel – they express very clearly – that ‘this is here, it’s gotta be used’ kind of thing... they can check on COMPASS and see how often kids are on that, though I think they have better things to do. But that’s been mentioned by administrators, to kind of put the pressure on a little bit, so it’s not just leading by the hand; there’s very clear expectations that it be used.” –Third-grade Teacher.

The teachers feel the pressure, but that pressure creates a sense of exciting collegiality. Frustrations and glitches are generally alleviated by the positive and continuous support, workshops and, most importantly, having the ed-techs around to answer all of the little questions.

“I think that most of us teachers are fairly open-minded and fairly flexible and willing to look at new and different ways if it’s going to translate to a better learning experience for their students. So technology was presented in a way, yes, as ‘make sure you are using it,’ but also, ‘make sure that you are using it how you want to use it in your classroom – make sure it’s fitting with your teaching.’” –Fourth-grade Teacher.

The administrators talked about change explicitly among themselves and with the principals and teachers. They raised the issue of what they might expect during the process.

The teachers recognized this attention to change. As one fourth-grade teacher explained, “the district was pretty good about talking about change. They told us, at the beginning, you know, change is difficult for all of us, more so for others... They were
pretty good at saying, 'you know, make it work for you', but the message is, 'make it work.'

The ed-techs, as well, were very sensitive on a personal level. They didn’t want to be the ones putting the pressure on the teachers. As one Ed-tech explained, "I find that the worst thing I could do is talk about any kind of expectation because there is a lot of guilt around, you know, 'I should be doing this more.' I think that’s common to teaching, it’s not a technology thing. But the last thing I want to do is give someone the impression that they should be doing something other than what they are already doing. I think that a lot of people assume that if they’re not using it as much as they think they should, somehow they’re not doing such a good job. I don’t want to give people that impression."

Closing Thoughts

In this section I have provided a synopsis of the ways that information and networking technologies are understood in the Torro North School District. These comments have been extrapolated from the large amount of data collected, and are not meant to be a comprehensive portrayal of the district, but rather snapshots that help create a picture that will be used for discussion and analysis in the next section.

In general, the teachers seemed to share a sense of understanding and collegiality regarding the process of change, and they were quite positive in spite of the frustrations and size of the learning curve. They felt very supported and encouraged to develop professionally and try new things.
I wanted to capture the experiences of school professionals in a district that was trying to make serious school improvements complemented by technology. I wanted to qualitatively document the experiences of the participants, to demonstrate that change is truly a dynamic and complex process, and that understanding such a complex process, really acknowledging it, is what is needed to improve our educational environments. And I talked about this with several of my interviewees.

"I think that one of the biggest obstacles to change is people not being willing to recognize there is going to be obstacles to change...it is about being willing to recognize that it is going to be mucky, that it's going to be messy, there's going to be chaos, we're going to feel incompetent, all those things, but we're willing to do it because we're gonna get somewhere greater." –Assistant Director.

"Good systems aren't about everything going right. Good systems are about having effective processes for handling problems." –Assistant Director.
"We shall...constantly be inquiring about the interaction between the powers of individual minds and the means by which the culture aids or thwarts their realization. And this will inevitably involve us in a never-ending assessment of the fit between what any particular culture deems essential for a good, or useful, or worthwhile way of life, and how individuals adapt to these demands as they impinge on their lives. We shall be particularly mindful of the resources that a culture provides in making this fit possible. These are all matters that relate directly to how a culture or society manages its system of education, for education is a major embodiment of a culture's way of life, not just a preparation for it.” Bruner, (1996), The Culture of Education, page 13.

Employing multifaceted, collaborative, inquiry-based learning activities in schools generally requires extensive effort and time devoted to the initial design, development, and implementation. Teaching with innovative technological tools calls for a change in the ways teachers and administrators think and act. Any study of technology will be enriched by a focus on how technology is incorporated into the school culture. The use of technology inevitably prompts teachers and administrators to question where it “fits” with respect to their daily activities. Such change involves a consideration of the assumptions, rationale, worth, purpose, possibilities, and constraints involved in the use of technologies.

A very strong influence on the integration of technology within the Torro North School District appears to be the administrators’ ability to create and sustain a positive and productive professional community. Recall that Bandura (1994; 1986) suggested social and institutional structures both constrain and enable personal development. Vygotsky (1978) believed meanings and beliefs are shaped through dialogue and
interaction. Both assume that individuals engaged in an activity or in a given situation undergo a form of psychological reconstruction through negotiation with oneself and others. Likewise, researchers of educational reform argue that professional communities are essential influences upon teachers’ willingness to experiment and be creative. Some educational sociologists would argue that learning is a process of becoming a member of a community of practice (Lave, 1988).

Elmore and Burney (1999) and Bryk and colleagues (1998) showed that more effective schools and school districts (districts) are characterized by professional communities that share understandings that

- professional development is essential,
- participant structures for promoting collegiality, sharing expertise, and problem solving are essential,
- when making decisions, it is vital to take into consideration the local context and culture,
- a unified, coherent vision with clear goals and explicit expectations are needed,
- progress needs to be continually monitored and supported, and
- continual discussions about the purpose and meaning of change are essential.
Teachers and principals I interviewed were quite positive about their jobs as well as their abilities to engage in new initiatives, including technologies that have been introduced and implemented between 1995 and 2002. They recognized that their efforts at change, whether initiated by themselves or by the district, were continually supported. This recognition, in turn, appears to contribute to their confidence and willingness to be open to and engage in further new activities. They were able to articulate clearly the direction and the vision of the district and their roles within it. The teachers I interviewed expressed perceptions that there was freedom and encouragement (and supports) to innovate and experiment. They often called on each other as resources and for support with new activities. In general, the teachers were comfortable and secure, liked their jobs and the collegial atmosphere, and were pleased to be working for this school district.

Overall, based on the comments of the teachers and administrators, the school district is a successful, effective, and healthy professional community. The integration of computing and networking technologies seems to be thorough and effective in that teachers have reported that they are 1) provided with multiple avenues for learning about the variety of affordances of technologies for teaching and learning, 2) provided with supports and scaffolds to experiment and try new things, and therefore, 3) comfortable with experimenting with a variety of ways to use it in their classrooms, 4) finding information and networking technologies useful and motivating for their students, and 5) motivated to continue to refine their skills and understanding of innovative uses of technologies to support their evolving teaching practices.
Leadership

The district administrators of Torro North are responsible for guiding the district community to adopt its current shape. Between 1995 and 2002, the school district clearly went through a fairly intensive change. The new administrators created and articulated a vision to guide the way that they would do business. They placed priority on professional growth and continual support. They created extensive workshops, increased funds for professional development, hired technical staff, and created the essential ‘ed-tech’ positions. They created structures for dialogue and learning by establishing collegial planning time, district-wide teacher exchanges, mandatory yearly ‘innovation projects,’ and school-wide ‘teacher talks.’ Their expressions of leadership were guided by a sophisticated understanding of the process of organizational change, including Fullan’s (2001a) notion of ‘reculturing.’

The district director of Torro North has invested substantial time and effort to establish a culture of innovation and collegiality. His efforts laid the foundation not only for the implementation of technology but for the implementation of any new initiative. He is a director who strives to be progressive. He is aware of the latest research and best practices regarding most aspects of the school environment including curricular resources, professional development opportunities, leadership structure, collegial environment, community involvement, and special needs issues, to name a few. He was clearly a strong influence on the direction of the district.

The administrators’ ability to articulate their understanding of the change process was critical. Sustainability of any innovation can only be attained when the novelty wears
off, when thinking and practices associated with the new initiative become the norm. Good leaders recognize what change is. They reflect upon their thoughts of change and work to create a unified vision across the district (Fullan, 2001a). Such a vision emphasizes the role of the participants and their interactions, rather than on top-down approaches by administrations. Working to create a unified vision among the schools in the district contributes to a shared understanding of what is important, what is worth achieving. This, in turn, encourages a goal-oriented community (Goleman, 2000).

The administrators of the district clearly understood the change process in these terms. They have lived it, read about it, and they discuss it constantly. Recall that much of the literature review focused on “change,” what it is and what affects it. Simply put, the focus is on people, on relationships, and on the dynamic nature of progress. Beliefs, philosophies, and patterns of behavior ultimately shape the individual and collective experiences of all participants of the school community. The administrators discussed these topics of people, relationships and change clearly, intensely, and with great sophistication.

The administrators repeatedly discussed the need for teachers to associate meaning with their experiences and make sense of technology (and other initiatives). The administrators understood there are many facets of the professional community that shape the experiences of teachers. They explicitly attempted to structure a community that encourages collegiality, motivation, competence, and confidence. They did this by providing a clear vision, extensive opportunities for professional development, continual
technical and curricular support, and an array of structured occasions for dialogue and collegiality.

This finding is consistent with Fullan’s (2001a) contention that one of the central causes for the failure of most reforms is a lack of appreciation for influences that affect how individuals make some sense of meaning from their experiences. In the literature review, I highlighted the idea that the sustainability of an innovation can only be attained when believing, thinking, and practices associated with a new initiative become part of the normal, everyday way of going about daily activities. The assumptions, beliefs, philosophies, and patterns of behavior dynamically interact with and affect the social and cultural environment, which influences, inevitably, the experiences of each person. To ultimately facilitate change, then, effective social and cultural structures need to be created whereby information and communication can be situated in meaningful, relevant frameworks necessary to create the knowledge and learning that challenge a person’s beliefs and conceptions.

This finding is also consistent with each of the conceptual perspectives highlighted in the review. Each of the perspectives more or less emphasizes the reciprocal and interactive nature of information and interpretation – though from different vantage points and with different words. Recall that individuals, to interpret and make meaning of their experiences, can utilize “cultural” information, or information from the “environment,” or the “professional community,” or the “activity,” or the “artifact.”
Opportunities for Dialogue

Recall that Goldenberg (2002) found that regular interactions help teachers develop norms of collaboration and conversation. Bryk and colleagues (1998) found that teachers tend to feel more comfortable exchanging ideas with each other in schools where structures are established to provide opportunities for regular interactions. Goldenberg (2002) found that ongoing professional exchanges may provide teachers with benchmarks to help them monitor and calibrate their progress. Vygotsky (1978) argued that interaction generates a shared communication and understanding. Structured opportunities for interaction provide a venue that can enable teachers and leaders to learn about the school vision, recreate understandings, and over time, facilitate conceptual change.

The district administrators of Torro North appear to be continually searching for and creating such opportunities for dialogue. They have set up several venues that serve to facilitate interaction. The teacher exchange meetings held at the administrative offices and the collegial planning time are examples. The principals, too, of several schools have set up their own 'teacher talks.' Though many schools all over North America employ such structures, often in the form of 'staff meetings' or 'planning time,' it is the design and intention of them, or how they are framed, that appears to make a difference in Torro North.

The district administrators and the principals I spoke with realize that, to support change, the teachers need to find their allies and supports or they would likely return to what they were doing before. They spoke with me about creating avenues that encourage
explicit talk about the change process, the frustrations associated with it, and their needs. They recognized that something new might cause frustration for them and their teachers, and believe that regular, constructive talk about the source of their frustration might help all create alliances and encourage everyone to work together and motivate one another. The teachers I spoke with did, indeed, feel a sense of collegiality and support.

These practices parallel Fullan’s (2001a) claim that collegiality is a strong indicator of successful change in possibly every research study on the subject. Like Bandura and his colleagues, Fullan contends that personal development in an interactive social context acts as a catalyst to challenge individual and collective beliefs, assumptions, and values that can bring about significant conceptual and cultural change.

**Support and Competence**

Recall that school effectiveness can be seriously undermined if the push for instructional improvement is not supported by necessary resources in the form of materials, technical support, equipment, time, space, and access to expertise (Fullan, 2001a). In many schools and school districts, Torro North included, there is often an array of school improvement projects going on at the same time. It is often the case that the initial excitement of a new project tends to wane after a while, and any available support often diminishes, especially when another new initiative is introduced.

A number of studies (Cuban, 1986; Fullan, 2001a; Little & Dorph, 1998; Spillane, 1999; 2000) have noted that when teachers perceive a lack of support they get the message that the project is not important. Under such circumstances, teachers find
themselves sceptical of new initiatives, which is not conducive to a constructive professional community. As a result few changes are made, and even fewer sustained.

In the Torro North School District, there are a number of effective and permanent supports in place for teachers to initiate and sustain innovative practices, including technology-supported activities. Every interviewee I spoke with about this conceded that the ongoing, easy access to (superior) supports, primarily in the form of the technical staff, professional development opportunities, and the collegial planning time, were essential to teachers’ comfort level, and ultimately, the success of the technology integration.

We know that continual support is essential to the success of technology initiatives but perhaps a better understanding of why this is so might be addressed. Fullan (2001a) notes the uncertainty of educational change can bring about considerable anxiety and at the same time the feeling of competence and mastery can bring about joy. Both are central to the subjective meaning of educational change, but have been underappreciated in most attempts at reform. In other words, the psychological well-being of teachers, when faced with a number of reform initiatives, has yet to be fully considered. The same is true for technology initiatives.

The research of Bandura and his colleagues may explain, in part, why more attention should be paid to this facet of reform. Recall that a primary construct of Bandura’s (1994; 1986) social cognitive theory is self-efficacy, which he defines as the beliefs people hold about their capability to assert some control over particular tasks or events in their lives. He contends the beliefs people hold about their capabilities often
determine what they do with the knowledge and skills that they have. In other words, when people believe they are able to perform a particular task or activity well, they are more likely to engage in it, which in turn, enriches their sense of competence and mastery, and contributes to an overall sense of psychological well being.

A person's sense of efficacy is linked to the choice of activity, the amount of time and effort spent on particular activities, the ability to persist when challenged, and the ability to respond productively to failure (Ashton & Webb, 1986; Bandura, 1977; Britton & Tesser, 1991; Multon et al., 1991; Schunk, Hanson, & Cox, 1987). There is often a steep learning curve with respect to the array of skills and knowledge needed to learn about and implement technology-supported activities. If teachers are not provided with technical or curricular support, the price will likely be high in terms of frustration. In turn, they are likely to experience a loss of confidence for the task, which affects the amount of time and energy they are willing to devote to it. This, in turn, will likely affect the overall success of the technology initiative.

Many of the teachers I interviewed admitted that incorporating technology into their classroom activities was time-consuming and at times difficult. They spoke of how much they have learned in the last year and about how 'green' they used to be. But they assured me that though their efforts to integrate technology into their teacher were difficult, they were excited, comfortable, and confident about what they had achieved. They felt supported, and believed that they would continue to be supported. Technical support was not really an issue for them (likely because computers are much more sophisticated and user-friendly than a decade ago), but they felt that the collegial
planning time was essential to their own development and success with technology-supported activities. They all spoke highly of the ed-techs, both in character as well as the level of detail and help that they provide.

Perhaps the success of the design of the collegial planning time (either one-on-one in small groups) can be supported theoretically utilizing Vygotsky’s (1978) concept of mediated learning, whereby an individual can be scaffolded towards successful problem solving through collaboration and interaction with others. Assuming these collegial planning sessions were productive, the increased sense of collegiality and confidence might strengthen their efficacy for technology-related tasks. Through repeated interactions, either formally with collegial planning time or in the ‘hallways,’ new ways of thinking and doing – new norms and rules – develop. Hence, such structures as collegial planning can be supported further by Rogoff’s (1994) cultural appropriation through dialogue and interaction, lending assistance to the ‘reculturing’ of Torro North.

From Conceptual Change to Cultural Change

The ‘reculturing’ of Torro North might also be explained via the process of conceptual change and ultimately the way conceptual change might contribute to cultural changes in the schools and the district. From an educational psychology perspective, conceptual change is essentially a process of accommodation and assimilation (Pintrich, et al., 1993). I mentioned earlier that successfully working through the complex and dynamic process of conceptual change requires that learners be engaged, generative, and capable of utilizing a variety of cognitive and self-regulatory processes (Pintrich, et al.,
processes that are influenced by our perceptions, beliefs, and values (Bandura, 1992).

In other words, ‘facts’ that are not integrated with prior knowledge are less meaningful and useful, and people will be less likely to make connections (Anderson, 1980, in Frederiksen, 1984). Generally speaking, accommodation and assimilation are important parts of learning, and meaningful learning calls for questioning and reformulating information, conceptions, and beliefs, revising philosophies, and trying out new actions and practices.

Efforts to help teachers make technology integration meaningful might explain, in part, why technology was integrated fairly seamlessly into Torro North. Teachers were learning about a variety of different, innovative instructional approaches prior to and along with the arrival of the computer and network technology. The focus of the district was on providing an array of instructional approaches so as to incorporate a wider variety of learners. To this end, the administration provided on-going workshops emphasizing many different pedagogical philosophies and approaches. I mentioned earlier that Torro North laid the ‘groundwork’ for technology, and one way to look at this preparation is through the processes of accommodation and assimilation.

The teachers were already introduced to and utilizing an array of instructional possibilities that paved the way for thinking about technology. There are, of course, many possible beliefs regarding the uses and purposes of technology in classrooms. One of them, which Torro North adopted, is the idea that technology provides simply another tool to support some of the pedagogical approaches that the district has emphasized
(primarily constructivist). Accordingly, teachers see technology as a new ‘tool’ rather than another unconnected and burdensome reform initiative that doesn’t ‘fit’ their practice.

The notion of assimilation also can be used to expand on and support the district’s rationale behind the use of COMPASS. Recall that their reasoning for introducing COMPASS was primarily to encourage teachers to use computers and gain technical skills. The original pilot group explicitly linked the objectives of the Saskatchewan Evergreen curriculum to objectives in COMPASS, simply put, to make it easier for teachers to integrate new knowledge with old. The next step for them was to use COMPASS as a bridge to learn about more meaningful and useful possibilities for utilizing computing and networking technology in the classroom.

But the process of conceptual change can be furthered to produce cultural change. I see the process as a continuum. Conceptual change invariably breeds new things to think about, new questions, and assuming effective supports are in place, new ways of doing things. The new ways of thinking and doing become shared, grow into norms over time, and ultimately influence a culture. Culture, as discussed earlier, is a shared system of meanings defined in and by the context of people interacting with one another. Beliefs, conceptions, philosophies, and understandings around learning and technology invariably are swapped and shaped by the on-going interactions of participants. As Fay (1996) has noted, it is through such interactions that we come to know ourselves better. Our sense of self continually changes through interactions, which dynamically affect others in the community, and ultimately, the culture.
Conclusion

The field of technology research and development could benefit from additional studies of school change and reculturing. My study was limited to four schools in one school district, in the Saskatoon area. It may or may not be representative of other settings. One of the values of a qualitative case study such as mine is that researchers and educators can read about the practices of effective technology implementations and revisit their practices in light of this information. Learning about others’ successes and challenges can be a powerful tool in shaping how we conceive of practices and what we do.

As I conducted my research, I realized the importance of leadership in introducing and disseminating technologies and school change. These leaders understood the importance of understanding the change process in order to enact change more effectively, and they taught me an exceptional amount about to incorporating technology-supported activities in classrooms. It surprises me that few studies have examined leaders’ efforts to “re-culture” the professional district-wide community.

It is important to keep in mind the bottom line. Children spend a considerable amount of their childhood in school. The kind of lives they lead and the kind of people they become are largely influenced by their educational experiences. Their educational experiences, in turn, are largely shaped by the energy that teachers and administrators give to their professional lives. In other words, teachers’ beliefs, actions, and motivations influence the effort they put into improving their classroom circumstances – in this case, effectively integrating technology into their classroom activities – and bettering the lives
of their students. Accordingly, teachers who are generally content with their professional community, who are supported, and are competent and collegial will likely provide a better learning environment for their students than those who feel dissatisfied, overwhelmed, frustrated, and resentful. Highlighting and explaining the experiences of teachers and integrating technology for school improvement has been the purpose of my dissertation.
APPENDIX: INTERVIEW PROTOCOL

Questions for District Administrators, Principals, and Technology Coordinators

Introductory Questions

Can you tell me about the story of the district/school? Who does it serve? Its strengths, weaknesses? What is distinctive about it? What is the philosophy or vision in general?

General Questions

Can you tell me about the role technology has played in your school over the last few years – where did it start? What happened? What was the motivation behind the interest and investment of technologies?

General Implementation Questions

What philosophical vision of teaching and learning have your technology efforts been trying to support, if any?

Have these efforts been driven by other concerns, such as social/community pressure, politics, financial opportunities, etc?

Who have been the key players, personalities in this effort? Who was originally motivated to pursue the use of technology in your district/school?

Planning for Technology

How and why did your technology plan develop in the way that it did?

What kinds of conflicts arose around your initial introductions/investments in technology? Any among parents, teachers, administrators?

How did you sell the idea of technology to principals/teachers/others in the school community?

How do you sell the idea of general change/innovations/initiatives to others in the school community?

Technology and Teaching and Learning

What range of uses are present, across and within schools?
How is technology aligned to the curriculum, and what are the steps to coordinate this?

What are some of the most promising uses of technology, and what are some of the barriers?

What do you see as the optimal relationship between technology and teaching and learning in the classroom?

What is changing in your school/district besides the technology that you are proud of?

**Professional Development**

What opportunities are available to teachers with respect to professional development, especially for technology integration?

How are teachers making their own connections with professional development programs?

How does informal professional development happen in the school(s)?

What are the most promising professional development practices, and what are some of the barriers?

**Sustainability**

What kinds of things are done to ensure the sustainability now to pursue the use of technology in your district/school?

What kinds of concerns do you have for sustainability?

How has your original initiative had to change/adapt in order to respond to unpredicted challenges, obstacles?

**School/Community Collegiality**

How are new initiatives introduced to principals, teachers, others?

What kinds of structures are in place, if any, or are attempting to be put into place, to enhance teacher collegiality and networking? Are they effective?

**Financing**

What has been the scale and nature of the investment in hardware, software, in human resources related to technology integration? How have they been secured?
How has your school financed technology purchasing, development and support (e.g. leasing, grants, government)?

**Leadership**

Who is providing the leadership with respect to technology use?

What is their experience?

What perceptions are there of the district level vision of what they should be doing with technology, and how does it motivate leadership in the district/school?

What is the role of champions/change agents?

How much of what is happening is due to individuality, how much is stars, people with quirky strengths and interests?

What is the relationship between the leadership of the technology initiative and the larger culture of the school?

Are there pathways available for the further development of people in leadership roles? Where do they seem to be headed?

**Barriers**

What are the barriers to using the technology you have effectively? How are they being addressed, coped with?

What resources are drawn on to solve problems; what people are involved in negotiations?

What problems are seen as tractable, which ones seem insoluble?

**Cultural Change**

What kind of changes, if any, have been initiated or resulted with respect to the professional community/collegiality?

**Community**

What role do groups like parents, community organizations, and corporations play in the technology initiative?

How would you like to involve those kinds of groups? Do you see them as having resources (expertise, access to equipment, etc.) that would be useful to you?
Expectations

What do you think success would look like for your technology initiative? How would you know it has succeeded?

How are you attempting to follow the growth of the program?

How do you find yourself adapting as it grows?

How do you hope to measure its success?

Where do you feel your district/school is right now in relation to that vision of success?

What needs to be done to move you forward?

Reflection

What advice would you offer to other teachers who are attempting to make better use of technology in their schools?

What would you do differently in your own district/school, in hindsight?

What changes are you hoping to make in the present?
Questions for Teachers

General Introductory Questions

What are your goals for your teaching and for your students’ learning? What do you feel is needed if children are to learn well?

What is your style of teaching and the kinds of pedagogy that you use, experiment with?

Technology and Teaching and Learning

What are your beliefs, good or bad, about technology in the classroom?

How were you introduced to technology in general? For teaching? How was it explained to you, framed by those who introduced the initiative?

What or who motivated you to use technology? Do you have any role models here or elsewhere?

How does your teaching style and activities mesh with technology?

What kind of changes/adaptations have you had to make to accommodate technology?

What do you see as the optimal relationship between technology and teaching and learning in the classroom?

Professional Development

What kinds of professional development opportunities are available for teachers? What kinds of opportunities are you and other teachers taking advantage of?

What is the design/purpose of the professional development itself – who leads it? How is it marketed? Is it effective?

What kinds of curricula are being taught to you with respect to technology? Are teachers designing any curricula themselves?

School/Community Collegiality

How are new initiatives introduced to you and your colleagues?

What kinds of structures are in place, if any, or are attempting to be put into place, to enhance teacher collegiality and networking? Are they effective?

What would you say the culture and philosophy of the school is, in general? Is it progressive, innovative? Medium? Stuck? What do you attribute these things to?
Sustainability

What kinds of supports are in place to ensure the sustainability of the use of technology in your district/school?

What kinds of concerns do you have for sustainability?

Leadership

Who are the leaders of change/innovations/technology in the community?

How comfortable do you feel with exploring new initiatives, new styles? What role do the school leaders play in your comfort?

How effective is the leadership in this school community? How are leaders here supportive? Not supportive?

Expectations

What do you think success would look like for your technology in your classroom? How would you know it has succeeded?

How do you find yourself adapting as it grows?

How do you hope to measure its success?

Where do you feel your classroom teaching is right now in relations to that vision of success?

What needs to be done, what do you need, to move you forward?

Reflection

What advice would you offer to other teachers who are attempting to make better use of technology in their schools?

What would you do differently in your own classroom/school, in hindsight?

What changes are you hoping to make in the present?
REFERENCE LIST


