

The Influence of Ubiquitous Computing on Teacher-Student Relationships

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF EDUCATION

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES

(Educational Leadership and Policy)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

October 2013

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Abstract

The purpose of this study was to develop an understanding of independent school teachers' perceptions of how a one-to-one computing program influenced various dimensions of the teacher-student relationship and the roles of teachers and students within that relationship. In particular, it examined the impact of ubiquitous computing on the pedagogical role of the teacher and the balance of power and control within the teacher-student relationship. It also investigated how the use of laptops influenced communication patterns between teachers and students and affected the closeness of their relationships.

This qualitative study employed a single-site, descriptive case study design. Interviews were conducted with 15 teachers with varying ICT experience across a range of subjects in a suburban, K-12 independent school. The school provided all students in grades 5 – 12 with a personal laptop computer and networked wireless access to the Internet. A variety of theoretical perspectives drawn from the literature on relationship variables and learning theories shaped the context for analysis.

Three major findings emerged from the data analysis. Teachers perceived that: 1) the integration of technology altered their pedagogical roles and relationships with respect to the focus and approach of instruction, the subsequent motivation and engagement of students, and the overall classroom dynamics, 2) open access to knowledge enabled by ubiquitous computing served as a catalyst in shifting the balance of power within the teacher-student relationship, 3) online communication helped them to build and maintain closer bonds and stronger relationships with students. Overall, teachers perceived that the use of technology in this setting enhanced teacher-student relationships. This is

significant because high quality teacher-student relationships correlate positively with a variety of academic outcomes (Davis, 2006).

The findings from this study have implications for teacher education, instructional design, and policy development with respect to technology integration and its potential to support 21st Century learning. Further research in a broader range of educational settings and inclusive of student perspectives would complement this research and assist in further shaping and informing teaching practice in technology-rich learning environments.

Preface

This dissertation is original, unpublished, independent work by author William Jones. The data collection described in Chapter Three was approved by the University of British Columbia Behavioural Research Ethics Board under Ethics Certificate Number H10-00668.

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Acknowledgements

I am deeply appreciative of the guidance, direction and moral support that I received from my supervisor, Dr. Tom Sork, throughout this educational journey. I also thank Dr. Nancy Perry and Dr. Stephen Petrina for their wisdom and the time invested in reading and providing constructive feedback on multiple iterations of this dissertation. The encouragement of this committee enabled me to overcome moments of doubt and periods of diminished motivation and inspired me to sustain my efforts over several years.

I wish to thank the Board of Governors of Southridge School and Strathcona-Tweedsmuir School for their steadfast support in this endeavour and for their generosity in providing resources that made it possible to pursue. Their commitment and flexibility were important elements in the successful completion of this research.

I would also like to thank my wife, Barbara, for her assistance with transcriptions, formatting, proofreading and other important details and for believing in me and supporting me in innumerable other ways.

Finally, I wish to thank my father, William Jones, who taught me through his own example that it was possible and worthwhile to pursue further education while working full time in a busy career.

Dedication

To my wife, Barbara Jones, for her unwavering support, unconditional love, continuous encouragement and the personal sacrifices made while supporting me in this educational endeavour.

CHAPTER ONE: INTRODUCTION TO THE STUDY

Over the last few decades, many schools have experienced a massive infusion of information and communication technology (ICT). Motivated by the hope of improving student learning and achievement, researchers and educators have become acutely interested in the potential benefits of ICT in the classroom. The growing knowledge base accessible via the Internet as well as the opportunity to place new productivity applications and devices in the hands of students have sent schools and school boards scrambling to fund the acquisition of these technologies. States such as Maine and Texas have implemented state-wide laptop initiatives, Canadian school districts such as Peace River North have implemented large-scale pilot projects, and hundreds of independent, parochial and individual public schools have introduced programs which provide every student in particular grades with full-time access to laptop computers and wireless Internet access. The One Laptop per Child (OLPC) project, tailored to Canada and funded by The Belinda Stronach Foundation, since 2010 has given over 3,600 laptops to aboriginal youth across Canada. At the same time, the proliferation of computers in the workplace and the emergence of digital media and information literacy as vital 21st Century skills have implied that students would be ill-prepared for a knowledge-based economy unless ICT competencies were embedded in the curriculum. And despite parental anxiety about the potential distractions created by Internet access, such as social networking, a recent study in the UK found that the educational benefits outweighed the risks of such technologies and that students without access perceived themselves to be educationally disadvantaged (University of Oxford, 2012).

Responding to the wave of technology implementation efforts, governments have endeavoured to complete studies, produce reports and curriculum documents like *The Information and Communications Technology Integration Performance Standards*, released by the BC Ministry of Education in May of 2005 and intended to “support teachers and students as they use technology to enhance learning across the curriculum” (p. 1). New standards and expectations for teacher competencies have been created, such as *ISTE National Educational Technology Standards and Performance Indicators for Teachers* (2000). Studies have been released praising the benefits of technology use in specific educational jurisdictions including the Alberta Education report entitled *Emerging Technologies in the 21st Century* (2008), which summarized the results of technology innovation pilot projects in 14 different school jurisdictions. Despite the proliferation of studies and reports, considerable uncertainty remains about how best to embrace technology and harness its potential for educational purposes. This uncertainty is reflected in a recent Alberta Education report entitled *Inspiring Education* (2010):

The future will present more opportunities as digital technologies are embedded in everyday life and materials. If we are to shape the future of education and not have it shaped for us, we must become more purposeful in our approach to technology. We need to understand what may be emerging, its implications, and how it can be used for education. (p. 29)

This suggests that our use of technology in schools is currently rather experimental and may precede a complete understanding of its implications.

The eagerness to embrace technology in schools may have been prompted by some early studies supporting the hypothesis that effective use could improve educational outcomes (Dede, 1998; Gabel, 2004; Goldberg, Russell & Cook, 2003; Gulek & Demirtas, 2005; Rockman et al., 1998; Shaver, 2004). Dede (1998) points to four kinds

of improvements in educational outcomes resulting from “technology-based pedagogical strategies,” including increased learner motivation, mastery of advanced topics, students acting as experts do, and better results on standardized tests (p. 210). A study on the Wireless Writing Project in the Peace River North School District cited a 22% gain in the number of students producing writing samples that met the BC Performance Standards (Jeroski, 2003). MacArthur (2009) found that word processing and assistive technologies like word prediction and speech recognition were particularly helpful to students who struggled with writing. Practitioners using ICT in the classroom claimed that it created new, media-rich alternatives through which students could demonstrate their learning and that it allowed for more differentiated instruction and student-centered learning activities. More visionary writers like Cummins and Sayers (1995) pointed to the possibility that students from across the globe connected via the Internet in collaborative critical inquiries could “actively generate their own intercultural literacy through dialogue with colleagues in their own classroom and in classrooms across the globe” (p. 13).

With such exciting possibilities in sight, many schools have succeeded in securing the funding to implement extensive ICT programs including those that provide every student and teacher with her or his own laptop computer. In addition, students and teachers have been given access to the Internet through wireless networks and classrooms have been fitted with data projection, interactive white boards, and other hardware and software applications. Some schools offer remote access to school servers and on-line resources from anywhere via the Internet, and the phrase “anytime, anywhere learning” was coined to describe the transcending of traditional school boundaries like the classroom walls and the school day. The rapid development of new technologies such as tablets and smart mobile devices, and activities like social networking that are enabled,

present incredible challenges and opportunities for educators and policy makers attempting to come to terms with the dizzying pace of technology-driven change.

A focus of research on the integration of one-to-one computing has understandably centered on student achievement or other learning outcomes. These indicators are typically the primary measures of any educational innovation as they reflect the primary goals of the endeavour. But few studies have critically examined how the infusion of laptops and one-to-one computing (i.e., where each student has fulltime use of her or his own wireless computer) into classrooms has altered the dynamic and complex nature of teacher-student instructional interactions and their relationships as a whole. And this is true despite the existence of a substantive body of research that emphasizes the significant influence of teacher-student relationship quality on a wide range of educational outcomes. For example, strong teacher-student relationships relate positively to academic achievement (Birch & Ladd, 1997), student motivation (Christophel, 1990; Frymier, 1994), school adjustment (Hamre & Pianta, 2001), character development (DeVries, 1998) and social skills (Davis, 2006).

Because teacher-student relationship quality relates to such important educational outcomes, any intervention or innovation that has the potential to alter this relationship should be of great interest to educators and educational researchers. There is considerable evidence that extensive use of computers, the Internet and the new tools, learning resources and participant structures that these provide or enable, have the potential to impact single relationship variables, such as the balance of power (Mabry & Snow, 2006) and locus of control, as well as the teacher-student relationship as a whole (Schofield & Davison, 2003). Technology, like other educational innovations, impacts the target outcomes but also generates other unintended benefits or consequences. For example,

new tools and participant structures such as those offered by Wikis (on-line collaboration sites) and on-line discussion groups have the potential to modify or disrupt traditional classroom interactions. Wertsch (2002) alludes to this phenomenon in his discussion of the introduction of computer-mediated communication (e.g., email) and suggests, “it may be important to consider the possibility that one cannot simply add asynchronous communication tools into an existing mix of social and psychological processes without changing them in fundamental and perhaps unintended ways” (p. 106). The ways in which technology integration influences teacher-student interactions are of primary interest to this study. More specifically, this study examines the impact of ubiquitous computing on relational variables such as the balance of power, communication, closeness and caring as well as pedagogical variables such as the extent to which instruction is student-centered and variations in approaches to learning and the construction of knowledge.

The teacher-student relationship is both unique and complex. Interactions within the relationship have both pedagogical and relational or interpersonal implications. Relationship constructs such as closeness or liking and the interactions that create and maintain those would fall within the relational domain. Interactions associated more directly with instruction such as lecturing could be considered pedagogical in nature. The ways in which teachers and students deploy technology in the classroom can influence these interactions and thereby affect relationship quality and character. One common theme in the literature points to how the use of ICT influences the position of the teacher within the learning process; moving from teacher-centered to student-centered approaches or from the traditional role of dispenser of knowledge to learning facilitator. For example, Tapscott (1998) argues that the teacher is no longer an “instructional

transmitter”. “He [or she] is a facilitator of social learning whereby learners construct their own knowledge” (p. 148).

The shift from transmitter to facilitator describes one potential, fundamental change in the pedagogical relationship between teacher and student. But laptops and wireless networks have also given students greater access to information and alternative avenues for communication such as instant messaging, email, and on-line discussion capabilities. These have the potential to alter traditional communication patterns and other processes or dynamics within the personal or non-pedagogical elements of the teacher-student relationship and perhaps in the classroom culture as a whole. For instance, Niles (2006) found that opportunities for students and teachers to communicate through email and instant messaging removed some traditional communication boundaries and positively influenced both teachers’ and students’ perceptions of their interpersonal relationships. Students discovered personal interests they shared with their teachers through online communications such as sports and music and this facilitated a better understanding of one another. Students and teachers also reported that the increased privacy perceived in electronic communications helped to alleviate embarrassment associated with asking questions in the classroom setting.

Many of today’s students are more comfortable with technology— more so than teachers. As Tapscott (1998) points out: “Because N-Gen children are born with technology, they assimilate it. Adults must accommodate – a different and much more difficult learning process” (p. 40). As a result, teachers often struggle with technology in the classroom and have to solve technical problems or modify their lesson plans (Wise & Groom, 1996). Observing such struggles or helping teachers to resolve them may also change the students’ perception of the teacher as expert or perhaps even alter the power

dynamic in the teacher-student relationship. In their study of Scottish schools, Condie and Simpson (2004) found that approximately 30% of teachers, “were disturbed by the pupils’ apparent competence in the technologies and they were uncomfortable that the students knew more than they did” (p. 78).

Other aspects of the teacher-student relationship worthy of examination within technology-rich environments include: the shifting roles of teachers and students, sharing of power and control, teacher immediacy, student engagement and motivation, student autonomy in learning and new roles and challenges for teachers created by student access to the Internet such as ethics, safety and web-based content censoring. For example, Internet-based communication tools such as email and social networking have created both new challenges and opportunities for teacher-student relationships. Online student-teacher interactions such as the cultivation of inappropriate relationships or self-disclosures have furnished horrifying newspaper headlines and underscored the need to redraw or clarify boundaries. Teachers’ roles in monitoring and responding to cyber-bullying and access to inappropriate web-based content are unclear. Taken collectively, these themes illuminate the significant implications of technology implementation with respect to its potential to alter teacher-student relationships, which in turn have a material influence on other important educational outcomes.

Rationale for this Study

Teaching is, by nature, a relational process or activity. As Burbules (1986) stated in a discussion of power in education, “we should conceive of education as a relational activity, not as the transmission of established truths and values from privileged expert to naive recipient” (p. 112). If indeed the introduction of laptop computing has the potential

to alter the traditional relationship between teacher and student, including the balance of power within that relationship, it would be useful to understand how and why. Since the quality of this unique relationship has been shown to influence important factors such as students' motivation, academic outcomes, school adjustment, character development and social skills, it would be valuable to understand how it may be influenced by technological innovation in the classroom.

If the teacher-student relationship is indeed influenced by the deployment of technologies, a deeper understanding of these issues may also serve to inform pedagogy and relationship development in technology-rich school environments. New knowledge in this area may have implications for teacher pre-service and in-service education, and for teacher evaluation, which should also be framed by current context. It may also be useful in the development of technology-based instructional strategies that do not have unintended or undesirable influences on the teacher-student relationship.

Laptops represent the first wave of wireless, one-to-one computing programs in schools. The relatively high cost of such programs has limited their proliferation. However, as newer, less expensive alternatives emerge (e.g., tablets, smart phones) it seems likely that the infusion of technology into classrooms will expand and accelerate. Under such conditions, it will be even more critical to understand the impact that this could have on teacher-student relationship quality because of its ramifications for important educational outcomes.

Purpose of this Study

The purpose of this study was to develop an understanding of independent school teachers' perceptions of how a one-to-one computing program influences various

dimensions of the teacher-student relationship and the roles of teachers and students within that relationship. To this end, the following research questions were developed:

1. How does one-to-one computing influence the role of the teacher with respect to the pedagogical relationship?
2. How does the increased access to information afforded by one-to-one computing influence the teacher-student relationship with respect to learner autonomy and teacher control?
3. How has one-to-one computing shaped the nature and patterns of communication between teachers and students?
4. How do one-to-one computing and laptop-enabled electronic communication affect the closeness of teacher-student relationships?

New knowledge in this area can shape the future use of technology in schools by informing educational practice and broadening the perspective on decision making to include important relational considerations among teachers and students. It might also serve to broaden the discourse on all educational innovations in such a way that teacher-student relationships are seen as central rather than peripheral to the resulting decisions and policy directions.

Position of the Researcher

I have served as a teacher and administrator in public and independent schools for more than 32 years. For the last 17, I have worked as an independent school leader and was instrumental in the introduction of laptop (also known as ubiquitous or one-to-one) computing programs in two different independent schools. The first of those programs

has been in place for almost 15 years. Independent schools were among the first schools in Canada to implement one-to-one computing and therefore have extensive experience upon which to draw. In 2006, The Canadian Educational Standards Institute (CESI) published a study entitled *Technology in Canadian Independent Schools: A Report on Effective Practice* which drew upon school visits and feedback from over 200 independent school educators including teachers from both of the schools in which I worked. Our participation in that study and review of the final report provided insights into how our school compared with other independent schools across Canada. It also inspired me to think about what things the report had not considered and what areas remained to be explored.

Independent schools place a very strong emphasis on teacher-student relationships. Teachers are generally expected to extend their relationships beyond the classroom through involvement in co-curricular programs, coaching, tutoring, community service and educational travel with students. Many independent schools also have boarding students, which can extend the duty of care and the relationships well beyond regular school hours. Because independent schools are often smaller and more intimate communities frequently including grades K through 12, students and teachers may find themselves in enduring relationships that even extend into the alumni phase. In my conversations with alumni at reunions and school functions over the years, they have frequently identified relationships with their teachers among the most valuable and memorable aspects of their school lives. This was also evident in an extensive alumni survey recently conducted by my current school. The high value placed on these relationships elevates my research interest in how they might be influenced by technology use.

Given my involvement in and advocacy for the implementation of laptop computing programs, I must acknowledge my own bias as a researcher who believes that ICT has the potential to enhance learning under the right conditions. I also acknowledge that the research conducted by the two technology committees charged with determining how best to deploy technology in our schools did not consider or consult research on how ubiquitous computing might influence teacher-student relationships. Instead, we focused on pedagogical issues, the logistical issues presented by an unsatisfied demand for greater access to computing facilities, and the rising costs of building technology infrastructures in our schools in the form of computer labs. Once those committees arrived at the decision that one-to-one computing was the best option, I was on the front lines when it came to convincing teachers, parents, and board members that this was the best approach. In essence, my role was to champion the laptop programs and that required conviction on my part and the ability to make a compelling case. For these reasons, it is important to recognize and acknowledge any bias that this might bring to bear on the current study.

In order to further clarify my perspective and position, and to explain my rationale for selection of the site for this case study, I present the following: From 1992 to 1999 I served as the Director of the Senior High at the same school where I have now been the Head of School since 2007. From 1997-1999 I served as a member of the technology committee who proposed the introduction of laptops. In 1999, I moved to serve as the head of another independent school. Faced with similar challenges there, I struck another technology committee to determine within the specific context of that school, what would be the best solution for technology integration. Once again, a one-to-one laptop program was proposed. In both of these settings, I would be considered an “indigenous insider” according to Banks’ *Typology of Crosscultural Researchers* (1998, p. 8). Having spent

considerable time working in both institutions, I have been socialized within their cultures, embraced their values and I am knowledgeable about the communities. Conducting the research in my current school (where I was instrumental in introducing the first laptop program nearly 15 years ago) would have been much more convenient in that it would have eliminated the need for travel as well as certain obstacles to data collection. However, as Creswell (2007) points out, “conducting research in one’s own workplace raises questions about whether good data can be collected when the act of data collection may introduce a power imbalance between the researcher and the individuals being studied” (p. 122). My position as the Head of School would have exacerbated that power imbalance. For this reason, I believed that conducting the case study in my previous school, five years later, would still provide good access to documents and data and enable me to capitalize on some of the rapport that had already been built without introducing power dynamics that could compromise validity or reliability.

A primary focus of the Doctor of Education Program (EdD) in Educational Leadership and Policy at the University of British Columbia is to provide students with opportunities to critically reflect on their own professional practice. The context of my practice over the last 21 years has been Canadian independent schools and during that time, I have taken great interest and been deeply involved in the integration of technology into the classroom. For these reasons, further study of the implications of technology deployment in independent schools forms a natural extension of my learning that seems congruent with the aims of the EdD Program.

Overview of the Dissertation

Chapter One included an introduction to the topic including the background,

rationale, purpose and significance of the research as well as the position of the researcher. It identified the specific research questions and an outline of the dissertation.

Chapter Two provides a review of the academic literature on various dimensions and variables of the teacher-student relationship. It also examines theoretical concepts related to learning with technology and its influence on teacher-student relationships. Since there is no single or dominant, broadly accepted theoretical construct that has guided or influenced recent research on teacher-student relationships and how they are influenced by technology, it seemed more appropriate to review a broad range of literature germane to this topic, as opposed to an in-depth exploration of one or two theories.

Chapter Three details the research methods including data collection and analysis and Chapter Four presents the findings of this study. Three major findings are presented as well as a number of related sub-themes. In Chapter Five, the findings are discussed within the context of the academic literature reviewed in Chapter Three.

Chapter Six includes a brief summary of the dissertation and overall conclusions about teachers' perceptions of the influence of technology on teacher-student relationships. It also discusses the limitations of the study and offers some recommendations for teachers, teacher education programs, administrators, policy makers and educational researchers.

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

A variety of theoretical constructs are embedded within the literature concerning teacher-student relationships. Some of these concepts fall more within the pedagogical domain of the relationship such as the extent to which instruction is teacher or student-centred. Others, like teacher immediacy, speak more to the personal aspect of this unique relationship. In addition, there are those constructs such as power, authority and control that bridge the pedagogical and interpersonal domains within the relationship. In the end, it is likely not possible to disentangle these domains or neatly categorize relational elements within them. Instead, this literature review strives to identify and examine a broad range of academic literature related to the purpose of this study—to understand teachers' perceptions of how a one-to-one, laptop computing program influences various dimensions of the teacher-student relationship and the roles of teachers and students within that relationship.

This literature review begins with a section that reveals the significance of the teacher-student relationship with respect to important learner outcomes such as motivation to learn, and examines its uniqueness in comparison with other kinds of relationships. The following sections align with the four research questions that frame this study as outlined in Chapter One. The first examines the influence of technology on pedagogical interactions, roles and relationships through the lenses of different learning theories or constructs such as learner-centeredness, constructivism, sociocultural theory, situated learning and individualization. The second section presents literature on the balance of power and control within the teacher-student relationship and provides the

foundation for understanding how technology use might influence aspects of learner empowerment and autonomy. Section three reviews literature on computer-mediated communication (CMC) such as email and online discussions to serve as background for the third research question, which seeks to understand how one-to-one computing shapes the nature and patterns of communications between teachers and students within the context of their relationships. Finally, section four introduces literature on significant relational variables or interpersonal elements of the teacher-student relationship; particularly the concept of closeness and related aspects such as trust, caring and supportiveness. These variables are examined with a view to facilitating an understanding of how technology-enabled communications might influence these interpersonal dimensions of the relationship.

The Significance and Uniqueness of Teacher-Student Relationships

The quality of teacher-student relationships is significant because constructive and supportive relationships have been shown to have a positive impact on students' motivation (Christophel, 1990; Frymier, 1994; Wentzel, 1998), academic outcomes (Birch & Ladd, 1997; Davis, 2006), character development (deVries, 1998), school adjustment (Hamre & Pianta, 2001) and other aspects of their school experience. Pianta and Shulman (2004) argued that "the development of children's early competencies in several domains has been linked to (and is perhaps facilitated by) the quality of the teacher-student relationship" (p. 445). The network of relationships that students find themselves surrounded by in schools, including those with teachers, form "the context for the child's construction of the self, of others, and of subject-matter knowledge" (deVries,

1998, p. 2). The influence of teacher-student relationship quality on such critical student outcomes underscores their importance.

The Influence of Relationship Quality on School Adjustment

Several of the points mentioned above, such as adjustment to school and student motivation, are worthy of further discussion. There is considerable evidence that the quality of teacher-student relationships, particularly in the early years of schooling, has a significant impact on students' adjustment or adaptation to school and may even be a predictor of school competency. Birch and Ladd (1997) identified three distinct elements of the teacher-student relationship that related to school adjustment including closeness, conflict and dependency. They found that dependency correlated negatively with school adjustment in the areas of academic performance, school attitude and school involvement or engagement. Higher degrees of conflict were related to negative school attitudes and school avoidance, and closeness had a positive relation with school attitudes. They explain that "children who share a close relationship with the teacher may perceive the school environment as a supportive one, and this may promote positive attitudes towards school" (p. 76).

Students' self-reported perceptions of their relationships with teachers and bonds to school have also been shown to be predictors of school adjustment. Murray and Greenberg (2000) classified students into four groups (dysfunctional, dysfunctional/average, positively involved and school anxious) based upon the students' perceptions of their relationships with teachers and feelings of connection to school. They found high correlations between students' perceptions and their social, emotional and academic adjustment. It also appears that students' perceptions of their relationships with

teachers have an enduring influence on adjustment outcomes and Murray and Greenberg have suggested “that the majority of young children are developing adequate or prosocial relationships with their teachers and such patterns appear to remain relatively stable into middle childhood” (p. 440). Pianta and Schulman’s (2004) work provides further support for the idea that teachers’ perceptions of their relationship with young students (kindergarten and grade 1) are related to students’ behavioural and social outcomes in school. They found a number of relational indicators that predicted “social and teacher-rated academic skills in first grade” (p. 454).

While many of the studies on school adjustment or adaptation focus on students’ experiences and social, emotional or academic outcomes in the early years of schooling, there is also evidence to support the notion that teacher-student relationship quality has a more enduring influence. Hamre and Pianta (2001) studied early teacher-child relationships and their trajectory through eighth grade. Results of their study suggest that “early teacher-child relationships, as experienced and described in kindergarten by teachers, are unique predictors of academic and behavioral outcomes in early elementary school, with mediated effects through eighth grade” (p. 634). They also argued that the child’s ability to form relationships with teachers predicted future “academic and behavioral adjustment in school,” although there was a higher correlation with behavioural over academic outcomes (p. 634).

Some research has examined student adjustment/adaptation to school through the lens of attachment theory. Bowlby (1969/1982) described children’s attachment relationships with their caregivers as secure or insecure. Building on this work, Lynch and Cicchetti (1997) studied students’ relationships with teachers, adults and peers as they made the transition from elementary to junior high school. They were encouraged to

find that 71.6% of students in their sample group “reported having a secure pattern of relatedness with either their teacher, their classmates or both of these partners” (p. 93). Their findings also suggest that middle-school children feel less secure in their relationships with their teachers than elementary students and positive relationships with peers and teachers increase the likelihood of student engagement in school. Overall, students’ adjustment to their school environment in terms of social, emotional and certain academic outcomes can be influenced by the quality of their relationships with teachers, particularly in the formative, early years of their education.

Relationship Quality and Student Motivation

Davis (2006) developed a framework for understanding relationship quality between middle school students and their teachers drawing from the literature on motivation, attachment and sociocultural theories. Her findings indicated that students who developed positive relationship “schemas” and had favourable perceptions of their teacher-student relationships reported higher levels of motivation, received higher grades and higher assessments of their social skills (p. 206). Students who perceived supportive relationships with their teachers also found their schoolwork to be more engaging and relevant. Teachers in the same study perceived that positive relationships with students increased the likelihood of them taking risks, extending effort and demonstrating positive attitudes toward learning.

Other studies have also revealed links between teacher-student relationship quality and student motivation. Goodenow (1993) looked at students’ sense of belonging in school and how this is influenced by teacher-student relationship quality. She argued that trusting relationships are prerequisites for student learning and success, and teacher

support correlates with motivation to learn and self-worth. “Belonging may influence motivation more directly as well in terms of its effects on interest, classroom affect and intrinsic value,” she found (p. 185). Deci (1992) also claimed that positive interpersonal relationships can create a feeling of belonging which in turn motivates students’ interest in school.

Influence on Peer Relationships

A final point highlighting the significance of the teacher-student relationship has to do with the manifestation of students’ perceptions of these in relations with their peers. Hughes, Cavell and Willson (2001) found that students used information gleaned from their observations of teachers’ relationships with other students to make judgments about the likeability of those students. Students who were in conflict with the teacher as a result of their classroom behaviour were viewed by peers as socially less preferable whereas students who maintained more harmonious and supportive relationships with their teachers were more accepted by their peers. The significance of this is elevated by Wentzel’s (1998) finding that perceived support from peers motivated students to adopt prosocial behaviours, which in turn have a positive influence on other student outcomes. Taken together, these findings suggest that in addition to the aforementioned benefits of positive teacher-student relationships with respect to academic achievement, motivation, school adjustment and other individual student outcomes, the teacher-student relationship also has the potential to influence the peer-to-peer aspect of the school experience, which is an important element of the social context for learning and classroom climate.

The Uniqueness of the Teacher-Student Relationship

The teacher-student relationship differs fundamentally from other interpersonal relationships such as parent-child relationships, friendships and more intimate or romantic relationships in that its primary objective is learning. This shared objective creates many expectations, establishes roles and sets in motion a dynamic and complex series of interactions. Muller, Katz and Dance (1999) argue that “the anticipation of achievement and success” is a vital aspect of the teacher-student relationships and failure to live up to certain roles and expectations may result in withdrawal from it. They also describe an “effective student-teacher relationship” as one that “involves the dynamic combination of expectations, caring, and feedback and rewards (in the form of grades)” (p. 329).

Besides the unique purpose of the relationship, other fundamental differences are also apparent. For example, Frymier and Houser (2000) identified two differences between teacher-student relationships and friendship relationships. Firstly, teacher-student relationships lack the equality of a friendship due to disparities in power, knowledge and other dimensions of the relationship. Extending from the technical to the professional realm, for the most part in K-12 schooling, teacher and friend in the teacher-student relationship are mutually exclusive. Secondly, the teacher-student relationship “has time constraints not typical of friendships” (p. 208). That is to say that the relationship usually has a defined starting point and ending point, even though some students and teachers remain connected after they share a classroom.

On the other hand, the teacher-student relationship has certain things in common with other types of relationships. For example, the teacher-student relationship develops through a series of phases evolving from the initial point of contact through a more

intimate period to a conclusion or separation (DeVito, 1986). Newberry (2010) identified four phases that are continuously revisited or recycled while establishing or maintaining teacher-student relationships. During the “Appraisal Phase” individuals gather information, get to know one another and begin to understand their roles. These initial perceptions shape expectations, the nature of interactions and the power structure and establish “attachments and affinity” (p. 1697). Testing, agreement and planning phases follow and parties revisit different phases as the relationship develops. For example, students may explore boundaries and limits during the testing phase, which may lead to a return to the appraisal phase where expectations might be revisited or re-established. Eventually, agreements are established around rules and expectations and the planning phase includes reflection on the past and planning for the future. According to Newberry, “These phases help us to recognize the transition that can take place in a relationship as it changes from one of duty to one of care” (p. 1698).

Both parties pursue certain goals through this relationship and the achievement of these requires negotiation, conflict resolution, the exchange of information, adjusting to expectations and a host of other “communication intensive” interactions (Frymier & Houser, 2000, p. 208). Consequently, variables such as communication style play a significant role in the quality of these relationships. The teacher-student relationship can also be characterized by elements common to other forms of relationships including conflict, closeness, warmth, dependency, expectations and a host of other dimensions (Frymier, 2000; Birch & Ladd, 1997; Pianta, 1999). Several of these are discussed further in later sections.

Demographic Influences on Teacher-Student Relationships

There is evidence within the literature that student demographic variables such as race, gender, socio-economic and disability status influence teacher-student relationships (e.g. Murray & Murray, 2004). That literature was not included in this review because this study did not examine teachers' relationships with individual students. However, there is one demographic factor worthy of discussion here and that is the generational difference that often exists between teachers and students as a result of their age difference. Of particular relevance to this case study is the difference between generations that have grown up with computer technology and those for whom it appeared later in life. Within the literature on student and teacher use of technology, we find terms such as digital natives (Prensky, 2001), the Net Generation (Tapscott, 1998), the Millennial Generation (Strauss & Howe, 1997) and the Nintendo Generation (Green, Ried, & Bigum, 1998) that describe a post-baby boom generation who grew up (or are growing up) using technology. This literature is relevant to this study because the purported differences between "Digital Natives" and older generations of teachers referred to by Prensky as digital immigrants have implications for teaching and student-teacher relationships.

The Net Generation grew up surrounded by digital technologies including computers, video games, cameras, cell phones, CD-ROMS, the Internet and all of the connections and activities enabled by them. Some believe that this holds great social and cultural significance. For example, Tapscott (2001) writes,

For the first time in history, children are more comfortable, knowledgeable, and literate than their parents about an innovation central to society. And it is through the use of the digital media that the

N-Generation will develop and superimpose its culture on the rest of society...They are a force for social transformation. (p. 4)

In addition to the sociocultural implications, there have been claims that the unique characteristics of this generation also have significant implications for their learning. Examples include their preferences for receiving information quickly, graphically and in non-linear formats such as those experienced using hypertext (Prensky, 2001). They intuitively interpret visual images, have strong visual-spatial skills that make them adept at integrating the virtual and the physical, prefer to discover rather than being told, shift attention among tasks rapidly, and expect and deliver quick responses (Oblinger & Oblinger, 2005).

Some predict the generational differences between students and teachers will pose an enormous problem. For example, “the single biggest problem facing education today is that our Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language” (Prensky, 2001, p. 2). Still others refute such claims describing them as hyperbolic, under-theorized or under-researched. For example, Bennett and Maton (2010) assert that it is not possible to generalize about this generation because they have grown up with “different histories” with respect to their access to technology and the resulting differences in their related opportunities and activities (p. 323). They also found significant variations in technology related activities and experiences across gender, age and socio-economic status that nullify generalizations. “So while some young people might be regarded as ‘digital natives’, there are by no means characteristics shared by all young people simply because of their exposure to digital technologies” (p. 325) (see also Guo, Dobson & Petrina, 2008).

In the end, it would appear that the digital native debate would benefit from additional research. Today's students certainly make use of technology to access information and to build and maintain social connections. Some use collaborative knowledge creation tools to support their learning and most are familiar with and make regular use of laptops, cell phones, digital cameras and web-based learning resources. But it is unclear to what extent growing up during the digital era has created generational differences between them and their teachers that will have a significant bearing on the way that they learn or their relationships with their teachers.

This section has presented literature that illuminates the significance of the teacher-student relationship quality in shaping important learner outcomes including student motivation, academic outcomes, school adjustment/adaptation and peer relations. It has explored the uniqueness of these relationships and how they differ from other types of relationships. The following sections present literature organized around the four research questions. The first of these presents research on how the use of technology has the potential to influence the pedagogical aspect of teacher-student relationships viewed from the perspective of different approaches to learning.

The Influence of Technology on Pedagogical Aspects of the Teacher-Student Relationship

This section examines literature on different approaches to teaching and learning and how the use of one-to-one computing can serve as a catalyst in the alteration of pedagogy and subsequently the roles of teachers and students within the context of their relationships. Specifically, it looks at pedagogy and learning from the perspectives of Learner-Centered Psychological Principles (LCPPs), constructivism, sociocultural

learning theory and situated learning. It also explores literature on the role that technology can play in the facilitation of small group and individual learning.

Learner-Centered Instruction

One of the key elements of the teacher-student relationship most frequently discussed in the literature is the focus of instruction and the potentially catalytic role of computers in causing a pedagogical shift from teacher-centered to student-centered approaches to learning (Kerr, 2004; Kozma & Shank, 1998; McCombs & Vakili, 2005; Schofield et al., 1997; Smeets & Mooji, 2001; Wheeler, 2001;). Tapscott (1998) describes this as a shift from “broadcast to interactive learning” whereby the teacher’s primary role becomes designing the learning experience and mediating the students’ interactions with the technology and the Internet. Learner-centered classroom environments and pedagogical approaches have been shown to have a positive influence on certain learner outcomes (McCombs, 2003; McCombs, Daniels & Perry, 2004; Cornelius-White, 2007, Davis, 2006) and are worthy of further discussion here since technology has been shown to foster such approaches.

The American Psychological Association (APA) (1997) developed 14 research-based, learner-centered principles (Table 2.1) to provide a framework for developing effective learning environments as part of the school reform movement. Drawing on those principles, McCombs (2001) defined learner-centered as, “the perspective that couples a focus on individual learners – their heredity, experiences, perspectives, backgrounds, talents, interests, capacities and needs — with a focus on learning — the best available knowledge about learning, how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning, and

achievement for all learners” (p. 186). McCombs (2003) described learner-centered teachers as those who know their subject area well, but who also have the ability to shift roles between teacher and learner thereby sharing the “ownership of their learning” with students when appropriate to do so (p. 96). McCombs et al. (2008) found that students experiencing learner-centered practices had a more positive appraisal of their own abilities, were more motivated to learn and achieve and had “positive lifelong learning skills” (p. 30).

Table 2.1. Learner-Centered Psychological Principles

LEARNER-CENTERED PSYCHOLOGICAL PRINCIPLES A Framework for School <i>Reform & Redesign</i>	
Cognitive and Metacognitive Factors	
1. Nature of the learning process	The learning of complex subject matter is most effective when it is an intentional process of constructing meaning from information and experience.
2. Goals of the learning process.	The successful learner, over time and with support and instructional guidance, can create meaningful, coherent representations of knowledge.
3. Construction of knowledge.	The successful learner can link new information with existing knowledge in meaningful ways.
4. Strategic thinking.	The successful learner can create and use a repertoire of thinking and reasoning strategies to achieve complex learning goals.
5. Thinking about thinking.	Higher order strategies for selecting and monitoring mental operations facilitate creative and critical thinking.
6. Context of learning.	Learning is influenced by environmental factors, including culture, technology, and instructional practices.

Table 2.1. Learner-Centered Psychological Principles

Motivational and Affective Factors
<p>7. Motivational and emotional influences on learning What and how much is learned is influenced by the motivation. Motivation to learn, in turn, is influenced by the individual's emotional states, beliefs, interests and goals, and habits of thinking.</p>
<p>8. Intrinsic motivation to learn. The learner's creativity, higher order thinking, and natural curiosity all contribute to motivation to learn. Intrinsic motivation is stimulated by tasks of optimal novelty and difficulty, relevant to personal interests, and providing for personal choice and control.</p>
<p>9. Effects of motivation on effort. Acquisition of complex knowledge and skills requires extended learner effort and guided practice. Without learners' motivation to learn, the willingness to exert this effort is unlikely without coercion.</p>
Developmental and Social Factors
<p>10. Developmental influences on learning. As individuals develop, there are different opportunities and constraints for learning. Learning is most effective when differential development within and across physical, intellectual, emotional and social domains is taken into account.</p>
<p>11. Social influences on learning. Learning is influenced by social interactions, interpersonal relations, and communication with others.</p>
Individual Differences Factors
<p>12. Individual differences in learning. Learners have different strategies, approaches, and capabilities for learning that are a function of prior experience and heredity.</p>
<p>13. Learning and diversity. Learning is most effective when differences in learners' linguistic, cultural, and social backgrounds are taken into account.</p>
<p>14. Standards and assessment. Setting appropriately high and challenging standards and assessing the learner as well as learning process – including diagnostic, process, and outcome assessment – are integral parts of the learning process.</p>

A number of other learner-centered teacher variables have been found to relate positively to cognitive, affective and behavioural student outcomes. Cornelius-White (2007) undertook a meta-analysis of 119 studies on learner-centered teacher-student relationships. In the cognitive domain he found unusually high correlations between learner-centered teaching and students' critical and creative thinking skills. Behavioral or affective outcomes showed positive relations between learner-centered education and participation, satisfaction and motivation to learn suggesting high levels of engagement in learner-centered classrooms. Correlations between learner-centered instruction and self-esteem, and social skills and connections indicate that another benefit is improved relationships.

McCombs and Vakili (2008) have also argued that technology has the potential to transform traditional models of learning because it enables content to be “customized” to address individual students’ “needs, abilities, interests, goals and other characteristics” (p. 1587). It can also provide students with direct access to knowledge and connect them with a broader learning community beyond the classroom walls and other traditional educational boundaries. This supports a number of the *LCPP* including: the notion that motivation is stimulated by students’ interests and personal choice; effective learning occurs when meaning is constructed from information and experience; and, learning is fostered through social interactions and communications including those enabled by technology. McCombs and Vakili also point to the potential for technology to alter the role of teachers within the learner-centered framework and contribute to their social and interpersonal growth. “Technology can be used to change the role of teachers to that of colearners and contributors to the social and interpersonal development of students,

counterbalancing the potential of computers to cause personal and social isolation and alienation” (p. 1596).

Learner-centered pedagogies and classroom environments clearly offer a range of benefits to students, teachers and their relationships. Technology-based instructional strategies that facilitate or instigate a shift to more learner-centered pedagogies should assist in realizing those benefits.

Constructivism and Sociocultural Learning Theory

Many educators and educational theorists embrace constructivist or sociocultural theories of cognitive development or advocate for constructivist approaches to pedagogy (Tharp et al., 2000; Vygotsky, 1978; Wertsch, 1998). In addition, some writers argue that technology supports or even encourages constructivist approaches to learning (Becker & Ravitz, 1999; Jonassen, Peck & Wilson, 1999). Teachers skilled in technology-based pedagogies often utilize constructivist approaches to learning using ICT as a means to enable student access to the knowledge base (Judson, 2006; Lim & Barnes, 2002; Schacter & Fagnano, 1999). For these reasons, some exploration of the literature on constructivism and sociocultural learning theories is relevant to this study.

Constructivists believe that learners construct their own knowledge through experiences and that knowledge cannot be transmitted directly from teacher to student. As Tharp et al. (2000) explain, “knowledge is not somehow poured into the “empty mind” of a learner. Instead, learners construct their own knowledge through their experiences with the material of the world and by observing how that material responds to their attempts to manipulate and explain it” (p. 44). Sociocultural learning theory draws on the work of Vygotsky and Dewey and extends constructivist theory by

acknowledging that the construction of knowledge occurs within a “*social context of relationships*” and that social context is shaped by social, cultural and historical elements (Tharp et al., p. 44, italics in original). Cognitive development occurs as the result of joint activities among participants, which in schools include teachers and students.

There are a number of important concepts and strategies associated with sociocultural approaches to teaching. The first is the notion that a more competent or more knowledgeable other guides and mediates the interactions between the learner and the environment (i.e., resources, tools, peers and so on) within the zone of proximal development or the ZPD. The ZPD is that zone wherein the learner, with the assistance of the more knowledgeable or competent other, can perform at a level that is above their unassisted capabilities. Vygotsky (1978) described it as, “*Distance between the actual development level as determined by 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, italics in original). The more knowledgeable other employs various strategies as part of their mediation role to optimize learning including scaffolding, guided participation, and fading (Hennessey, Deaney & Ruthven, 2005). Scaffolding refers to the assistance provided to the learner enabling them to “engage more successfully at the expanding limits of their competence” within the ZPD. This support is seen as temporary and adjusted as required by the student’s progress. Guided participation refers to structuring tasks into manageable chunks that allow the learner to gradually approach independence and fading refers to the gradual withdrawal of assistance as the learner’s competence increases (pp. 266-267).

A present-day interpretation of this theory within the context of technology-rich learning environments could view the “more knowledgeable others” as students or

teachers (Sutherland et al., 2004, p. 419). Additionally, the access to knowledge afforded by ubiquitous computing introduces another potent learning resource with which the students' interaction must be mediated by the teacher. Based on their study of emerging teacher mediation strategies for using technology in secondary classrooms, Hennessy et al. (2005) concluded that these "evolving pedagogic roles" of teachers are "highly complex and demanding." They also stated that, "They require a combination of diverse proactive and responsive strategies for mediating interactions between pupils and technology, and they involve increased levels of interaction with smaller groups of students" (p. 288). This form of mediation may be new to teachers not trained or experienced in technology-rich classrooms and may, in fact, not be a part of their skill set at all.

There is substantial evidence to suggest that appropriate use of technology can support sociocultural approaches to learning. Jonassen et al. (1999) argue that if computers are utilized effectively and not as delivery mechanisms, they can support the students' construction of knowledge in a variety of ways. These include: accessing information; comparing perspectives and world views, representing learners' ideas and understandings, collaboration with others, exploring knowledge to support learning-by-construction, exploring real world problems and many others (p. 13). However, the literature does not provide a clear answer to the question of whether or not technology serves as a catalyst in transforming teachers' pedagogical practices to more constructivist approaches. Hennessey et al. (2005) drew on sociocultural theory to analyze how teachers used technology to structure learning activities around what they referred to as "Technology-integrated Instructional Conversations" (TICs). TICs are interactions among teachers, students and computers as the teacher mediates the students' interactions

with technology and digital information resources. These conversations include questioning, guiding, probing and providing feedback as students engage in computer-based learning activities. They concluded that technology can act as a “catalyst in stimulating teachers and pupils to work in new ways” (p. 285). Becker and Ravitz (1999) conducted research at 153 schools of the National School Network to determine whether schools with good technological infrastructures and support networks experienced a shift to more constructivist instructional practices. They claimed that, “the relationship between technology use and pedagogical change is truly causal and not the mere conjunction of innovative teachers who happen to both use technology and develop a more constructivist pedagogy” (p. 381). However, they are quick to qualify this statement indicating that questions remain as to whether this “causal impact” may apply only to teachers who were already predisposed to constructivist approaches and computers simply provided the tools to enable them. Windschitl and Sahl (2002) found that the availability of ubiquitous computing alone did not precipitate a shift toward more constructivist practices but that computers acted as a catalyst in shifting pedagogy where there was a pre-existing dissatisfaction with teacher-centered pedagogies. It appears that more research will be necessary in order to clearly understand the relationship between technology and the adoption of constructivist pedagogies.

Situated Learning

Situated learning (Lave & Wenger, 1991) shares an important element with sociocultural learning theory in its recognition that learning is “situated” in certain forms of social co-participation. Their notion of being “situated” goes beyond the idea of “learning by doing” and proposes that, “learning is an integral and inseparable aspect of

social practice” (p. 31). Situated learning contrasts slightly with sociocultural theory in the greater emphasis that it places on the evolving relations between “newcomers” (apprentices or students) and “old-timers” (masters or teachers). It evolved from the idea of apprenticeship whereby apprentices acquired the skills of experts as well as the cultural elements of their practices. Rogoff (1990) viewed children’s cognitive development as a form of apprenticeship. She developed the concept of *guided participation* to describe the collaboration between children and their teachers or caregivers and the process which gradually moved them toward becoming “skilled practitioners within their communities” (p. 8). She also presents the underlying concept of *intersubjectivity* which she describes as, “a sharing of focus and purpose between children and their more skilled partners and their challenging and exploring peers” (p. 8).

A central and defining concept of situated learning is the idea of “legitimate peripheral participation” whereby learners begin by taking on limited roles in an activity gradually accepting more active roles and greater responsibility for the outcomes and moving toward full participation in the “sociocultural practices of a community” (Lave & Wenger, 1991, p. 29). Like Vygotsky’s work, the concepts of situated learning and cognitive apprenticeship both include the idea of a more competent or more knowledgeable other guiding participation and, according to Lave and Wenger, sometimes limiting the participation of learners. They argue that, “legitimate peripherality is a complex notion, implicated in social structures involving relations of power” (p. 36). Those power relations may determine the extent to, or the pace at which, one moves toward full participation.

Ubiquitous computing and Internet access might alter the nature of legitimate peripheral participation within the context of technology-rich classrooms. Students have

direct access to the knowledge base and may rely less on the “master” to approach expert performances in certain areas. Learning is still socially embedded, but the nature of social learning interactions may be altered, particularly in the nature of guided participation. Besides having direct access to the knowledge base, some students may be more skilled than their teachers in using the technology itself and more adept at learning new applications without assistance. They may indeed be the more competent or more knowledgeable other in certain respects. Easy access to abundant content means that they may bring information or content to the table that exceeds or challenges the teacher’s knowledge and this may blur or alter the roles of master and apprentice, even though the social hierarchy of the classroom remains intact.

Individual and Small Group Instruction

A number of studies have shown that effective use of ICT allows students to become more engaged and independent in their learning (Christopher & Kee, 2006; Condie & Simpson, 2004; Deaney, Ruthven & Hennesey, 2003). This phenomenon suggests that teachers may spend more time working with individual students as opposed to large-group, teacher-directed instruction. In their survey of over 600 teachers using technology, Scheingold and Hadley (1990) reported that 53 percent spent less time lecturing to the entire class, over 70 percent spent more time working with individuals and 61 percent felt that they were better able to meet individual student needs. In their study of the use of a software program to teach an A-level Economics course, Lim and Barnes (2002) found that teachers were able to “time interventions differently for different students” (p. 31). This individualization of the learning process through

increased teacher engagement with those students of higher need provided more flexibility for the teacher and optimized her or his use of instruction time.

As ICT enables the teacher to move away from lecturing and other modes of direct, large-group instruction, the opportunities for small-group, collaborative learning increase. Both Piaget and Vygotsky emphasized the value of learning in the social settings offered by small peer groups long before the integration of technology into schools. But recent studies have also shown that when small groups of students collaborate utilizing ICT, the known benefits of sociocultural learning can be extended (Hartley, 2007; Lou, Abrami & d'Appolonia, 2001; Schacter & Fagnano 1999; Wheeler, 2001). Teachers who employ these instructional strategies have more time available to spend with small groups of learners who have direct access to information via the Internet and a host of productivity tools at their fingertips. In addition to the intended learning outcomes of these activities, students working in groups can also learn specific IT skills from their peers, including those which are not part of the teacher's skill set and would not likely be taught by the teacher. However, not all students perceive this shifting role of the teacher as a positive one. In their study of the perceptions of students in grades 8, 10 and 12, Deaney et al. (2003) found that some students associated the use of ICT with "a degree of distancing and displacement of teachers" and became frustrated with sometimes having to wait for help as the teacher worked with other groups (p. 158). And while the potential existed to spend more time with individual students, some students felt that they had little interaction with the teacher as he or she provided individual attention for others.

It seems clear that the pedagogical aspect of the teacher-student relationship has been irreversibly altered by the introduction of technology, but research also suggests that while the instructional role of the teacher has significantly changed, it has not been

diminished (Finlayson, Wardle & Rogers, 2002). Hennessy et al., (2005) argue that teachers employing ICT cannot simply defer the responsibility for learning to the students and their computers. Instead their new roles involve “*strategically balancing freedom of choice, pupil responsibility and self-regulated learning with structured activity, focused enquiry and proactive teacher guidance* through the ZPD” (p. 286, italics in original).

The extent to which this pedagogical aspect of the teacher-student relationship is altered by the infusion of ICT varies widely and not all teachers embrace this pedagogical shift simply because the technology is available to them. Teacher resistance to the use of ICT is well-documented (Cuban, 1994; Cuban, Kirpatrick & Peck, 2001; Morton, 1996). Traditional school structures such as age-graded schooling, self-contained classrooms, the standard school timetable and a century of tradition all have a powerful influence on teaching practice and on teacher-student relationships, often making them resistant to change and technological innovation (Schofield, 1995; Sarason, 1990). Even among teachers who acknowledge the ICT-induced shift to student-centered, constructivist approaches to teaching, there are those who remain skeptical about the value of such strategies. For example, Ferneding (2003) writes:

Teachers’ traditional practices are being challenged by the introduction of constructivist-based pedagogy, where the teacher’s role is redefined from being that of “sage on the stage” to a “guide on the side.” However, within the context of integrating computer technology with print and oral traditions, teachers need to take a more active role in synthesizing the complex interactions of these various modes and mediums of communication, thus standing on the sidelines may not be an appropriate place for teachers. (p. 89)

It has also been suggested by Sutherland et al. (2004) that the introduction of ICT was like a “Trojan Horse, secretly bringing in new approaches to learning that conflicted with

the deep grammar of the subject” (p. 417). Despite this lack of agreement as to the benefit of these paradigmatic shifts in pedagogy and the ancillary transformation of teachers’ relationship with students, the integration of ICT into the learning process has the potential to significantly alter this instructional or pedagogical component of the teacher-student relationship.

The Balance of Power and Control within the Teacher-Student Relationship

The extent to which students and teachers share power and control is a significant factor in the student-teacher relationship. Teachers are generally perceived as holding the majority of power and control but students have the ability to resist and may also be empowered by their teachers (Burroughs, 2007; Frymier, Shulman & Houser, 1996). According to Millar and Rogers (1976), control within relationships has to do with “who has the right to direct, delimit, and define the actions of the interpersonal system in the presently experienced spatial-temporal situation” (p. 91). While teachers may control the content, organization and other dimensions of instruction, they may also choose to share that control by allowing students to make choices within certain parameters. Technology integration presents new and different opportunities for sharing control. This section examines the concepts of power, control, autonomy and empowerment in order to provide an academic foundation for the second research question: How does the increased access to information afforded by one-to-one computing influence the teacher-student relationship with respect to learner autonomy and teacher control?

Conceptualizing Power

Power is inherently relational (Brunner, 2002; Cornelius & Herrenkohl, 2004;

Foucault, 1999). Within the contexts of schools and teacher-student relationships, Cornelius and Herrehkohl conceptualized, “relationships of power as existing on a balance scale, with situational factors causing the positions of persons in an environment to constantly shift and change with the potential of being tipped in different directions” (p. 469). Of particular interest to this study is the influence of ubiquitous computing as a “situational variable” that could potentially shift the balance of power between students and teachers.

Authority might simply be defined as the legitimate use of power. Pace and Hemmings (2007) describe it as, “a *social relationship* in which some people are granted the legitimacy to lead and others agree to follow” (p. 6). The extent to which students “follow” their teachers is variable and may depend upon the degree to which they recognize and respect his/her authority, accept its legitimacy or feel a shared sense of purpose or what Metz (1978) referred to as a “shared moral order” (p. 26). According to Pace and Hemmings (2007) there are different types of authority found in social theory which have been used to examine relationships within classrooms. They draw upon the work of Weber (1925/1947) in identifying four different types of authority distinguished by the source of their legitimacy (p. 6). *Traditional* authority is that granted to those in certain “ruling” positions and is generally met with obedience so long as the decisions made and actions taken fall within the normal boundaries of tradition. In education, that would imply that teachers could expect to be obeyed by their students so long as teachers’ behaviours were consistent with the “time-honoured conventions of formal schooling” (p. 6). This concept is similar to what Cothran and Ennis (1997) referred to as moral authority. *Charismatic* authority is the result of strong personalities that garner student support through emotional attachment. *Legal-rational* (or bureaucratic) authority is

legitimized by rules and policies that give people the right to enforce explicit expectations such as being on time for class. It may include the use of rewards and punishments.

Professional authority is based upon expert knowledge, which in the case of teachers could include “a strong command of subject matter and pedagogical skills” (p. 7).

Because these various types of authority were developed by Weber as “ideal types” they rarely exist in singularity and are generally “blended or “hybridized” as teachers interact with students” (Pace & Hemmings, p. 7).

Many studies of power within the classroom focus on teachers’ efforts to control students’ behaviours in an effort to maximize engagement and learning and minimize disruptions. This is commonly referred to as classroom management. While there is no widely accepted definition of classroom management, Evertson and Weinstein (2006) state that it has two distinct purposes. “It not only seeks to establish and maintain an orderly environment so that students can engage in meaningful academic learning, it also aims to enhance student social and moral growth” (p. 6). The introduction of ICT also introduces new challenges to the teacher’s authority and control of the learning environment. Deaney et al. (2003) describe the high-technology classroom environment as “a complex interplay of context, people, activities, machines and available software within specific settings” (p. 142). The teacher’s classroom management role now includes new responsibilities such as monitoring Internet content, resolving technical problems as well as other non-traditional responsibilities (Sanchez, 2003; Schofield, 1997; Leask & Pachler, 1999).

Classifications of Power

A number of studies (e.g. Kearney, Plax, Richmond & McCroskey, 1985) drew

upon French and Raven's (1959) classification of the social bases of power that bear certain similarities to the different types of authority described above. These have been interpreted within the context of teacher-student relationships by a number of writers (e.g. McCroskey & Richmond, 1983; Tauber, 1985). *Coercive* power is based upon the students' belief that failure to obey will result in punishment. *Reward* power is based upon students' recognition of the teacher's ability to provide or withhold rewards. *Legitimate* power results from students' acknowledgement or acceptance that the teacher, by virtue of his/her position, has the right to make certain demands. *Referent* power is based on the students' willingness to comply because he or she identifies with the teacher and may like or wish to please or follow her or him. And finally, *expert* power is rooted in the students' belief that the teacher has special knowledge or expertise that they view as valuable or desirable.

These traditional views of power have been the subject of considerable criticism (e.g. Kipnis, Schmits, Swaffin-Smith & Wilkinson, 1984; Willmott, 1987). Watkins (1994) summarized some of their shortcomings claiming: 1) such theories fail to explain how and why some people have access to these power bases while others do not; 2) they do not account for all of the strategies used by those in power; and 3) they do not recognize the influence of "the moral or political dimensions of administrative action" (p. 21).

A more contemporary perspective on power can be found in the work of Brunner (2002). He conceptualized power in three categories. The first is described as "power over" where power is conceived as dominance, authority, control, influence, or power over others or things" (p. 696). Brunner conceives this form of power as "dualistic" in that one either has or does not have power. His conception of "power over" draws on a

body of literature known as the “social control paradigm” of power. His research based on interviews with more than 700 subjects revealed this to be the predominant conception of power and he argued that those who understand power in this way have a tendency toward dominating and controlling others and have difficulty working in a collaborative manner or recognizing the equality of other perspectives.

Brunner’s (2002) second category is classified as “power with/to others” and is conceived as the ability to accomplish shared goals through cooperative interactions with others. His findings indicate “People who conceived of power as coactive, collective, or cocreative most often tended or were predisposed to work with others to accomplish things through collaborative work” (p. 699). Unlike “power over” it is not viewed as dualistic. Instead, everyone holds power, which is exercised “synergistically or jointly” (p. 699). The body of literature that supports this model is drawn predominantly from a feminist perspective of writers such as Nel Noddings (1984) and this power theory and the ethic of care generate what Brunner refers to as a “social production,” as opposed to a “social dominance,” paradigm of power (p. 702).

A third category of power identified by Brunner’s (2002) research was conceived as a combination of the previous two and was enacted as a combination of dominant and collaborative activities. He found this perspective to be rare in comparison with the other two and also found that even though it combined controlling and collaborative efforts, it was typically viewed by subordinates as “power over” because acts of domination made them suspicious of efforts to collaborate. However, it seems plausible that teachers would exercise both types of power under different circumstances at times collaborating or negotiating with students and at other times simply directing students to act on decisions already made by the teacher.

Cornelius and Herrenkohl (2004) offer another perspective of power in the classroom. Based on Wertsch's (1998) notion that power exists within "human relationships mediated by tools" they sought new conceptualizations of power that could explain "the locations of power in interactions... and the dynamic ways in which persons and tools influence each other in sociocultural settings" (p. 470). Three concepts emerged from their study of the literature. The first was "ownership of ideas" indicating a power relation between individuals and concepts. In the classroom, this implies that students may perceive teachers as more powerful if they believe that they own certain knowledge and students' relationships with others may be influenced by perceptions of who owns certain knowledge (p. 470). The second concept of power was "partisanship" which explains how power relationships among students could "develop through their interactions with concepts and with each other" (p. 470). This occurs when students align themselves with other students around their ideas or possibly because of social standing when engaged in a discussion or debate. The third form of power is "persuasive discourse" which suggests that particular styles of communication can affect power relations among people (p. 471). Cornelius and Herronkohl believe that these conceptions of power provide a useful framework for researchers to analyze the relationships among teachers, students and ideas in classroom interactions.

Teachers are not the sole proprietors of power in the classroom. Both teachers and students hold power and negotiate in order to manage certain conflicts of interest (Cothran & Ennis, 1997). This perspective views power as reciprocal in nature, which Pauly (1991) defines as follows: "Reciprocal power exists in a group when each member achieves a degree of control over the others and is simultaneously subject to control by them" (p. 57). Students, for example, might withhold their cooperation in an effort to

persuade the teacher to alter the proposed learning activity. Dobransky and Frymier (2004) found, “when students perceive shared power, they also feel closer (greater intimacy) to their teachers and feel more positively toward the class and its content (affective learning)” (p. 220). The next section explores various ways in which teachers share power and control with their students.

Learner Autonomy and Control

Juxtaposed against the concepts of teacher power and control is the idea of learner control or learner autonomy. There are many different definitions of learner autonomy found within the literature (Bergen, 1990; Dam, 1995; Holec, 1991). According to Little (2007), “the essence of learner autonomy is *the ability of the learner to take charge of one’s own learning*” (p. 15, italics in original). Related to learner autonomy is the concept of learner control, which Raya and Fernandez (2002) claim to be something that accompanies autonomy and “is not a single unitary concept, but rather a continuum along which various instructional situations may be placed” (p. 66). This implies that teachers may choose instructional strategies that allow students more or less control over their learning.

Control is a key element of self-determination theory (Deci & Ryan, 1985), which is a theory of motivation that “distinguishes between self-determined and controlled types of intentional regulation” (Deci, Vallerand, Pelletier & Ryan, 1991, p. 326). Self-determination theory emphasizes that self-determined behaviours are the result of a “regulatory process” based upon choice rather than compliance (p. 327). It builds on the principle that humans have innate psychological needs, which they are motivated to

fulfill; particularly the needs of competence, relatedness and autonomy. Deci et al.

described these needs as follows:

Competence involves understanding how to attain various external and internal outcomes and being efficacious in performing requisite actions; relatedness involves developing secure and satisfying connections with others in one's social milieu; and autonomy refers to being self-initiating and self-regulating of one's own actions. (p. 327)

This theory postulates that settings that foster the satisfaction of these needs will optimize the motivation, performance and development of individuals. This has significant implications for classroom learning and teacher-student relationships. It suggests that learning, which relates positively to student motivation, can be influenced by teacher behaviours. Specifically, teacher behaviours that are less controlling (i.e. increase learner control) should help to meet students' innate need for autonomy. Obviously, there is some optimum level of control or balance between teacher and student control as exercising no control over the learning process would likely yield poor results.

Reeve, Bolt and Cai (1999) found, "when teachers support students' autonomy, then students' perceptions of competence and self-determination increase" (p. 546). Building on self-determination theory, Reeve (2006) developed the concept of "autonomy-supportive motivating style," which he describes as a set of teacher behaviours that can "nurture students' inner motivational resources" (p. 236). In addition to the innate psychological needs Deci et al. (1991), identified, Reeve states that students internalize other resources which include "interests, preferences and values" (p. 226). These along with the need for competence, relatedness and autonomy can motivate students to engage in classroom learning, particularly when satisfied by teacher behaviours that align instructional practices with students' psychological needs, interests,

preferences and values. These ideas are also reflected in the *APA Learner-Centered Psychological Principles* wherein Principle 8 states: “Intrinsic motivation is stimulated by tasks of optimal novelty and difficulty, relevant to personal interests, and providing for personal choice and control” (McCombs & Vakili, 2005, p. 1585). Reeve identifies a number of autonomy-supportive teacher behaviours including: listening carefully to students; creating opportunities to work in their own way; and, allowing them direct access to learning materials. The last two of these instructional practices could be enabled by computer access during instruction.

Reeve (2006) contrasts autonomy-supportive teacher behaviours with controlling behaviours stating that the latter interfere with students’ self-determination “because they ask students to adhere to an agenda that alienates students from their inner motivational resources and instead defines what the student should or must do” (p. 228). Reeve draws from an extensive body of research to argue that there are numerous, positive educational outcomes of autonomy-supportive teachers and classroom environments. These include: enhanced confidence, intrinsic motivation and creativity, an appetite for more challenging academic work, deeper understanding of concepts, positive affect for learning, and elevated academic performance and persistence (p. 228). In her study on teacher-student relationship quality in middle schools, Davis (2006) recognized the balance between teacher and learner control as a relationship variable. She argued that “teachers who balance their need for structure with students’ need for autonomy increase students’ sense of responsibility for their learning, intrinsic motivation for academic tasks, feelings of competence and use of strategies leading to conceptual understanding” (p. 211).

Empowering Students

Student empowerment is a concept related to learner autonomy but treated separately in the literature. Houser and Frymier (2009) have defined empowerment as “a student’s feeling of competence to perform a task that is meaningful and has an impact on the situation” (p. 35). Frymier, Shulman and Houser (1996) examined the concept of empowerment as it applied specifically to the classroom and created a ‘learner empowerment measure’ that they used to determine the impact of various teacher behaviours on student motivation. Drawing from various theoretical perspectives on empowerment (Conger & Kanungo, 1988; Luechauer & Shulman, 1993; Thomas & Velthouse, 1990), they concluded that motivation was at the conceptual heart of empowerment. In fact, they viewed empowerment as a more comprehensive conceptualization of motivation. Brooks and Young (2011) also found intrinsic motivation to be positively associated with learner empowerment and stated that feelings of control are what distinguish empowerment from similar concepts. Using Thomas and Velthouse’s four dimensions of empowerment (meaningfulness, competence, impact and choice) Frymier et al. (1996) discovered that the first three of these correlated positively with motivation which they interpreted as increasing learner empowerment and having a positive impact on learning.

Empowerment is of interest in this study because it has been shown that certain teacher behaviours and communication variables have a positive influence on learner empowerment. This is a desirable outcome because of its positive impact on learning and could be a significant element of the teacher-student relationship. Houser and Frymier (2009) confirmed that teacher immediacy behaviours and clarity of instruction serve to enhance student empowerment. According to Frymier et al. (1996) empowering teachers

seek to remove factors that promote feelings of powerlessness and replace those “with structural systems and messages that foster student feelings of responsibility, personal meaningfulness, ownership, self-efficacy, and intrinsic motivation to learn” (p. 183). Brunson and Vogt (1996) claim teachers empower students by adapting to their needs in ways that increase control and ownership of their learning. Students can also be empowered by teacher behaviours that allow them choice over what and how they learn, encourage risk taking independence and self-assessment of their learning, and fostering the acceptance of responsibility for their learning (Stone, 1995).

In summary, research has demonstrated that teacher behaviours that support learner autonomy, and instructional activities that optimize learner control, have a range of positive effects on student motivation, learning, teacher-student relationships and other desirable outcomes. The appropriate use of technology has the potential to support teachers in their deployment of autonomy-supportive teaching styles and pedagogies that assign greater control to students over their learning. The mechanics of that are discussed in the next section.

The Influence of Technology on the Balance of Power and Control

Having examined the concepts of power, control, learner autonomy and student empowerment, this section focuses on literature that illustrates how student computer use has the potential to alter the balance of these variables within the teacher-student relationship.

The very nature of electronic resources commonly used in technology-enabled instruction can enhance learner control. For example, Dillon and Gabbard (1998) reviewed studies on the use of hypermedia and its impact on learner comprehension,

control and style. Hypermedia use refers to the practice of teachers allowing students to access a variety of texts through hyperlinks as opposed to accessing information through a single text (paper or electronic) in a teacher-directed sequence and at a teacher-determined pace. This enables the student rather than the teacher to control the pace, depth and sequence of information delivery. “With its embodiment of structure and linked information nodes,” Dillon and Gabbard concluded, “hypermedia is considered to offer users far more control over access and exploration” (p. 337). They were also quick to point out that there was insufficient evidence to suggest that increased learner control enhanced student achievement, but the practice of hypermedia use can clearly alter the relationship between student and teacher in terms of learner autonomy or control. Condie and Simpson (2004) also found that students’ use of ICT promoted learner independence and Melhinger and Howard (1996) predicted that, “the very relationship between students and teachers will be challenged because the technologies enable learners to gain control of their own learning” (p. 4). In contrast, Niles (2006) gleaned from his study of a laptop computing program that teachers’ relinquishment of control altered the classroom dynamics and had a positive influence on teacher-student relationships. LeBaron (2001) argued that technology allows the transfer of greater responsibility for learning from the teacher to the student, increasing student autonomy and control and also student motivation.

Schofield (1997) found computer use to be motivating to students because it increased their control over certain learning tasks and enabled them to personalize their work. It also increased students’ control over how and when they utilized their teachers’ assistance. Schofield and Davidson (2003) studied the impact of Internet use on teacher-student relationships. They found that Internet use increased learner independence,

perceptions of autonomy and control, and student motivation because it reduced reliance on the teacher. It also enabled students to interact directly with experts on-line on topics that were outside of their teachers' expertise and empowered students to contribute new content to classroom learning. Lensmire (2006) claimed that allowing students to contribute content is one form of giving students authority. Schofield and Davidson also reported that classroom activities involving Internet use were perceived by teachers and students to be characterized by "warmer and less adversarial relationships" (p. 72).

There have been a small number of studies that have shown a positive relation between technology use in the classroom and learner empowerment. Mabry and Snow (2006) studied the influence of laptop use for high-risk students on learner empowerment and personalized instruction in a standards-based learning environment. They found that the use of laptops increased individualized learning and encouraged student responsibility, which in turn led to feelings of empowerment among students. "Egalitarian relationships," they noted, "were fostered by the simultaneous acquisition of computer skills by teachers and students and by frequent sharing, which created a climate of collaboration" (p. 197). In one of the earliest studies of the impact of computers in classrooms, Fisher (1989) compared what he referred to as high-access classrooms (HCAs) to classrooms without computer access to examine the relationship between student empowerment and computer access. He found that easy access to computers encouraged and supported learning activities characterized by increased student control, social and cognitive complexity, significant scope, and opportunities for teachers to provide private and individual feedback. These were found to be qualities that enhanced learner empowerment.

There is one final point to be made here that bridges concepts of power, empowerment, teacher authority and expertise. Providing each student with a laptop introduces new dynamics into the classroom culture. Technical problems associated with laptop use have the potential to disrupt learning and compromise learning outcomes in classroom environments where instructional practices rely heavily on fully functional wireless networks, Internet connections, computer and peripheral hardware (data projectors, printers, scanners, interactive whiteboards) and software. Moreover, institutional responses to this reality have the potential to alter the teacher-student relationship. For example, while the classroom has traditionally been the private domain of a solitary teacher, the technical support required by that teacher today often means that other “experts” may now be found in the classroom and interacting directly with teachers and students (Ferdig, 2006; Schofield, 1995). Technical support personnel such as network administrators and computer technicians as well as academic personnel such as educational technology coordinators may be found working alongside students and teachers in ways that blur the traditional lines of authority between the teacher and student and alters their roles and interactions.

Many researchers have discussed the phenomenon whereby some students have technical expertise using computers, software applications and even the Internet that exceeds the expertise of their teachers (Burns & Polman, 2006; Mouza, 2006; Niles, 2006; Schofield and Davidson, 2003). While some teachers find this threatening, the practice of teachers harnessing their students’ expertise in the resolution of technical issues has also served to enhance the teacher-student relationship and altered the power dynamic within the classroom (Collier, 2001; Wise and Groom, 1996). Mouza reported

that students sharing expertise with teachers in laptop classrooms felt “a sense of pride and empowerment” (p. 493).

This reality has a number of implications for classroom dynamics and teacher-student relationships. Burns and Polman (2006) found that teachers’ reliance on students’ technical expertise helped to create a community of learners where teachers and student were learning together. They also reported that these “role reversals” created an increase in personal communication and ultimately a better relationship between teachers and students (p. 376). Schofield (1997) identified the emergence of “peer experts” within the classroom to whom other students turned for technical advice rather than the teacher (p. 30). In some cases, student technical expertise became a source of power (what French and Raven would have deemed expert power) that entitled them to certain privileges within the social structure of the classroom. For example, Schofield and Davidson (2003) observed that those students who were able to provide technical assistance to the teacher and other students were allowed to make decisions about when to leave their seats and could also talk with other students and deviate from assigned learning activities. This recognition and adoption of student expertise within the context of instruction can be interpreted as an ICT-induced alteration of the teacher-student relationship.

The Influence of ICT on Communication Patterns

This section reviews literature on the use of electronic forms of communication such as email that are enabled by computers and Internet access in many schools. This capability fundamentally alters communication patterns between teachers and students. For example, email transcends one of the most basic school boundaries – the school day. The third research question in this study examined how one-to-one computing shaped the

nature and patterns of communication between teachers and students. This is of interest because of the critical role that communication plays in the building and maintenance of relationships and the literature reviewed here informed the discussion of this study's findings.

Although social media and social networking may also have very significant implications for teacher-student relationships, they were not a part of this study because the school investigated by this case does not facilitate nor permit their use among teachers and students and no data on the topic could be collected. For this reason, literature on social networking is not included in this chapter. Instead, the focus is on CMC that the school actually facilitates such as email and online discussions.

Computer-Mediated Communication (CMC)

Laptops with Internet access placed in the hands of every teacher and student provide them with what Wertsch (2002) refers to as “new cultural tools” (p. 106). CMC such as email is fundamentally different than face-to-face communication due to characteristics such as its asynchronous format and lack of visual, social or paralinguistic cues. Email is also different than other written forms due to its evolving grammar and conventions (Bloch, 2002). In the beginning, CMC was utilized by computer operators who discovered that the networking of large computers created the unintended capacity for sending simple messages (Walther, 1996). Today, it has transformed the way in which people interact and maintain relationships and some would argue that it has fundamentally altered the social fabric of our culture (Negroponte, 1995). Wertsch (2002) points out that in “many cases this new tool is developed with no intention of influencing

change in social or psychological processes, but it is precisely in these areas that one may find its most powerful and lasting legacy” (p. 106).

The most common forms of CMC used in K-12 schools are email and online discussions. The latter enable groups of teachers and students to discuss curricular content outside of the classroom by posting and responding to comments. Email is more commonly used for online conversations between the teacher and one student and its potential for more interpersonal interactions makes it of greater interest to this study on relationships. Email can also be used by the teacher or student to send a message to the entire class, but the context of this study focuses my attention here on one-to-one email communications.

A fundamental aspect of electronic communication between teachers and students is that it generally occurs outside of class time. Although their research did not focus specifically on the use of email, Dobransky and Frymier (2004) studied the impact of out of class communication (OCC) on the development of teacher-student relationships. They found that student-teacher engagement in OCC related positively to relationship variables including shared control, intimacy, caring and trust. Email is one form of OCC and its capacity for utilization outside of the traditional school boundaries of space and time (e.g., office hours) make it increasingly attractive to students.

Benefits and Challenges of Email

Within the literature on the use of email, there are conflicting accounts of its effectiveness as a tool for interpersonal communication. Early studies claimed that the lack of non-verbal and social cues made it difficult or impossible to decipher the mood of a message, project or detect individuality or convey other personality qualities possible

through face-to-face communication (Culnan & Markus, 1987). On the contrary, Walther (1996) has argued that under the right circumstances, email can surpass face-to-face communications in terms of levels of affection and emotion leading to a phenomenon he has coined “hyperpersonal communication” (p. 17). Other writers place email somewhere on the continuum between the impersonal and the “hyperpersonal” and point to some of the challenges and benefits of using email, which are discussed below.

Much of the literature on email communication between teachers and students focuses on higher education. Within that context, Hawisher and Moran (1993) have identified a number of challenges presented by this medium. According to their analysis, the “spontaneity and fluidity of the medium” and the expectation of a rapid response work against the careful structuring of messages and reduce reflection and self-censoring prior to sending. (p. 630). In addition, email writers have difficulty with the placement of salient points and readers are challenged to distinguish the important from the less salient points of the message. There are also concerns that the evolving grammar and conventions (such as the use of upper case to indicate yelling) of email can lead to misinterpretations and unintended messaging and that the potential for inappropriate behavior such as harassment and “flaming” are greater with email (Bloch, 2002). Goleman (2006) uses the term “cyber-disinhibition” to describe a phenomenon whereby the lack of realtime feedback characteristic of Internet communication disables our “inhibitory circuit” sometimes causing inappropriate and impulsive online behavior (p. 1). Hawisher and Moran also point to concerns that attitudes toward email may vary according to the gender, age, race and class of individuals in terms of expectations of response and appropriate use. With all of these complexities, “email may be deceptive to students in terms of the degree of both linguistic and grammatical control that is required

as compared to oral communication” (Bloch, 2002, p. 132). Even elements such as the expected level of formality when emailing a teacher have the potential to generate conflict in the relationship.

Walther (1996) disagrees with several of the points made above. Contrary to the assertion that email messages are often hastily written, sent with little scrutiny, or misguided by the absence of social cues found in face-to-face communication, he argues that the asynchronous nature of email gives a person much more time to plan, edit and refine a response, should they choose to use it. Furthermore, email is free of many of the additional, non-linguistic demands posed by face-to-face communications which involve “heightened levels of psychic, sensory, and emotional involvement and arousal, increased cognitive load, competing conversational and relational demands, and differential salience of context cues” (Walther, 1996, p. 25). From this perspective, composing an email should be considerably less complex than face-to-face interactions whose ancillary demands may reduce the ability of the sender to focus on the composition of the message or the ability of the receiver to accurately interpret it.

Despite the inherent challenges of successful email communication, it appears to hold many potential benefits for teacher-student communication and relationship building. One such benefit is the so-called “equalization phenomenon” whereby organizational status differences (e.g., teacher-student) are minimized in group email discussions and “students who are sometimes silenced because of their status, race, handicap or gender” are more likely to “speak up” than they may be in the classroom setting (Hawisher & Moran, 2002, p. 634). Other personality traits like shyness, a lack of self-confidence/courage, or the fear of public speaking may be overcome when a student has the time to formulate a thoughtful response in an on-line class discussion or student-

teacher email interaction. Doherty and Mayer (2003) suggest that email creates a different space wherein teachers and students can interact in a more democratic, less teacher-dominated fashion. They also believe “incidental e-mail communication between teacher and student provides a new space – new in scope, location, time, mode, and interactional protocol – in which to explore and build this core relationship (p. 593). Manning (1996) adds that this new virtual space also lacks some of the negative and evaluative non-verbal cues of the classroom space such as frowning or other indicators of disapproval. It transcends traditional school barriers of time and space enabling teachers and students to interact at mutually convenient times outside of the school day and the school walls. Email also provides a mechanism for the teacher to provide private, individual feedback without having to embarrass a student or single her or him out in class.

On-line discussions between teachers and students can strengthen learning and interpersonal relationships. Niday and Campbell (2000) conducted an interesting study where they matched middle-school students up with pre-service teachers to study literature together. They found that email exchanges “fostered deeper thinking about literature” and helped to build relationships in which students felt cared for, had their viewpoints affirmed and their ideas validated (p. 61).

Potential Boundary Violations

An unintended byproduct of email use between teachers and students is that it creates a new avenue for boundary violations. Aultman, William-Johnson and Schutz (2009) developed a typology of 11 teacher-student relationship boundaries that suggest a balance between teachers’ expressions of care for students and the need to maintain a healthy personal life and control over classroom interactions. Two of the boundaries in

this typology are more susceptible to violations enacted through email communications.

The first has to do with the content of online communications and whether or not it crosses boundaries of intimacy, self-disclosure, confidentiality, or has the teacher offering advice on personal matters. Exchanges of inappropriate content via this medium may also violate other aspects of professional conduct. Indeed professional organizations such as the Ontario College of Teachers (2011) have issued professional advisories to their teachers such as the following:

The use of the Internet and social media, despite best intentions, may cause members to forget their professional responsibilities and the unique position of trust and authority given to them by society. The dynamic between a member and a student is forever changed when the two become “friends: in an on-line environment. (2011, p. 6)

The second boundary is that of personal time. When students have the ability to send email messages to teachers at any time of the day or night, seven days a week, there is the potential for the teacher to expend too much personal time responding to such messages at the expense of his or her health or other personal relationships (Hargreaves, 2000). Dworkin (2000) and others have written about the potential of work overloads for teachers to lead to burnout and excessive email from students has the potential to contribute to this. Hawisher and Moran (1993) have also described the phenomenon of “too much access” and argued that, “E-mail, in dissolving boundaries of time and space, breaks down some of the barriers that have long been established between students and professors” (p. 635). The same can now be said of K-12 schools that have facilitated greater access to teachers by providing ubiquitous computing without necessarily articulating any clear expectations or limitations of its use. While the ability for students to connect through CMC would appear to hold benefits for learning and relationship

building, the lack of traditional boundaries such as office hours in this new virtual space may pose new challenges and obfuscate the boundaries of this relationship.

The Interpersonal Qualities of the Teacher-Student Relationship

Education is largely an interpersonal enterprise (Davis, 2001; Frymier & Houser, 2000; Goodenow, 1993; Wubbels & Breckelmans, 2005) and learning is embedded within a particular social context (Lave & Wenger, 1991; Piaget, 1932/1965; Rogoff, 1990; Vygotsky, 1978). From an interpersonal perspective, the students' needs are not simply the "inferred needs" expressed by the curriculum, but also the expressed, personal needs of a particular student (Noddings, 2005, p. 149). Meeting a broader range of student needs extends beyond the pedagogical relationship between teacher and student. This final section of the literature review speaks to the interpersonal aspect of the teacher-student relationship. It provides context for the fourth research question, which investigates how one-to-one computing and laptop-enabled electronic communications affect the closeness of teacher-student relationships. The literature reviewed in this section looks not only at closeness, but also factors that enhance or enable closeness such as trust, caring, supportiveness and teacher immediacy behaviours.

Closeness in Teacher-Student Relationships

Closeness is a significant variable within the teacher-student relationship and Birch and Ladd (1997) found that it related positively to school attitudes. It is difficult to find any clear definition of the term or understand how it might be conceived differently by teachers and students or among individuals within those groupings. On the other hand, it is one of the most commonly used terms in describing relationships. Frequently, the

term “closeness” embodies notions of trust, warmth or intimacy and generally suggests some form of affinity that one has for another. Reeve (2006) used the term “relatedness” in describing one of four characteristics that contributed to students “positive academic functioning” with the others being “attunement,” “supportiveness” and gentle discipline.” According to Reeve, a sense of closeness or relatedness, “occurs when teachers create conditions in which students feel special and important to the teacher: it revolves around a sense of warmth, affection and approval for students” (p. 232). Newberry and Davis (2008) viewed closeness as, “the emotional bond the student and teacher share with one another: with high closeness reflecting a strong bond between the two” (p. 1966). Tharp, Estrada, Dalton and Yamauchi (2000) suggest that closeness originates with the physical proximity of sharing the same space within a classroom and that close relationships may eventually develop through shared interests and activities which lead to the development of an “affinity” for the relationship (Tharp et al., 2000, p. 57). Closeness may also be the result of feeling cared for and having needs met (Noddings, 1993) or from experiencing a sense of belonging (Goodenow, 1993). Regardless of the cause, the important point is that closeness is generally viewed as a positive aspect of relationship quality and therefore factors that increase closeness could contribute indirectly to those benefits associated with positive teacher-student relationships.

Teacher Immediacy

Another perspective on closeness arises through the literature on teacher immediacy or teacher immediacy behaviours as they relate to developing closeness or affinity within the teacher-student relationship. The concept of immediacy was first forwarded by Mehrabian (1971): “People are drawn towards persons and things they like,

evaluate highly, and prefer; and they avoid or move away from things they dislike, evaluate negatively or do not prefer” (p. 1). In simple terms, immediacy has come to be conceived as “a perception of closeness between persons” (Frymier & Houser, 2000, p. 209).

Borroughs (2007) found that students’ compliance with or resistance to teachers was partially a function of teachers’ immediacy behaviours. He described immediate teachers as “relaxed, animated and vocally expressive during class...smiles frequently, engages in a lot of eye contact and is generally perceived as friendly and approachable” (p. 456). Non-immediate teachers on the other hand were described as “tense, reserved, and vocally unexpressive...seldom smiles, avoids looking directly at students and is generally perceived as remote, aloof and unapproachable” (Burroughs, p. 456). Frymier and Houser (2000) explain immediacy in terms of verbal and non-verbal activities where verbal involves “calling students by name, asking about themselves and asking for students’ opinions” and non-verbal immediacy “consists of behaviours such as smiling, making eye contact, moving about the classroom and using vocal variety” (p. 209).

Immediacy received significant attention as an interpersonal interaction variable in the literature because many studies demonstrated that it had a positive impact on student learning (Andersen, 1979; Christophel, 1990; Kelly & Gorham, 1988; Witt, Wheelless & Allen, 2004). Initially, it was thought that verbal and non-verbal immediacy behaviours directly enhanced student learning in the cognitive and affective domains. However, Christophel (1990) determined that immediacy had a positive influence on motivation first, which then improved learning and Frymier (1994) later verified this.

Thomas, Richmond and McCroskey (1994) believed that the effect of immediacy was primarily in the area of non-verbal behaviour. Such behaviours might include smiling

at students, making eye contact, classroom movement and voice inflection. They asserted that since non-verbal communication was beyond the level of conscious control it was predominantly a function of personality or personal style and that these behaviours “are presumed to communicate distinctive impressions of individuals to others, what we have chosen to refer to as “Socio-Communicative Style” (p. 109). According to Thomas and colleagues, the two most frequently referenced dimensions of communicative style are assertiveness and responsiveness. Because responsiveness is characterized by descriptors such as “helpful, sympathetic, compassionate, sincere and friendly” one might expect this to relate more to immediacy behaviours (and closeness) than to the assertiveness trait, described as “independent, dominant aggressive, competitive and forceful” (p. 109). Surprisingly, their research demonstrated that immediacy behaviours related both to assertiveness and responsiveness; Wooten and McCroskey (1996) confirmed this. The implication is that both of these approaches could be effectively used by immediate teachers.

Research on the relationship between teacher immediacy and technology use appears to be very limited and primarily confined to the post-secondary context, distance learning and web-based learning. It also focuses primarily on the instructor’s rather than the student’s use of technology. Witt and Schrodt (2006) examined two levels of immediacy across four levels of instructional technology use in an effort to understand how teachers’ immediacy behaviours moderated technology use and shaped “students’ initial perceptions of affect for the course and instructor” (p. 10). The study demonstrated that highly immediate teachers using minimal and moderate levels of technology significantly increased students’ affect for the course and the instructor. The effect was notably less for non-immediate teachers. Since teacher immediacy behaviours have been

shown to have a positive effect on learning outcomes and student affect, the impact of technology use on teacher immediacy in elementary and secondary classrooms seems an appropriate area for further research.

Trust

Trust is another dimension of the teacher-student relationship. According to Millar and Rogers (1976), trust exists “in a relationship if both participants have manifested specific behaviours that indicate reliance and/or dependence on one another, faith in one another, and certain levels of expectations in each other (cited in Dobransky & Frymier, 2004, p. 212). Dobransky and Frymier also demonstrated that trust along with intimacy (closely related to immediacy) were both indicators of the “interpersonal-ness” of teacher-student relationships (p. 218). Wooten and McCroskey (1996) went on to explore the relationship between “Socio-Communicative Style” (SCS) and students’ trust of teachers. They stated that student trust was based upon a continual pattern of interaction and an overall impression of the teacher-student relationship. They pointed to research suggesting that, “the impact of immediacy may, at least in part, be a function of its modification of students’ perceptions of the teacher’s SCS” (Thomas et al., 1994, p. 95). Their research also surfaced a positive correlation between teacher assertiveness and responsiveness and students’ trust.

Caring

One concept that appears frequently in the literature on interpersonal aspects of the teacher-student relationships is caring. Muller et al. (1999) found that caring was an important element of effective teacher-student relationships that enhanced learning. The

concept of the ethic of care is most often attributed to Noddings (1984) feminist perspective and she and other writers have also written about the educational implications of caring. Noddings (1993) described caring as “both a relation that has certain characteristics, and the behavior, thinking and attitude of the carer in the relation.” She describes the “carer” as one who “attends to the cared-for in a special act of receptivity (non-selective attention or engrossment)” and one who “hears, sees and feels what is there for the other” (p. 48). The carer helps the one being cared for in different ways that might range from advice to co-participation in an endeavor and she is guided by their expressed need and best interests. Noddings points to the reciprocal nature of caring in mature relationships stating that the carer and cared-for may switch roles at different times. A response from the cared-for is necessary to provide feedback to the carer about the impact of her efforts, which helps to direct and sustain them. However, on the point of reciprocation, Noddings states, “in unequal relations such as parenting and teaching, the role of the carer falls steadily to one party” (p. 48). Care theory implies that teachers should be concerned not only with their students’ academic achievement or intellectual development, but also their moral and social development and from this perspective, teaching closely resembles parenting.

Noddings distinguished between “natural caring” as a response that arises from “love or natural inclination” such as a mother may experience in meeting the needs of her own child, and “ethical caring” which is motivated more by a desire to act morally in caring for another (1984, p. 4). Goldstein (1999) has argued that teachers interacting with their students could experience both forms of caring. “A teacher who has made the choice to approach each interaction with her students as an opportunity to enter into a caring

relation would be likely to experience both ethical and natural caring in those relationships” (p. 659).

Several other variations on the concept of care are found in the literature on teacher-student relationships. Pastoral care is a concept introduced into the school context by Marland (1974). According to Best (1999), pastoral care in education refers to a commitment to addressing “the all-round well-being and development of the child as a person” in addition to meeting their academic or intellectual needs as a student. He describes it as an integral part of the goals and moral purpose of education and claims that pastoral care adds “a distinctive ethical dimension” (p. 3). The goals of pastoral care appear to include the instilling of character attributes such as taking responsibility for one’s own life and an inclination toward social actions that enhance the lives of others. Some aspects of pastoral care may fall to professionals in schools who are charged with guidance and counseling such as individual social-emotional issues which require one-to-one interactions. Others, such as “the promotion and maintenance of an orderly and supportive environment” may be viewed as the joint responsibility of all teachers, counselors and administrators (Best, p. 4). Depending upon the specific mission, vision and values of a particular school or district, pastoral care might also refer to the promotion of the moral, spiritual or cultural development of its students. Often the term is used as a “catch all” describing efforts that demonstrate concern for students social-emotional needs and their overall well-being.

Wentzel (1997) made use of the term “pedagogical caring” in research that sought to understand the extent to which middle school students’ perceptions of teacher caring affected their motivation with respect to positive social and academic outcomes. Her findings showed strong connections between students’ perceptions of caring and

academic effort as well as effort to pursue prosocial and social responsibility goals. She also reported that “students are more likely to engage in classroom activities if they feel supported and valued” (p. 417). Students in the study perceived caring teacher behavior to be similar to attributes of effective parenting describing traits such as “democratic interaction styles, developing expectations for student behavior in the light of individual differences, modeling a caring attitude toward their own work, and providing constructive feedback” (pp. 415-416). In summary, relational caring in its various forms influences the quality of the teacher-student relationships as well as specific educational outcomes.

Earlier in this dissertation I have made the point that the interpersonal and pedagogical aspects of the teacher-student relationship are closely intertwined and that many teacher-student interactions contain both pedagogical and relational components and intentions. For example, Frymier and Houser (2000) concluded that “communication between teachers and students is relational as well as content driven” (p. 216). Wubbels and Brekelmans (2005) interpretation of teaching supports this notion as they conceptualize teaching as a form of communication stating that “every form of communication has a *content* and *relation* aspect” (p. 7). The content aspect could be a mathematical principle and the relational aspect may be the smile with which that is delivered. Frymier and Houser used the term “referential skill” to describe the instructional abilities of teachers in explaining content and “ego support” as their efforts to support students’ emotional needs (p. 216). These two skills were perceived as the two most important by students and they were also predictors of motivation and learning. Ego support resembles other forms of caring discussed here. According to Frymier and Houser, it involves encouragement and confirmation and bolsters students’ self-confidence and self-worth. Like other forms of caring, it supports aspects of well-being

rather than intellectual development. Frymier and Houser distinguish between immediacy and communication skills such as ego support stating that immediacy has been characterized by specific behaviours (e.g., smiling, making eye contact) whereas communication skills are “macro behaviours” that may or may not include identified immediacy behaviours (p. 216).

Another example of the convergence of instructional and relational interactions was forwarded in a compelling argument by Goldstein (1999) wherein she draws parallels between the concept of caring and concepts related to Vygotsky’s (1978) work on the interactions between teachers and students within the ZPD, which is discussed further in the next section. Although Vygotsky and other social constructivist theorists recognized that cognitive development was embedded within a social context, Goldstein went on to make detailed comparisons between sociocultural learning constructs such as scaffolding, intersubjectivity and guided participation, effectively arguing that these essentially constitute “a caring encounter” (p. 648). The details of her case exceed the scope of this literature review but strengthen the notion that strong connections exist between pedagogical and interpersonal interactions and constructs.

Summary

This literature review has examined a wide range of theories that underpin and characterize the interpersonal and pedagogical aspects of the teacher-student relationship. It has also presented research that provides an understanding of how the integration of networked computers in schools can influence the unique and complex relationships between teachers and students. Learning theories such as learner-centered instruction, situated learning, constructivism and sociocultural theories provide a framework for

understanding pedagogical interactions between teachers and students and serve as theoretical lenses through which to focus on specific elements of the learning process with a view to understanding how these might be affected by the use of technology.

The literature on power, authority, learner empowerment and learner autonomy is useful in developing an understanding of how teacher behaviours influence the balance of power within the teacher-student relationships. These theories illuminate how and why certain approaches to technology utilization could alter teacher-student interactions in ways that subsequently shift power dynamics and increase learner autonomy and empowerment.

The introduction of CMC such as email and online discussions creates new and different opportunities for teacher-student interactions outside of the traditional classroom boundaries. Interactions within these new virtual spaces also have the potential to alter the balance of power within the relationship. The literature on these communication technologies informs our understanding of how and why they differ from face-to-face interactions and their implications for shaping teacher-student relationships.

Finally, theories of care, teacher immediacy, closeness and trust form the basis for understanding certain personal aspects of the teacher-student relationship. From these perspectives, we can begin to examine the ways in which technology-based communications and interactions affect perceptions of relational closeness, caring and trust. Chapter Three provides details of setting, participants, and research methods.

CHAPTER THREE: RESEARCH METHODS

Case Study Approach to Inquiry

This study utilized a qualitative approach and meets many of the suitability criteria explained by Creswell (2007) such as the need to explore and understand a complex problem or issues for a specific group within a specific context by engaging directly with participants and empowering them to share their stories. A case study design was chosen. Yin (2009) has argued that the choice of research methods should be based upon the nature of the research question. In his view, research questions of “how” and “why” that focus on contemporary events and do not require the control of behavioral events are best suited to case studies (p. 9). This study examines “how” the introduction of educational technology alters the student-teacher relationship within a context that does not involve the manipulation of student or teacher behaviours and therefore fits these criteria well.

Merriam (2009) proposes the case study as a useful and relevant method for “investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon” (p. 50). She also emphasizes the value of case study research in education for examining educational processes and issues, and informing practice and policy development.

In utilizing a case study approach, it is essential that the question being explored occurs within a bounded system (Creswell 2007; Merriam, 2009; Miles & Huberman, 1994; Stake, 2005). Those boundaries could include a specific group of people to be interviewed, a single program or a particular school. These boundaries limit the data that could be collected and focus the researcher’s attention on the interaction of those factors

that shape or characterize the phenomenon being examined. Merriam states, “I have concluded that the single most defining characteristic of case study research lies in delimiting the object of study, the case” (p. 40). This case study examined the perceptions of a specific group of teachers within a single school where a laptop computing program was implemented over a fixed period of time. These factors provided firm boundaries for this case.

The use of a single-case design is an important consideration in this study. Using a single site helps to establish the boundaries of this case study as discussed above. It also meets several of the criteria that Yin (2009) proposes for choosing a single case. It can be considered a “*representative or typical*” case within the Canadian Independent School context as many of these schools have introduced similar programs in comparable contexts. It might also serve as a pilot case for future studies that could include multiple sites and generate more generalizable findings. It is possible that multiple sites would help to improve validity by offering triangulation of the research findings or cross-case analysis. Although as Creswell (2007) explains, “The study of more than one case dilutes the overall analysis; the more cases an individual studies; the less the depth in any single case” (p. 76). On the contrary, Yin (2009) states, “a potential vulnerability of the single-case design is that a case may later turn out not to be the case it was thought to be at the outset” (p. 49). In the end, I chose a single site that set boundaries for the case and a site where teachers had been using laptops for a considerable amount of time. Schools in the early stages of implementation are bound to experience growing pains as they wrestle with technical challenges, the need to develop new classroom routines and a host of other uncertainties and frustrations. Teachers at this site have enough history with the laptop program to have overcome many of the issues presented in the early days and without

these distractions, I felt that they would be better positioned to address the interview questions without their perceptions being clouded by start-up challenges.

Merriam (2009) identifies three defining features of case study research characterizing it as particularistic, descriptive and heuristic. This study reflects each of those criteria. It is particularistic in that it focuses on the impact of extensive ICT utilization on the teacher-student relationship. It endeavours to provide a rich and thick description of the phenomenon including its historical origins, a detailed description of the setting and school culture, the nature of the laptop program, the backgrounds of the teachers and students involved and other contextual variables which may have shaped and influenced the use of technology and the interactions between teachers and students. And finally, it is heuristic in developing a better understanding of how extensive technology use in the classroom alters the classroom dynamics and specifically the relationship between teachers and students in that context.

Case studies have been categorized or classified in a number of ways. Yin (2009) classifies them in three categories as being explanatory, exploratory or descriptive. This case study would fall under the descriptive domain as it attempts “to describe an intervention and the real-life context in which it occurred” (p. 20). Stake (1995) describes case studies as being intrinsic or instrumental. I believe that this case qualifies as intrinsic as opposed to instrumental in that it is based upon a genuine interest in the case itself and is intended to gain a specific understanding as opposed to understanding a generic phenomenon or building a theory. The findings are not broadly generalizable, although they may contribute to the knowledge base around this phenomenon and be applicable to similar settings.

Merriam (2009) has also developed classifications of case studies according to their overall intent and design. This particular case study would be considered a “basic qualitative study” in accordance with those classifications as it seeks to understand teachers’ experiences with technology use; particularly their perceptions of its influence on their relationships with students (p.22). The study was also conducted within a bounded system and followed the data collection, analysis and presentation protocols characteristic of a *basic qualitative study*.

Setting

This section describes the site at which this research was undertaken in order to provide a robust context for this case study. It delineates the school history, philosophy, curriculum, student body, faculty, physical plant and the technology program.

School Classification

This school is classified as an independent, K-12, non-denominational, co-educational, day school. It is located in a suburban area near a major Canadian city. The school offers a rigorous academic program in preparation for a university education and life beyond. In addition to the provincial curriculum, it is authorized as an IB World School and offers the International Baccalaureate Primary Years (PYP) and Middle Years (MYP) Programmes. It also offers Advanced Placement (AP) courses for students in senior grades. Approximately 90 to 98% of its students enter four-year university programs upon graduation. University destinations include Canadian, American and some overseas universities.

The school's mission emphasizes well-roundedness and character development and to that end it provides a diverse co-curricular program including athletics, fine arts, outdoor education, public speaking and community service. All students are expected to participate in these programs. In addition, the school has an international exchange program partnering with schools in Australia, India, Scotland, Spain and other Canadian provinces. International travel is also undertaken for athletic teams, musical ensembles, educational tours, cultural studies and international service projects. There is an emphasis on values such as truth, tolerance, compassion and respect and these are woven into the cultural fabric of the school along with an ethos of high achievement. Academic support is available to students with learning challenges and social/emotional and post-secondary counseling programs are also in place.

The school is also accredited by the Canadian Accredited Independent Schools (CAIS), which upholds a rigorous set of standards in all areas from academic programming to school governance. CAIS is an organization consisting of approximately 95 independent schools across Canada and this school is fairly typical in comparison to the characteristics of other member schools. In addition to ensuring high standards, this organization offers the school and its students and teachers other opportunities such as national athletic competitions, student leadership conferences and teacher/administrator professional development opportunities. The school is also a member of several provincial organizations for independent schools.

School History

Compared with other Canadian independent schools, this school is relatively young and was founded in the mid-nineties by a group of parents who were interested in

educational alternatives for their children. It began as a K-9 school with under 200 students and expanded to include a senior high school program over the following three years. The school first opened in rented facilities but soon moved to a temporary building on its own property. Over the next five years, permanent facilities were constructed to support a growing student body as the reputation of the school grew within the community. Within a decade the school was well established with a student body of approximately 670 pupils.

The Student Body

The school draws students from a growing population in its suburban surroundings and its catchment area extends for approximately a 25 to 30 kilometer radius. Given its mission, philosophy and enriched academic programs, it attracts students who are generally above average academically and who are university bound. The school has an admissions process in place and selects students based upon entrance tests, school reports and perceived fit with the school's mission. For students seeking entrance to upper grades, mission fit would imply an interest in a well-rounded program including enthusiastic participation in the co-curricular program as demonstrated by participation patterns in their previous school. For primary students with limited previous school experience admissions focus more on school readiness and parents' interest in the school's mission and philosophy.

As part of its admission process the school strives to achieve an equal gender balance between boys and girls. It is an ethnically diverse student body with approximately 33% Asian, 33% Caucasian and 33% Indo-Canadian students. As an independent school that charges tuition fees, families tend to fall into the middle and

upper middle class from a socio-economic perspective. The school has strived to maintain the lowest tuition fees among independent schools of its kind within the province in order to maintain diversity. However, the costs are still considerably higher than public schools and this certainly influences the make-up of the student body.

As a university preparatory school, high achievement is part of the school culture and most students are quite motivated and have relatively strong work ethics. Academic success and participation in co-curricular activities requires students to manage and organize their time. Teaching students how to do so is part of the school's program including the provision of paper and electronic organization technologies such as student agendas and laptop computers (for students in grades 5 through 12) as well as instruction on how to make effective use of such applications and devices.

The school places a strong emphasis on moral values and ethical behavior and as an independent school it has the ability to uphold strong expectations for student conduct and decorum. Students wear school uniforms and agree to live by a student-written code of conduct in the Senior School. This creates a learning atmosphere that is generally characterized by respectful behavior and students feel safe and supported in taking risks. Working hard and getting good grades is culturally endorsed by the community and overall the students experience high academic achievement as well as success in co-curricular areas.

Because of its origins as a parent-founded, tuition-based school, parents are extensively involved in the school as volunteers and partners in the educational experience. They also provide strong financial support through fundraising efforts and personal donations. The K-12 configuration means that families are often associated with the school for long periods of time and therefore become well acquainted with other

members of the community including teachers and other families. This support and familiarity translates into a close and intimate community and also one of high expectations and accountability.

School Facilities

The students are housed in two modern, high-quality buildings on a 7 hectare campus. The junior (K-7) and senior school (8-12) buildings are essentially self-contained units with their own classrooms, libraries, gymnasias, and specialized areas for art and music. A central cafeteria serves both. A few teachers cross over and teach in both schools but most are assigned to one division or the other. Because the buildings are relatively new, certain aspects of the technology infrastructure were built in and it was easier to incorporate new systems such as wireless access points than is often the case with older buildings. The Junior School has a computer lab for use by students below grade 5 where the laptop program begins. The facilities are a source of pride for the school community and purpose built for the school's mission and vision.

The Faculty

Teachers at the school are chosen on the basis of their qualifications and experience as well as perceived fit with the school's mission and philosophy. For example, all teachers are expected to contribute to the co-curricular program outside of class time and so the ability to coach a team, direct a play or lead students on an outdoor expedition would be desirable assets. Other contextual factors such as the school's laptop program cause it to search for teachers with strong ICT skills and experience. Generally the school endeavours to attract and retain teachers who are interested in and capable of

contributing to a well-rounded educational experience as opposed to those who may be experts in their subject area but less interested in non-academic activities.

To balance high expectations around co-curricular involvement and timely and regular communication with parents, teachers have generous preparation time. The nature of the school means fairly small class sizes and low student-teacher ratios. Teachers are well supported by professional development opportunities and learning resources. Each teacher is provided with her or his own laptop computer and there is strong technical support available through a team of IT professionals.

Demographically, the faculty is less diverse than the student body from an ethnic perspective. Male/female balance is quite even and the age range is somewhat skewed toward a younger demographic although there is representation in all age bands.

Teacher-Student Relationships

It is somewhat difficult to generalize about teacher-student relationships since each dyad has its own character and qualities. Several contextual variables at the site school have the potential to contribute to strong relationships or at least relationships in which students and teachers get to know each other well. For example, as a K-12 school, some teachers and students spend many years together. Even though most teachers only teach in one division of the school, a teacher who teaches a student science in grade 5 might also coach that student in basketball in grade 12. Because the school is relatively small and has fewer sections of any given course than a large secondary school, the same teacher could foreseeably teach a student in math multiple times from grades 8 to 12. Some relationships become closer over time and even those that don't have greater familiarity. Small class sizes also contribute to this phenomenon.

In this high accountability environment where parents pay substantial fees and expect students to thrive, teachers also feel very committed to student success and frequently spend time outside of class helping students who may be struggling. These tutorials provide additional time for students and teachers to build relationships. The same is true of co-curricular activities. High student teacher and student involvement in the co-curricular programs creates additional time together and opportunities to get to know one another in different ways and experience interactions unlike those in the classroom. Spending time camping with your English teacher is much different than composing an essay for her or him and these opportunities expose teachers and students to one another in different and often enlightening ways that hold unique opportunities for relationship building. Having worked in a number of different schools, I feel that I can confidently state that students and teachers at this school generally enjoy healthy and harmonious relationships.

History of the Laptop Program

Within five years of its founding, the school was finding it challenging to meet the increasing demand for access to computing facilities. Two computer labs were already in place and one mobile set of computers was available for booking, but the demand was rapidly outpacing availability. In 2001, the school established a Technology Committee that included teachers, administrators and parents with the mandate of developing a technology plan that would present a vision for the integration of technology into the teaching/learning process and propose a clear action plan to achieve that vision. The following vision and goals were developed:

The Vision

Our vision is to provide all teachers and students with the technology and the skills to enable them to construct knowledge and understanding by accessing information and by connecting with others in the community and around the world. ICT will enable students and teachers to create and participate in meaningful and authentic learning experiences that will enhance their love of learning and prepare them for leadership roles in a technology-rich future.

Goals

1. To integrate technology across the curriculum in an effort to accommodate different learning styles and intelligences, and enhance creativity, problem solving, and critical thinking skills.
2. To broaden the scope of assessment and evaluation through use of technology by teachers and students
3. To extend the boundaries of the learning beyond the physical classroom, both after hours and offsite, through the use of technology
4. To enable teachers and students to connect with others both locally and globally for the purpose of collaborative learning.
5. To commit to ongoing professional development of the faculty and staff to provide them with the appropriate ICT skills and teaching strategies.
6. To increase student/teacher access to the technology required to accomplish the goals of this plan.
7. To develop within students the ICT knowledge, skills and ethics necessary to thrive in an increasingly technology-rich world.

After considerable research including external school visits and participation in the Canadian Educational Standards Institute's *National Technology Project* the Technology Committee concluded that the most effective way to achieve the goals of the technology plan would be to implement a one-to-one laptop computing program and provide wireless access to the Internet throughout the school. The next steps involved building buy-in for the plan with the Board of Governors, parents and teachers. Doing so involved extensive planning, communication and the development of a plan to finance the project. These activities took several years and in June of 2004, a plan was in place to pilot the project beginning with students in grades 5 and 8 commencing in September of 2005. This gave parents (who would bear a considerable portion of the expense) a full year of notice. It also enabled the school to put laptops in the hands of teachers a full year before students and provide extensive professional development over the lead-up year.

The pilot year was a success and eventually laptops were provided to all students in grades 5 through 12. There was ongoing evaluation of the project and many issues had to be addressed along the way including expansion of the infrastructure, increasing technical support for teachers and students, information sessions for parents, the development of accepted use protocols, modification of classroom management strategies, dealing with ergonomic and health concerns, ongoing professional development for teachers, and a host of other related issues. At the time of this writing, the one-to-one computing appears to be well embedded within the school's educational program. Teachers and students are using technology in different ways and to varying degrees, but the initial problems and bumps frequently associated with implementations of this kind appear to have been successfully overcome.

Data Collection Methods

Yin (2009) identifies six sources of evidence most commonly used in the conduct of case studies including: “documentation, archival records, interviews, direct observations, participant-observation and physical artifacts” (p. 101). Given the nature of this study and its focus on teacher’s perceptions, the primary data collection method was personal interviews, preceded by a brief survey to assist with participant selection. The survey is discussed later in this chapter as is evidence collected from documents and archival records.

The use of research interviews as a method of data collection in qualitative research has been well supported in the literature (Kvale, 1996; Merriam, 2009; Mishler, 1986; Rubin & Rubin, 2005; Schaeffer & Presser, 2003; Seidman, 2006). Interviews enable the researcher to gain an understanding of the “lived experience” of other people and the meaning made from those experiences (Seidman, 2006, p. 9). Interviews are an effective means of obtaining and representing the “multiple views” that are inevitably present in the case according to Stake (1995, p. 64). In this study I strove to incorporate sound interview design principles, employ effective interview techniques, carefully select informants, and precisely record and transcribe conversations. I am confident that the interviews provided effective data collection for this case study, which has as its focus the lived experience of teachers working within technology-rich environments.

Interview Design and Structure

This section discusses the structure of the interviews that I used for data collection and the rationale for their design. Mishler (1986) proposed that qualitative research interviews were not merely mechanisms devised to collect data that could later be

analyzed and interpreted to reveal meaning. Instead, he argued that it was the discourse between researcher and informant that generated a shared meaning and that the interview itself “is jointly constructed by interviewer and respondent” (p. 52). While this concept is at first frightening to a novice researcher, I embraced it as a primary design element for the interviews utilized in this case study.

A key variable for consideration in designing the interview is the extent to which it will be structured. Merriam (2009) suggests that interview design falls along a continuum from “highly structured/standardized” to “unstructured/ informal” with the most structured formats consisting of a standard set of predetermined questions more like oral surveys (p. 90). Mishler (1986) is critical of rigid formats arguing that they make the questionable assumption that there is a “standard stimulus for all respondents” (p. 44). Merriam (2009) suggests that the most unstructured formats with no predetermined questions are appropriate in cases where the researcher knows too little about the subject of study or “phenomenon” to craft appropriate questions (p. 91). It has also been suggested that the appropriate degree of structure might best be determined by the type or intention of the interview with “exploratory” interviews having little structure and “hypotheses testing” being more structured to allow for comparison of responses among groups or individuals (Kvale, p. 97). However, most writers on the subject of qualitative interviewing advocate for a semi-structured approach (Creswell, 2007; Merriam, 2009; Mishler, 1986; Rubin & Rubin, 2005; Seidmen, 2006). In this study, the interview structure was a hybrid of highly structured and semi-structured as questions of predetermined wording and order formed the interview protocol. However, the use of follow-up and probing questions and a flexible approach to following the threads of the emerging conversation generated less structured interviews. This format seemed most

appropriate for this particular study since the interview was indeed intended to be a conversation from which shared meaning could be derived and considering that the case was not testing a particular hypothesis nor was the researcher completely lacking in knowledge about the subject.

Strong survey and interview designs and the conversations that emerge from the latter incorporate a variety of question types. Schaeffer and Presser (2003) provide a thorough discussion of subjective question types and their applications including: “ratings, ranking, agree-disagree statements, forced choices between statement pairs and open-ended inquiries” (p. 76). A number of these formats were employed in the participant selection surveys (discussed in the next section) including: ratings, agree-disagree statements and open-ended questions. For example, respondents were asked to rate their level of expertise in integrating technology into their teaching from novice to advanced. They were also asked to state their level of agreement on a five-point Likert scale (from strongly disagree to strongly agree) with fifteen statements about technology use within the classroom and teacher-student relationships.

The crafting of specific questions to guide the interview is vital to developing an understanding of respondents’ experiences and perceptions. Rubin and Rubin (2005) identify the three main types of interview questions as main questions, follow-up questions and probing questions. They suggest that the main questions should be worked out in advance to ensure that all parts of the research question are addressed. Follow-up questions can then be used to seek explanation of the themes, concepts or events introduced by the respondents. Probing questions are used to manage the conversation by maintaining focus on the topic, providing direction about the preferable degree of depth and asking for further examples for clarification. In short, the main questions should

supply the answers to the research inquiry while “the follow-up questions and probes ensure that you get depth, detail, vividness, richness, and nuance” and also acknowledge emerging themes (p. 129). Following this advice, I developed a written interview guide and planned to ask each of the participants the same main questions. I also prepared possible follow-up questions and used probing questions during the interviews to follow certain threads in the discussion or seek clarification.

Besides the actual construction of questions, the sequencing of them within the interview guide is also important; particularly for managing the interview dynamics. Merriam (2009) proposes beginning with questions that ask for “relatively neutral, descriptive information” and then moving to questions concerning “perceptions, opinions, values and emotions” (p. 103). I sequenced the questions to begin with a simple, open question asking subjects to tell me about some of the ways that they were using technology in their classrooms. This was followed by a series of questions that focused on instructional practices, classroom management and pedagogical interactions with students. The latter portion of the interview contained questions designed to collect evidence about the influence of technology on communication and interpersonal aspects of the teacher-student relationship. Table 3.1 below outlines the mapping of interview questions to research questions and related theory.

Once the interview design had been drafted, it was essential to test the questions before using them in actual interview settings to ensure that they were effective in collecting the target data. A number of writers (Merriam, 2009; Maxwell, 2005; Stake, 1995) advocate for piloting questions to reveal any weaknesses and allow the opportunity to revise, eliminate, replace or add new questions in advance of the research interviews.

Table 3.1. Mapping of Research Questions, Theory and Interview Questions

Research Questions	Related Theories/ Concepts	Interview Questions
1) How does one-to-one computing influence the role of the teacher with respect to the pedagogical relationship?	<ul style="list-style-type: none"> • learner-centered psychological principles (LCPPs) • sociocultural theory • situated learning • constructivism 	2, 3, 4
2) How does the increased access to information afforded by one-to-one computing influence the teacher-student relationship with respect to learner autonomy and teacher control?	<ul style="list-style-type: none"> • balance of power • sources of authority • learner empowerment • autonomy-supportive style • self-determination theory • teacher mediation • motivation 	4, 5, 6, 11
3) How has one-to-one computing shaped the nature and patterns of communication between teachers and students?	<ul style="list-style-type: none"> • virtual spaces • socio-communicative style • balance of power • computer-mediated communication 	7, 8, 9
4) How do one-to-one computing and laptop-enabled electronic communication affect the closeness of teacher-student relationships?	<ul style="list-style-type: none"> • attachment theory • immediacy • trust • care • closeness • relationship boundaries 	8, 9, 10, 11

In addition to the researcher's own observations during piloting, including whether or not the questions stimulated answers that fulfilled the line of inquiry, it is also possible to ask the pilot respondents to provide feedback about the questions themselves including any difficulties answering or understanding them. I invited teachers from my own school (also a laptop environment) to volunteer for pilot interviews once the school

year had concluded. A number of them did and I conducted three pilot interviews after which I asked for feedback as described above. Following the pilot interviews, I rewrote three of the questions. The pilot interviews also allowed me to practice using the recording device and interacting with the respondents using follow-up and probing questions. This helped to build my confidence in the interview guide as well as my interviewing techniques. The final interview questions appear in Appendix A.

Selection of Interview Candidates

In the interest of purposeful sampling, I selected teachers who represented various demographics (e.g., age and gender), as well as varying degrees of teaching experience and technology expertise. I also chose teachers from a range of grade levels and subject disciplines in order to provide a broad perspective. I surveyed a larger group of potential participants in order to enable me to be selective in choosing a meaningful sample of respondents as suggested by Stake (1995) and Yin (2009). I sent an invitation to complete the survey to every teacher involved with the laptop program, which totalled 51. The actual survey questions and response data appear in Appendix B. The survey was deployed solely for the purpose of participant selection.

Both Yin (2009) and Stake (1995) advocate the use of surveys within case studies and Stake suggests that conducting a survey first is a legitimate method of identifying and selecting appropriate interview candidates. A total of 28 teachers completed surveys. Of those, 21 agreed to be interviewed. From the 21 volunteers, I selected 15 participants. The participant group represented good gender balance and diversity in terms of age, years of teaching experience, technology experience and expertise, subjects taught and years at the school.

The survey also included 15 items that explored teachers' attitudes regarding the use of technology, teacher-student relationships and electronic communications with students. In selecting candidates, I endeavoured to achieve what Merriam (2009) refers to as "maximum variation" by selecting a sample of candidates that collectively represented a broad range of responses (p. 78). Another question asked what percentage of their class time involved students using laptops and I selected multiple respondents from each of the five response bands to participate in the study.

Since only 21 of the 28 survey respondents agreed to participate in an interview, only 7 candidates were excluded. The primary reason for exclusion of willing candidates was redundancy of subject area, grade level and/or experience and the desire to obtain maximum variation within the sample group. For example, an arts teacher was selected rather than two science teachers of similar age, experience and the same gender. Table 3.2 below illustrates characteristics of the interview subject group.

Conducting the Interviews

It is clear that the depth and accuracy of the researcher's understanding and the meaning that is constructed through the discourse relies heavily on the quality of the interviews. And as Kvale (1996) points out, the character of the original interviews to a significant extent predetermines the quality of the subsequent analysis and interpretation. Once the interview questions are carefully composed and willing respondents have been selected, leading and managing the interview presents multiple challenges for the researcher. Mishler (1986) articulates some of the complexities of conducting the interview when he states that "an adequate understanding of interviews depends on recognizing how

Table 3.2. Participant Demographics

Subject	Gender	Age	Total Years Teaching	Years at Site	Years using Laptops	Subjects/Grades Taught
25 B	F	45	20	9	6	Visual Arts 8 - 12
23 C	F	46	20	11	5	Science 5-7, Math 7
23 D	M	34	12	9	3	Music 5-7, English 7
24 B	M	34	8	4	7	Social Studies; AP History
24 A	M	39	4	3	3	Science 8, 10; Physics 11
23 A	F	57	22	8	6	English 12; AP Literature
24 C	M	40	9	6	6	Social Studies 9,10; AP Geography
24 D	F	31	8	6	5	Math, English, Socials 6
7 B	F	44	20	11	6	Chemistry 9, 10, 11, AP
3 A	F	45	20	10	5	Humanities 7; English 7
3 B	F	38	10	8	3	Drama 8-12, English 8
23 B	F	36	13	3	10	French; Spanish 9, 10, 11
7 A	M	46	24	12	8	Math 8-12; AP Calculus
25 A	M	44	17	10	6	English 8, 9
3 C	M	41	19	5	7	Chemistry 11, 12; Bio 9

Note: AP = Advanced Placement Course

interviewers reformulate questions and how respondents frame answers in terms of their reciprocal understandings as meanings emerge during the course of an interview” (p. 51).

The literature on conducting qualitative research interviews provides insights into these challenges and offers strategies and techniques for addressing them. This section outlines the strategies and techniques I employed in the conduct of my interviews.

The interviews were conducted in a small conference room at the school site. This proved to be convenient for most teachers who could attend interviews before or after school, during preparation periods or at lunch time. The environment was quiet, free of distractions and comfortable. Thirteen of the fifteen interviews were conducted there and two were conducted at the individuals’ homes at their request. Interviews were conducted on five different days over a two week period.

Setting the tone for the interview is an important first step and there was limited time to establish a good rapport. I already knew some of the respondents, though I had not seen them for years, but there were others whom I had never met. I followed Kvale's (1996) advice by giving each of the interviewees a short briefing before beginning the interviews. The briefing included a brief explanation of the purpose of the study, the general nature of the questions, the number of questions and the expected length of the interview. I explained that I was trying to get at their personal experiences and that there were no right or wrong answers. I encouraged them to provide examples whenever possible and to ask for clarification or repeating of questions whenever necessary. Finally, I explained how the interviews were being recorded and later transcribed. During the interviews, I tried to honour the respondents' knowledge and experience and maintain neutrality in regard to the respondents' knowledge even when it conflicted with my own knowledge (Merriam, 2009). In cases where there was incongruence, I made an effort to not reveal this to the respondents through facial expression (such as frowning) or other linguistic or paralinguistic communication.

An important aspect of establishing and maintaining effective interactions between interviewees and researchers is acknowledging and understanding the power asymmetry that exists between the two. As Kvale (1996) explains, "The interviewer defines the situation, introduces the topics of the conversation, and through further questions steers the course of the interview" (p.126). In addition to any power imbalance inherent in the interviewer-respondent relationship, I also have to acknowledge that a number of the subjects had worked for me in the past, although I sensed no power imbalance on that basis during the interviews and it had been at least three years since we had worked together.

Mishler (1986) proposes addressing this inherent power imbalance through alterations to the traditional roles of interviewer and respondent by allowing interviewees more control over the flow and content of the interview, involving them in “interpretation and use of findings,” viewing the interaction as a collaborative research venture, allowing and “attending to what and how interviewees may learn from their efforts to respond meaningfully to questions within the context of their own worlds of experience” (p. 132). Although I used a fairly structured interview format, the transcripts indicate that I allowed a reasonable amount of latitude and frequently followed threads that the respondents initiated in the discussion. I also sent each of the respondents a copy of particular sections of a draft of my findings that included any quotations from their personal interviews followed or preceded by my interpretation of the meaning of that excerpt. I asked them to tell me whether or not I had interpreted what they said accurately and gave them the opportunity to revise or edit their own words. Several recommendations were incorporated into the final draft of my findings. This also served to enhance the trustworthiness of the data.

Directing the flow and content of the interview conversation within the context of the aforementioned issues was certainly challenging to a novice researcher such as me. Yin (2009) explains that the interviewer has two key roles during the interview, which include following your own “line of inquiry” as determined by the research questions of the case study and asking “your actual (conversational) questions in an unbiased manner that also serves the needs of your line of inquiry” (p. 106). Although conversational give-and-take is desirable within the interview, the researcher walks a fine line between this flexibility and allowing the interview to be hijacked. Stake (1995) describes the content of the interview as “targeted and influenced by the interviewers” (p. 66). Gudmundsdottir

(1996) describes it as treading “the thin line between “showing an interest in” and being “captured beyond return” by our informants’ narratives” (p. 300). The three pilot interviews that I had conducted in advance helped me to understand some of these challenges. In addition, I have conducted hundreds of employment interviews during my career. While these are different from research interviews, they share some of the same issues such as interviewees wandering or hijacking the interview. They also require probing and follow-up questions in addition to the predetermined questions. My extensive employment interviewing experience was very helpful in managing these research interviews.

As I mentioned at the outset of this section, Mishler (1986) identified the tendency of respondents to occasionally reframe or redefine the interviewer’s questions while at other times accepting the interviewer’s definition as dominant. Ultimately, Mishler argues that, “Respondents’ acceptance of interviewers’ frameworks of meanings is a key factor in a ‘successful’ interview” (p. 54). But he also explains that respondents learn through the interviewer’s response to their questions during the interview about “what particular meanings are intended by questions and wanted in their answers” (p. 54). This was not a significant challenge during these interviews because the teachers involved were very familiar with most of the language in the questions due to their expertise in the field. There were some occasions on which I needed to reframe a question or clarify its intention as indicated by the initial response to it. After the first set of interviews, I altered one question to clarify it after noticing the need to do so during these first interviews. In some cases, the respondents actively sought clarification or asked me to repeat or elaborate on the question. These exchanges and adjustments helped to preserve the original meanings of the questions.

Overall, the interview subjects were very open to sharing their experiences and their perceptions of technology use and its influence on teacher-student interactions and relationships. Several mentioned that they enjoyed the interview because it caused them to reflect on their practice and gave them the opportunity to share their perspectives. Those with considerable teaching experience in other settings were able to draw comparisons to teaching with and without the use of technology and these perspectives were particularly helpful in illuminating its influence on their practices and interactions with students. While some interviews were richer in terms of the data they provided, I learned from each of them and utilized excerpts from every transcript in my findings.

Recordings, Transcripts and Field Notes

Capturing and preserving the interviews was a critical aspect of data collection for this case study. Stake (1995) has argued that recording of interviews is not essential and that it is not necessary to capture the exact words of the respondents. However, as a novice interviewer, I wanted to apply my full concentration to listening and managing the interviews and felt that recording would be the best way to ensure that. I obtained a good quality, digital recorder to ensure high fidelity recording and tested it during pilot interviews to familiarize myself with its operation. As Kvale (1996) suggested, I explained the use of the recording device to the participants prior to the commencement of each interview and there was no need to make any adjustments to the device during any of the conversations. At the conclusion of each interview, I copied the digital file to my computer so that I had a duplicate of each recording. I later burned the recordings to a CD and stored this in a locked filing cabinet for safe keeping.

For practical reasons (time limitations and poor keyboarding skills) I had the recordings transcribed by two reputable professionals under confidentiality agreements. The transcriptions were verbatim transcriptions. In order to ensure accuracy of the transcriptions and avoid missing any of the nuances, paralinguistic expressions or subtleties of the conversations, I listened to each recording at least once with the written transcript in hand and made corrections and some notes in the margins. Mishler (1996) also suggested returning to the original recordings rather than the transcripts because they contain certain features of speech such as “rapid changes in pitch, stress, volume and rate” that will not be evident in the transcripts (p. 48).

Some authors propose giving the written transcripts to respondents to check for accuracy but as Stake (1995) points out, “Interviewees are often dismayed with transcripts, not only because of the inelegance of their own sentences but because they did not convey what they intended” (p. 66). Rather than send full transcripts to the subjects, I sent only the excerpts used in the dissertation along with my analysis or interpretation of the excerpt to confirm accuracy of language and meaning. This process, known as “member checking” was less onerous than asking them to review full-length transcripts and was also helpful in establishing validity (Creswell, 2007; Merriam, 2009). Indeed, some asked me to clean up their grammar a little which I subsequently did.

Field notes constitute an important component of the data collection and may be supportive to subsequent analysis and interpretation. Merriam (2009) suggests making field notes about the mood, health and demeanour of interviewees as well as any perceptions about ulterior motives, exaggeration or understatement. Mishler (1986) also emphasizes the importance of making field notes about “non-linguistic features of

speech” that may help to interpret transcripts (p. 48). These may include gestures and facial expressions not discernible from the audio recordings.

Immediately following each recording, I made field notes on forms that I had created. I noted the date, start/finish times of the interviews and any unusual circumstances. For example, one interview was interrupted by a lengthy public address system announcement. I also made notes about the demeanor of each subject for example the extent to which they seemed relaxed or nervous. When there were any difficulties with a particular question, I noted that. For example, one of my field notes states, “I don’t think that this subject fully understood question #8. He seemed to pick up on key words and not grasp the full meaning of the question.” Another comment read, “This teacher has spent his entire career in a laptop environment so has a different perspective than those who can compare to previous no tech/low tech settings.” Rubin and Rubin (2005) argue that data collection and analysis should be conducted simultaneously as opposed to a linear process where all analysis follows collection. By creating field notes at the end of each interview, I was able to identify important ideas and record thoughts that helped to create meaning from the interview and inform subsequent interviews. In essence, this formed the beginning of my analysis. Field notes were consulted later during the data analysis process to help clarify and to understand the meaning and context for some statements.

Additional Data Sources

In addition to interviews, documentation and archival records were useful in creating a rich description of the case. As Merriam (2009) points out, documents that have been produced for reasons other than the research are not limited by some of the

issues that affect other data sources such as interviews and observations. Unlike observers or interviewers, documents do not impact the research setting nor are they “dependent upon the whims of human beings whose cooperation is essential for collecting good data through interviews and observations” (p. 139). For these reasons they constitute useful and readily accessible data which can assist the researcher in the description of the case and the formulation of findings. Documents useful to this study included items such as the school’s proposal to introduce the laptop program, presentations from parent and faculty meetings, minutes from the Technology Committee’s meetings, letters to parents and articles in the school newsletter regarding the laptop program and the school’s website.

Data Analysis and Interpretation

Analysis of interview transcripts began by listening to each recording again with the transcripts in hand and making margin notes on excerpts that were interesting. On a second pass, interesting passages were bracketed. Seideman (2006) described this process of reducing the transcript text as “winnowing” (p. 117). Excerpts were re-examined a number of times in search of themes and connections. During this review, I made notes about ideas, possible connections, questions and issues that emerged in what Maxwell (2005) referred to as analytic memos. Maxwell cautioned against the over-reliance on coding as the singular method in qualitative data analysis. “I want to emphasize that reading and thinking about your interview transcripts and observation notes, writing memos, developing coding categories and applying these to your data, and analyzing narrative structure and contextual relationships are *all* important types of data analyses”

(p. 96, emphasis in original). Analytic memos proved useful at various stages of analysis and in writing the discussion of findings.

Eventually, I developed a preliminary coding system that was refined and reduced to the point that most of the excerpted data transcript could be organized under one or more categories. I organized excerpts into electronic files under each code and maintained one additional file for any excerpts that seemed of interest but did not fit well under a particular code.

In order to develop themes from the categorized data, I drew upon several of Saldana's (2011) focusing strategies. For example, I took key words and phrases from the coding process and began to integrate them into longer narrative forms through a process that Saldana refers to as "codeweaving" (p. 187). After experimenting with this and several other techniques, a set of themes and sub-themes took shape and these eventually constituted the findings discussed in Chapter Five.

Reliability and Validity

Since qualitative research of this type does not have the methodological controls found in quantitative studies such as control groups, random sampling and tests for statistical significance, qualitative researchers must attempt to eliminate threats to validity once the research has already commenced and evidence has been collected, rather than exclusively through design features incorporated in advance (Maxwell, 2005). Maxwell identifies two broad types of threats to validity including researcher bias and reactivity. Since researcher bias is unavoidable, I made an effort to identify my own biases prior to collecting data and determine how these might best be mitigated when drawing

inferences from the data. Merriam (2009) suggests researchers “clarify their assumptions, experiences, world view, and theoretical orientation to the study at hand” (p. 219). I included these elements and possible sources of bias in Chapter One in the Position of the Researcher section.

Maxwell (2005) identifies the second threat to validity as “reactivity” (p. 108). This has to do with the inevitable influence of the researcher on the study participants. He states that “what the informant says is *always* influenced by the interviewer and the interview situation” and suggests that rather than attempting to eliminate this effect, the researcher must instead strive to understand his/her influence on subjects and “how this affects the validity of the inferences you can draw from the interview” (p. 109, emphasis in original). In cases where I felt that informants could be reacting to me in a particular way, I noted this in my field notes so that it could be considered during analysis and interpretation.

Maxwell (2005) offers a checklist of eight tests to help to help thwart potential threats to validity. Of the eight, five seemed particularly relevant and helpful to this study. The first of these was the collection of rich data through intensive interviewing followed by the creation of accurate, verbatim transcriptions. The second was respondent validation referred to by others (Merriam, 2009; Creswell, 2007) as member checking. I accomplished this by seeking feedback from each respondent about the accuracy of my data and the inferences made during analysis. The third strategy involved avoiding any temptation to overlook or disregard data that conflicted with the majority or that might be discrepant to emerging conclusions. As Maxwell (2005) explains, “The basic principle here is that you need to rigorously examine both the supporting evidence and the

discrepant data to assess whether it is more plausible to retain or modify the conclusion, being aware of all of the pressures to ignore data that do not fit your conclusions” (p.112). I believe I accomplished this. A fourth technique is triangulation, which is more difficult to accomplish in a single-case design such as this. However, Griffie (2005) suggests that this can be achieved to some extent by comparing responses of different informants to the same questions. The fifth strategy that was useful in preserving validity is comparison. In single-setting case studies like this where there is a relatively homogenous group of interviewees (i.e., teachers from the same school) comparisons may be achieved in two ways. First, by seeking literature that explains “typical” settings of this kind (i.e., Canadian independent schools, or other laptop programs) with which to compare this case, it can be ascertained whether or not it is exceptional (p. 113). Also, the participants themselves may bring experiences from other settings or experiences that occurred before technology was introduced that enable comparisons with the phenomenon currently under examination. Both of these solutions were exploited in this study. For example, I reviewed the report entitled *Technology in Canadian Independent Schools: A Report on Effective Practice* (2006) produced by *The Canadian Educational Standards Institute* to help ascertain the typicality of the case school. I was also purposeful in selecting some interview subjects whose experience considerably predated the use of laptops in schools.

Reliability, according to Merriam (2009), is interpreted differently in qualitative research than in quantitative studies where it refers to the ability to replicate results. Instead, reliability in qualitative studies occurs when outsiders agree that “given the data collected, the results make sense – they are consistent and dependable” (p. 221). She argues that this is best accomplished when: 1) the researcher explains his or her

assumptions, theories, position and participant selection criteria; 2) triangulates using multiple methods of data collection; and 3) leaves an auditable trail explaining how data were collected, categories determined and decisions made. With the exception of using multiple methods of data collection, each of the above suggestions was incorporated into the methodology of this study. And although interviews were the primary method of data collection, participant selection through purposeful sampling ensured a variety of perspectives on the research questions. Baxter and Jack (2008) stated that purposeful sampling, systematic data collection and reflection of field notes can all contribute to reliability. Having utilized the strategies, techniques and design principles described above, I am confident that I have taken reasonable measures to enhance reliability and validity inasmuch as applicable to qualitative research.

Ethical Considerations

This research was conducted in accordance with all of the protocols required by the University of British Columbia's Behavioural Research Ethics Board (BREB). First contact was made with prospective subjects by a Letter of Initial Contact and Invitation Appendix C after written permission to conduct the study had been obtained from the school's Board of Governors. Participation was completely voluntary. Those who agreed to participate received and signed individual consent forms Appendix D explaining the purpose of the study, procedures, risks and benefits, and assurance of confidentiality. Interviews were conducted with regard for individuals' personal comfort and safety. Measures were taken to protect the confidentiality of all transcripts, recordings, letters and forms by locking them in a secure location.

Summary

This chapter provided a detailed description and rationale for the research methods utilized in this qualitative case study. It outlined the research design, setting, participant selection, data collection and analysis, ethical considerations, and efforts made to ensure validity and reliability. Chapter Four presents the analysis of data and findings.

CHAPTER FOUR: FINDINGS

Introduction

The teacher-student relationship is both unique and complex. While teachers and students come together primarily for the purpose of learning, many of their interactions do not focus specifically or exclusively on learning. For the purposes of this analysis, I have tried to examine the influence of technology use on both the interpersonal and the pedagogical domains of the relationship. I acknowledge that these two components are intricately interwoven and cannot be neatly disentangled for the purpose of analysis. Despite this imperfection, I have made some attempt to distinguish these, in part, through the design and focus of my research and interview questions and by interpreting those interactions that pertain directly to instruction, that is, to the pursuit of curricular learning outcomes, as pedagogical and those interactions that do not pertain to instruction as interpersonal. Other researchers have made similar distinctions. For example, Frymier and Houser (2000) concluded that teacher-student interactions were both relational and content-oriented. Content interactions involved explaining course material whereas relational elements focused on “meeting students’ emotional needs and motivating them to succeed” (p. 216). Interactions that do not pertain specifically to pedagogy and course content may still involve learning, as many life lessons may be the result of non-pedagogical interactions between teacher and student. Indeed much relationship building may take place through interactions that are not pedagogical in nature, whether they occur in the classroom or outside of it. Without denying the complete inseparability of the pedagogical and interpersonal aspects of the teacher-student relationship, I have

examined teachers' perceptions of the influence of laptop computing and technology use through both lenses.

Three major findings and a number of sub-themes emerged from this study. The first finding responds to the first research question regarding the influence of one-to-one computing on the pedagogical relationship and the roles of teachers and students within it. Regular computer use was found to influence this relationship significantly by promoting more student-centered instruction, altering the teachers' mediation, classroom management and content delivery roles, and assisting teachers to motivate students and engage them in building a community of learners.

The second finding addresses the second research question, which examined the influence of one-to-one computing on learner autonomy and control. It reveals that ICT use has the potential to reduce the power asymmetry within the relationship serving as a catalyst for learner empowerment and more individualized approaches to inquiry. It also indicates that the sources and use of authority within the classroom dynamics are altered.

The third finding addresses the third and fourth research questions, which examined how access to computer-enabled communications altered communication patterns among teachers and students, and influenced relational variables such as closeness. This finding indicates that electronic communications provided alternate means for student-teacher interactions enabling teachers to extend their care and support for students, strengthen relational bonds, and facilitate increased access and approachability. In doing so, it also indicates the risks of increased conflict and potential boundary violations. This chapter is organized around these three major findings and their related sub-themes.

Finding 1: Technology Influences the Pedagogical Relationship

Teachers in this study perceived that their pedagogical relationships with students and the traditional roles of teachers and students within these relationships were altered by the use of laptops in the classroom and the instant access to on-line information and communication channels enabled through the Internet. The roles of teachers and students within the teacher-student relationship continuously evolve in response to research and new knowledge about teaching and learning. Technology and other innovations can act as catalysts in that evolution. In this particular case study, teachers believed that the use of laptops and the associated access to digital learning resources and electronic communications altered the nature of their pedagogical interactions with students and the specific roles that teachers and students played within their relationships. Changes included a shift toward more student-centered instruction and different roles or approaches with respect to mediation of learning, classroom management, assessment and construction of knowledge. The laptop program introduced the use of student and outside experts for both technical support and content expertise. And ICT use also created new opportunities to motivate and engage students within a community of learners, and enabled some streamlining of instruction. Each of these alterations in the pedagogical relationship between students and teachers is discussed in the sections that follow.

A Shift Toward Student-Centered Approaches to Learning

One of the shifts that teachers reported as a result of their use of technology in the classroom was their instructional position relative to students within the learning process along the continuum from teacher to student-centered learning. A number of participants

in the study explained that the role of the teacher becomes more of a facilitator of student-centered learning and the co-construction of knowledge as opposed to the teacher acting as a dispenser of knowledge. Speaking about her use of laptops in the classroom, one teacher stated that,

I think it's for the better because you want it to be like a constructive – well, I've been reading a lot about constructivism lately, so you want to be in a constructivist learning environment, right? You want it to be student-centered, you want students to be able to learn how to problem solve and again, you're stepping back in your role a little bit as a teacher and acting more as a facilitator and a mediator, not just an instructor. (24D – 44 – 4)

This notion of “stepping back” was mentioned frequently by teachers in this study, and despite various contextual nuances in this expression, it generally referred to a shift away from teacher-centered instruction or direct instruction led by the teacher. There were variations in the teachers' perceptions of what constituted a more student-centered approach to learning and how the teacher's role changed to accommodate this shift through the use of technology. For some, the shift involved a reduction in the use of textbooks, teacher-created notes or resources sourced by the teacher in favour of resources that students located themselves on the Internet. These included videos from educational sites or YouTube, images, on-line simulations or demonstrations as well as text-based, on-line resources. Students could then construct their own notes on a topic that could be incorporated into a small group or full-class discussion. One teacher described this variety of student-centered learning activities like this:

Well, I think the main thing with laptops is that the variety, in terms of things we do with kids, has increased. Before laptops, I mean, I wouldn't say it was totally a teacher-centred or directed or lecture approach but it was much more like that and there was sort of, 'You

better get my notes or use the textbook or follow me or you're kind of lost' and now there's just a lot more to go to. (7A – 4 – 22)

Student access to on-line resources was seen as an enabler of more student-centered approaches regardless of whether the teacher or the student was the one to locate specific resources. Even when the teacher directed students to specific websites, the variety and number of these enabled the teacher to respond to individual learning styles or modalities, providing many different options on a single topic.

Some teachers continued to use teacher-created notes but the technology enabled them to do so in different ways. Rather than using class time to lecture and have students take notes, some teachers posted electronic notes on their websites and had students personalize them. One teacher described this process.

So it's more student centred. It's less just sitting and taking down notes. In fact I don't actually ever have students – I very – very, very, very rarely have students take notes any longer. If they need notes I usually provide them. I do talk about how to personalize them using highlight and colour and things like that but it's quite a big shift so I have found it easier to be inquiry-based using the technology. (23C – 5 – 14)

Another interpretation of student-centeredness focuses on how Internet access allowed the teacher to provide students with greater choice of topics for project work. Rather than limiting project topics to those for which the teacher or school library had resources, teachers allowed students to pursue a wider range of interests and they can access resources directly and within the classroom environment via the Internet. This greatly expanded not only the topics available but also the variety and nature of resources available on a specific topic. It personalized the learning by allowing students to explore a topic that was interesting and motivating to them but still within the scope of the

learning objectives. In this way the teacher facilitated learning without being the dispenser of knowledge. As one music teacher explained,

But I certainly feel often I'm much more of a facilitator and I mean I've always been a facilitator as opposed to a fill the empty vessel kind of teacher but I think that certainly we're able to give the kids a lot more independent projects. So instead of me saying, 'Okay, we're going to research composers and I've got some information here on Beethoven and Bach and Mozart'. Now we can be a lot more flexible. (23D – 5 – 14)

The open access to resources directly by students has other benefits with regard to student-centered learning. Not only can students select topics of personal interest that go beyond the learning resources available within the classroom or the school, they can also select topics that are outside of the teacher's knowledge or expertise. This has the potential to be intimidating to some teachers, particularly if they believe their authority is rooted in their expertise of the subject matter (Schofield & Davidson, 1997). However, others may be liberated by the idea and embrace the notion that they neither have to know or to teach everything in order for their students to learn it. One example in this study involved an art teacher who explained a project whereby the students created a piece of work in the style of a particular movement or era. Each student drew the name of a different stylistic movement from a hat, researched that movement and created a piece in the chosen style. The teacher explained that prior to the use of laptops in the classroom, she would have had to teach or assemble resources on many different styles such as modernism and expressionism and provide sample pieces of art for each. She would also have needed to know all about the historical context for each style. She describes the task as follows:

So I would have had to have taught them everything about fifteen different 'isms' and not just showing the pictures of the artwork. I would have had to have known the political times, the sociological times, philosophical... I don't need to know that anymore. I don't need to teach it fifteen times. And so I can come up with these big ideas and they're, they research all of that. (25B – 4 – 9)

In this example, the students used laptops to locate images of original art and historical information on the topic. They projected large, high-quality images using the SmartBoard in the art studio and discussed their work with other students in the room. Once they understood the style, they began to create their own piece with the benefit of all of the resources for both the art making and the knowledge base at their fingertips. The teacher facilitated the process by moving around and assisting individuals as required. She described the shift from how she might have handled the project before students had laptops in the following way:

So how I would teach it now is I would rely a lot on them researching on their own, so it's far less didactic. It's far less me telling them about what I know or I can find about a certain movement... it would be very daunting to do (before)... (25B – 3 – 20)

During the interview, the teacher also revealed that without students having individual access to on-line resources, she would have had to reduce the scope of the project since the cost and practicality of acquiring high-quality resources on each of the stylistic periods would have been prohibitive. If faced with making choices in reducing the scope, she acknowledges that she may have made those choices based more upon her own personal interests and expertise, which in itself is a teacher-centered approach.

The use of the technology itself (hardware and software) has also altered the roles of teachers and students within the pedagogical relationship. Since many of the technical skills and much technical knowledge are self-taught outside of the classroom, there is a

wide range of technical expertise among both teachers and students. This impacts the teacher-learner dynamics in a several ways. When teachers are teaching students how to use a new software application, there are often tech-savvy students in the classroom who can learn at a quicker pace. This reduces the value and efficiency of a teacher-centered approach whereby the teacher moves through a step-by-step process explaining how to do one thing and then allowing the whole class to try it before moving on. One teacher described the experience of having learned that it is better to simply allow students to experiment with the program or application in such a way that the tech-savvy students can move ahead at their own pace with the teacher offering assistance, where needed, to others. Advanced students can also assist other students to learn the new program and in some cases help the teacher as well. A teacher described his experience with introducing a new software application:

So instead of me – before when I would show them the screen and then pause it and then they do it, and then show them the screen, show them what to do, and then pause it and they'd do it. I'm avoiding the whole step-by-step instruction with certain things. And they actually learn a lot more if they do it themselves because everybody's at their own pace.
(24D – 6 – 6)

This illuminates the benefits of a student-centered approach that recognizes the previous knowledge of individual students as opposed to a lock-step process of taking an entire class through a teacher-directed demonstration at a predetermined pace. Teachers also acknowledged students' technical expertise within the classrooms in other ways that promote a student-centered approach. For example, at the site of this case study there is a common expression among teachers, which is “ask three before me.” This means that students who have a technical problem with their laptop should ask three students before

they ask the teacher what to do. This has helped teachers to manage technical issues more efficiently and reduced students' reliance on the teacher in this technical area. One teacher made the following observation:

I find it's allowed it to be a lot more student-centred, where again, students help each other troubleshoot for example and are not always coming to me. So the whole 'ask three before me,' they've learned how to do that. (24D – 5 – 1)

There are potential risks involved in the technology-rich classroom as the teacher moves away from being at the centre of learning. One such risk is that of becoming too disengaged as expressed by one teacher in this study.

I think there is, there is the possibility for a teacher to disengage by retreating and letting the students just interact with the computer... So I can see a teacher coming in with a task, and then the whole class could spend the whole period individually on that task, and there, I think that's a loss. Then you never have the collective discussion or the group discussion coming back to the collective. So I think there is a danger there. (23A – 16 – 14)

This suggests that teachers must be mindful of the balance between teacher and student-directed learning and between individual and group learning tasks in order to optimize the benefits of both.

Overall, the data indicated that the use of laptops in the classrooms served as a catalyst in promoting a more student-centered learning environment. This constitutes a realignment of the roles of teachers and students within the instructional domain of the teacher-student relationship as students assume a more active and significant role in accessing and constructing knowledge and that process is facilitated by the teacher whose role as a dispenser of knowledge is proportionately reduced.

Teacher Mediation and Classroom Management

Mediation and classroom management are roles for which the teacher has primary responsibility within the teacher-student relationship. These roles are similar and closely connected. However, for the purpose of this discussion, mediation refers to the teacher's role in mediating interactions between the learner and various elements of the learning environment (Vygotsky, 1962; Hennessy et al, 2005; Sutherland et al, 2004) and classroom management refers more to the management of student behaviours through the organization of tasks, resources and equipment to ensure an orderly learning environment (Evertson & Weinstein, 2006). The teacher mediates the learning interactions between students and their laptops by controlling how the students will make use of the technology for learning while in the classroom. The focus is more cognitive. The classroom management function has more to do with minimizing technology-related distractions, maintaining student focus or on-task behaviour and managing the physical presence of the laptops and their relative position in relation to teacher and student. The focus is more behavioural or procedural. The introduction of laptops into the classroom poses new challenges for teachers in their interactions with students in both of these areas.

Educators in this study identified a pedagogical shift requiring greater emphasis on the mediation of student interactions with the technology and the web-based resources accessed with laptops. One challenge is simply determining when and how much students will be allowed to use their computers during the class. Some teachers, particularly with older students, allowed greater student discretion as to when they could use their computers. For example, students might be allowed to search for information during a class discussion, either to add to the discussion or to expand or clarify their own

understanding. Others felt the need to exercise greater control over student access during structured activities.

...it can also create a wall if you don't control the use of the computers, so I think you really, you have to be bold enough to say, 'We're not using computers now. We're having a discussion circle' and do it that way. (23A – 16 – 2)

These different possibilities create new decision points for teachers in their mediation roles.

When students have access to the Internet during class, teachers also need to make decisions about the scope of information searches. Before laptops, if students were researching a particular topic, there may have been a small section of books or articles on that topic in the school library or the teacher may have collected and brought resources to the classroom. While these resources may have been limited and even outdated, they placed certain parameters around the volume of readily available material. Students in a laptop environment armed with multiple search engines will find thousands of hits on any topic. This presents a new dilemma for the teacher about whether to allow open searches or pre-select websites that students can use in their research, much as the librarian had chosen certain books for the library to represent various topics. One teacher described the dilemma as follows:

You know we're doing our grade nine space race project and they're able to look anywhere on the internet to find an alternative place in the universe to live, right? And for some kids it's too stressful. ...It's just way too opened ended, right? And we've even talked about it as teachers because we do that as a group project with all the grade nine science classes, right? So we go back and forth. You know, should we give them a list of websites or should we just say 'Off you go'? So – a bit of a tug of war there. (3C – 13 – 5)

Filtering of web-based content is another challenge that arises when allowing students to do Internet searches. Most schools utilize some sort of web-filtering product on their network to help limit access to inappropriate content. But these are rarely sophisticated enough to eliminate the problem and teachers must usually take an active mediation role in filtering or censoring content. One teacher described the challenges that she encountered when her students were first working on a crime unit and entered that term into a search engine.

The first time I had the kids make a cover page for the crime unit and they typed in 'crime' as a search engine word and it was particularly around images. Images are difficult (to filter) because - it's my understanding anyway, it's a lot easier to filter out text that's inappropriate than it is to filter out (images). And although there are programs for that they're exorbitantly expensive and even then it's difficult. So, you know there's the potential for students to access things that we don't want them to at times. (23C – 13 – 19)

Some teachers created learning activities that were hybrids of traditional and technology-based interactions. An English teacher described one such activity as follows:

One class I tried a discussion circle in the inner circle, and the outer circle had their computers, and they were making notes on the inner circle's discussion. And then they were going to post those to an online dialogue, so just to see if we could get both a real live discussion going and then an online dialogue. (23A – 16 -5)

This is an interesting example of the teacher mediating the students' use of technology and their interactions in a discussion simultaneously.

In addition to the mediation of interactions between the students and the technology as it relates to the learning process, there are a host of other practical challenges that the laptop environment poses for the teacher in maintaining a safe and orderly learning environment, and on-task behaviour. These can range from managing

power cords to ergonomic considerations. Teachers in this study believed that their classroom management roles had changed as there were many new technology-related issues to manage and these required them to adopt or develop new strategies.

Laptops can be useful learning tools but they also introduce many potential distractions into the classroom environment. These include gaming, email and the allure of websites that may captivate student interest but are unrelated to the lesson at hand. Teachers in this study identified a number of ways in which they modified the classroom management role that they play within the teacher-student relationship in order to compensate for technology-related distractions. One such strategy involved asking students to “fist” their laptops when the teacher requires the attention of the full class to deliver instructions. Fisting means to close the lid of the laptop far enough that it cannot be viewed by the student but not so far as to cause the computer to go into hibernation mode as this can cause delays in access. When asked to fist their laptops, students left an opening the size of their fist between the screen and the base of the machine. One teacher described it like this:

Well, you have to be careful. If you're trying to communicate to the whole class and they have the laptops we use devices like fist your laptop. All the kids know this term 'fist the laptops' which means put the screen down and then they'll leave it. (23C – 19 – 8)

Teachers also identified strategies that they employed to monitor what students were viewing on their screens during the lesson. Many accomplished this by movement about the room or positioning themselves at the rear rather than the front of the class so that they could monitor student screens. Teachers had different levels of tolerance for students having other windows open behind the topic-related window just as teachers

have different levels of tolerance for the level of chat within the classroom. When and whether to intervene are judgment calls that the teachers made within the context of their expectations and classroom management styles. For example,

There are always some kids who have a window open behind what you're supposed to be doing. I'm not naive to that, and I sometimes choose to address it and I sometimes choose not to, and it really depends on the situation and, if it's somebody who's regularly uninvolved in my class, I might bring it up with them or discuss with them sitting somewhere else where I can see over their laptop a little bit better, or something like that. (3B – 18 – 6)

Other teachers claimed to have become adept at determining whether or not students are on task or viewing things that they should not be, simply by the looks on their faces.

You also have to be aware of the kids' facial expressions when they're sitting with their laptop. Are they actually doing what they're supposed to be doing? And I've very quickly figured out when they're not. There's a particular look they'll have on their face when they're probably looking at something that they're not actually supposed to be looking at at that time. (3A – 15 – 9)

Besides managing potential distractions, teachers are faced with technical problems that have the potential to interfere with learning. These included students being unable to log on to the school network, students who had forgotten to charge laptops or forgotten power cords, network down time, malfunctioning laptops, and a variety of other hardware and software problems. There are times when multiple technical problems occurring simultaneously within the classroom can overwhelm the teacher and derail the lesson plan entirely. Technical problems combined with monitoring requirements have the potential to elevate demands on the teacher and to increase teacher frustration. This has relevance to the teacher-student relationship as teacher frustration has the potential to

generate conflict or tension in their relationships with students. One teacher described the challenge as follows:

I think it's really hard to manage a classroom when some kids have broken laptops, some kids are functioning with paper, some kids are on laptops, or if nobody besides the teacher is monitoring the integrity of the network, because there's just not the time in class to sit and look at what everybody in your class is doing. (24B – 18 – 3)

In response to the technical issues that accompany daily laptop use and their need to manage these, teachers made greater use of student expertise to solve technical problems, teach the use of hardware and software applications, and assist with the integration of technology into the learning process. This created new avenues for building teacher-student relationships. In this study, a number of teachers had adopted shared techniques for engaging students in resolving technical issues such as the “ask three before me” strategy mentioned previously. This had the combined benefit of preventing the teacher from becoming bogged down with the resolution of technical problems as well as engaging the students in the pro-social behaviour of helping other students. But besides these obvious benefits, some teachers in this study pointed to a more profound relational change that may be an unintended bi-product of exploiting student expertise. One participant captured this particularly well when discussing the teacher-student relationship. He said,

The excitement they get to know more than I do in certain aspects and to be actually the teacher of information - I would say that probably once or twice per class per week there's an incident where a student will tell me something and I'll say, 'You gotta tell the whole class that,' and then they'll be able to tell the whole class that information. So on that side of things I think that it's probably improved. It is more democratic. (25A – 7 – 18)

Another described it in this way:

I've had students in the past who were the tech-savvy kids in the class and sometimes that was my way to connect with them – was having them show me how to do something. And then it actually improved our relationship. (24D – 43 – 5)

These examples illustrate how the co-option of students to assist with classroom management issues also benefited the teacher-student relationship in certain situations.

Sharing Traditional Teacher Roles with Other Experts

Despite the willingness of many students to assist in the manner described above, there are times when only an IT professional can resolve technical problems and this means students leaving class to visit the IT help desk or IT professionals coming into the classroom to assist. Teaching has traditionally been carried out more or less in isolation where the teacher is usually the only professional adult within the classroom managing the delivery of instruction and all associated elements of the classroom environment. Teachers in this study acknowledged that the introduction of technology has meant that they are no longer capable of managing all aspects of the classroom environment and in addition to sharing that role with students, they have also turned to other IT personnel to help with the technical elements of classroom management. While experienced teachers are most often quite confident in their subject and pedagogical knowledge, they may feel less confident in their abilities to solve technology that which have the potential to disrupt or interfere with the learning process. The excerpt below illuminates this concern:

Certainly if it's a basic tech problem, yes I can troubleshoot, but it's interesting because I feel as a music teacher or as an English teacher I feel quite competent and confident, whereas when different tech issues will come up, I don't. (23D – 22 – 8)

Although this excerpt suggests that teachers' confidence might be undermined by their inability to manage some technical challenges, teachers in this study have generally come to accept the need to share this classroom management role with other personnel and have become comfortable with this arrangement. However, it does introduce a new element and a third party into what has traditionally been the teacher's role within the teacher-student relationship and this has the potential to clash with the deeply-rooted culture of the classroom.

In this particular school, the network administrator also had the ability to monitor student Internet traffic and could see what any student was viewing on her or his screen at any given time:

he keeps an eye on what students are doing on their laptops and often he has twenty or thirty screens up beside him during the day, and he just scrolls through every now and again and, you know, within two or three minutes he can see what everyone in the school's doing. (24B – 17 – 13)

If the network administrator detected inappropriate activity, he could email the student directly or contact the teacher. This represents another alteration of the teacher's classroom management role within the teacher-student relationship and the sharing of that responsibility with someone who is physically outside of the classroom but still interacting directly with the student or the teacher as part of the overall classroom management strategy. It may seem like a "big brother" approach but it underscores how seriously the school takes its duty of care in monitoring student Internet activity and managing the potential for off-task behaviour enabled by laptop use. It also blurs the

boundaries of responsibility for classroom management as this has shifted from being the sole responsibility of the teacher in working with her or his students.

In addition to accessing technical support from outside of the classroom, teachers and students can also access subject-matter expertise on line and this is discussed further in the next section.

New Roles for Accessing and Constructing Knowledge

One of the roles that the teacher has traditionally held in her or his pedagogical relationship with students is the teaching of certain content outlined by the curriculum. Regardless of where a teacher's pedagogical approach lies along the continuum from traditional, direct instruction to a more constructivist approach, it has been the primary responsibility of the teacher to design learning activities whereby students acquire or construct certain content knowledge. In the most traditional approaches, the teacher delivered some portion of that content directly through lecturing and note-taking activities or directed students to read specific material from textbooks or articles. These resources would often be supplemented by images and video material. Occasional research projects, trips to the library, field trips and guest speakers might also be part of the mix but logistical or financial realities place limits on the frequency of such experiences. When students have full-time access to the Internet within the classroom, the potential sources of information related to course content grow exponentially. This study found that the increased use of technology draws more on the teacher's knowledge of pedagogy than content since content is easily accessed from multiple sources by students directly. Finding and bringing knowledge and information to the classroom is more of a shared role for teachers and students. One teacher expressed this viewpoint as follows:

I mean, we're learning more and more and more about the diversity of learners through the brain research, and I think some of that stuff is really as important as your knowledge of your subject, so I would say the knowledge of pedagogy and brain research is perhaps as important as knowing everything there is to know about chemistry or physics, because we can access the knowledge, but you've got to control the learning environment. (23A – 9 – 7)

Teachers in this study offered many examples of students accessing information and sharing this with the teacher and the class. The information accessed frequently went beyond what the textbook or other teacher-acquired learning resources may have included and often was not part of the teacher's own knowledge of the subject matter. One might predict that this could be intimidating or discomfoting for teachers, particularly those who might feel that their authority is grounded in knowledge or expertise. However, teachers in this study were generally not threatened by this phenomenon and some found that it actually extended the learning and increased student engagement. For example:

So it's much more, I would say, where the kids are actually bringing – finding knowledge and bringing it to the class rather than me telling them the knowledge. And kids very frequently will come up with ideas that they've found or things that I haven't thought about as well by using the Internet. So, I really like it, I think that the kids have the ability to learn a lot more and be engaged with it as well. (25A – 3 – 13)

Teachers in this study also perceived that sharing the role of sourcing content with students was empowering and this will be discussed in detail later in this chapter.

The Internet also enables teachers to bring other instructional voices into the classroom in the form of lectures or demonstrations accessed through sites like YouTube. Teachers in this study provided examples where they used outside experts to broaden the perspective on a topic. For example:

... on YouTube, I can bring in somebody else's voice to talk about Shakespearean sonnets, for example. It's not just my view. We can get another expert view, and then the kids can sort of critically appraise, "Well, this person says this, the teacher says this, what do I think?" So it enables me to diversify the sort of points of view coming into the class by getting different people online. (23A – 4 – 1)

In some cases, teachers made use of web-based resources to demonstrate skills that they themselves did not have which meant enabling students to learn things that they could not effectively teach. This removed certain limitations on learning outcomes for students.

While it could be argued that the same could be accomplished by bringing an expert into the classroom, such experiences are restricted by expense, availability and other organizational limitations. Doing so via the Internet is easily accomplished. One teacher described the benefits of this in the following manner:

If you don't have a demo ready, you go on YouTube and you find a demo. We're doing paper sculpture right now, and I don't work in paper, you know, as an artist. No, so I just find a bunch of paper sculpture demos on YouTube. So my skills are not holding back what the kids are learning. (25B – 3 – 10)

These examples illustrate a shift from teachers continually expanding their content knowledge to developing new instructional strategies that enable students interacting with technology and web-based resources to acquire new skills and knowledge. In classrooms where each student is equipped with a laptop, this also enables greater individualization as students can access different web-based resources that suit their personal learning styles and interests. In this shift the teacher increasingly shares the role of sourcing or delivering instructional content with the students as well as other expert voices.

Student Engagement and Motivation

Teachers in this study perceived that student technology use was helpful in engaging and motivating students and felt that this had the potential to enhance student affect for the subject and strengthen teacher-student relationships. Some teachers noted that certain technology-based activities broadened the participation of the class overall and increased individual engagement when compared with similar learning activities that were not technology based. One example of this was the use of blogging for a novel study in English. Unlike a classroom discussion where participation is limited by both time and the willingness of a particular student to raise her or his hand, the use of blogging allowed every student to participate in an on-line discussion including those who may be shy and less inclined to raise a hand in class. On-line blogging also enabled students to be more thoughtful in their response as described by one teacher below:

As much as you try to get that active participation, there will be a few kids in the class who would never raise their hand. Whereas with blogging, I do this with one of my novel studies, the students are actually required to comment on their classmates' blogs or their blog entries and of course I have to guide them on how to do it at the beginning, but the depth and the richness of responses that I get, I would've never seen before in a face-to-face classroom environment.
(24D – 8 -10)

The activity described above can be undertaken at home or in the classroom and allows the teacher the flexibility to extend student engagement outside of the classroom and the regular school day.

Some teachers explained that open access to information with laptops during the class was motivating because it enabled the class or an individual student to pursue a particular line of inquiry during the lesson. This often engaged students more effectively

and generated enthusiasm that increased or sustained their interest while fostering enjoyment. In some cases, these spontaneous learning opportunities were created simply by the teacher using a term or a word that students did not know. When a student asked about it, the teacher would ask him/her to search for an image, diagram or definition on the Internet that they could then share with the class to explain the concept.

I love the way, if I use a word that the kids don't understand, or a term, and they raise their hand and ask me, I'll say 'Oh, great question. Why doesn't somebody Google that for us quickly and see if they can come up with a picture of that, or see if you can come up with a definition for that. And then the kids are so excited, because now they're in control. They're the ones that are going to bring the information to the whole class. (3A – 6 – 4)

The idea of learner control will be discussed in more detail later in this chapter. But the excitement described above was a theme that arose in many of the interviews. Sometimes that excitement or enthusiasm motivated students to dig deeper into a concept and created an appetite for more learning on the subject. This has the potential to create challenges for the teacher in terms of managing the lesson and the time available to cover the intended material. But most teachers were pleased when student interest led to searching for more information about a topic and some explained that these spontaneous learning adventures sometimes extended the learning beyond their own expectations. A social studies teacher offered the following experience:

And oftentimes, they'll get enthusiastic or excited about something, and then they'll go much, much farther than my initial idea of where they were going to go with it. I even find that sometimes doing a lesson, if I mention something like the BC iceman for example, I had just mentioned that in passing because we were talking about fossilization, and immediately somebody's looking that up, and then calling others over. So then, you have to play on those enthusiastic, spontaneous

moments because that's true intrinsically motivated learning. (3A – 8 – 4)

A number of teachers in the study perceived that students were motivated and engaged by the use of technology because technology-based learning activities were more interactive or media rich than lessons that employed more traditional resources or activities. They described the use of some elaborate, web-based simulations that would have been difficult if not impossible for the teacher to create without the technology. One example involved the study of witch trials whereby students logged on and assumed the role of a 16th Century villager. They had to make decisions and their character might be accused of being a witch. This game-like learning activity plays to student interest in computer and video games while engaging them in a curriculum-based learning activity.

Some teachers created so-called “jings” which are short video clips featuring the teacher describing a concept or demonstrating a skill. These jings would be uploaded to the class website and students could view them at home. Unlike a classroom lesson, which does not enable the student to rewind and replay parts that they may not have grasped, the jing allowed students to repeat all or parts of the lesson until they understood. Many students appreciate the ability to supplement the textbook explanation with the jing and these also allowed the teacher to address a wider range of learning styles. A senior chemistry teacher used jings to demonstrate concepts such as the balancing of chemical equations. The teacher explained,

They're used to video games and movies and access to moving things, although mine are not like a Hollywood production that's for sure. But I think maybe they're used to the digital world and they appreciate that I'm trying to meet them in their world. (7B – 40 -9)

The examples above provide insights into how teachers have integrated technology into the learning process in ways that engaged and motivated students. In addition to the pedagogical benefits of such approaches, teachers also perceived, as in the excerpt above, that students appreciated their efforts to engage them and to allow them to pursue their personal interests. Taken together, this appreciation coupled with their excitement and enthusiasm for the learning helped to strengthen the teacher-student relationship.

Although the majority of teachers in this study perceived similar advantages to the laptop program, several were skeptical about the universality of the benefits. One expressed that concern as follows:

I think it's more motivating to some students than others. I think the students who are generally interested in computers and the Internet and technology, they'll always be that. And then there are some that just don't want to have anything to do with it, and there are some that are in the middle. So I think it just depends on the individual. (24D – 18 – 1).

While this perspective was not prevalent in the data, it would be unwise to assume that all students respond equally well to technology-based instructional strategies or that their relationships would be improved with teachers who use them effectively.

Building a Community of Learners

Some participants in this study felt that the technology assisted teachers in building a community of learners wherein students collaborated with one another in their learning and the teacher and students learned together and from one another. Rogoff (1994) described the concept in this way: “In a community of learners, both mature members of the community and less mature members are conceived as active; no role has

all of the responsibility for knowing or directing, and no role is by definition passive” (p. 213). Within the teacher-student relationship, teachers have traditionally held the roles of directing learning and there is a general expectation that the teacher knows much more than the student about the subject matter. Students are primarily the learners in the relationship and construct knowledge as a result of the learning activities that the teacher designs. Despite these distinct roles, any honest teacher would concede that he or she has learned things from students at various times. With the introduction of technology into the classroom including the hardware and software applications, many teachers find that their students are equally or more knowledgeable about the use of these. Since many of these technology skills are self-taught, there are large variations in the knowledge held by individual students and teachers. As students and teachers utilize these technologies for learning, there are new opportunities for students to learn from one another and for the teacher to learn from students and this is another way in which the traditional roles of teachers and students within the teacher-student relationship are changing.

Some teachers in this study explained how this phenomenon fundamentally alters the classroom dynamic and the way that students perceive and interact with their teachers. For example,

And I would say it's been a hugely positive experience with the students. As I said before, they really like it if, say, I don't know how to Skype. 'Can you show me how to Skype?' And then they show you how to do things. And boy, because it shows you yourself as a learner, yourself as someone who doesn't know how to do things sometimes, and instead of getting angry or not doing it, you are like 'You can help me,' and so you are a community of learners which is again, much more democratic. Not one person telling everything but it's actually back and forth, and then I think that really helps people learn together. (25A – 29 – 10)

Having students understand that the teacher is also a learner within the classroom was viewed by most teachers as a healthy perspective on their relationships. However, some admitted that it was somewhat unsettling in the early going.

And at first, I was very worried about that. I was very, very worried about not knowing the technology and not being able to help the kids with the tablets and the programs, and ‘oh my gosh, they know, another draw program, I know nothing about it.’ Now it’s more a bustling little space where, we’re working on that. They half the time just go to another student. They don’t even come through me, because I’ve told them my limitations. And then I go over, ‘so is he helping you with that?’ And so I go over and I sit down, you know, and of course they all catch on more than me. So I think that’s probably the biggest shift, is I have no ego attached to that, those materials, and bar none, those kids have way more time than me. So they know that, and they like it too. I have them get up and do presentations, like spontaneous – not for marks. (25B – 10 – 1)

For some it has been a leap of faith or a calculated risk to employ technologies that they know their students are more knowledgeable about. But many have embraced the opportunities to involve students more in the teaching of technical skills or to invite students to contribute to the learning resources that will be utilized during class. It takes some confidence and experience, perhaps, to get to that point as noted below.

But I’m confident enough as a teacher to know that they know more than me about technology, obviously, and particularly access to resources. And I’ve said to them, if you find something that’s useful and it’s going to be helpful for people, show me and we’ll have a look at it ... (3B – 36 – 8)

The majority of teachers in this study felt that this shift in their pedagogical relationship with students had more benefits than drawbacks in building a community of learners where the exchange of knowledge flowed up, down and laterally as all actors within the classroom alternated in their roles as teachers and learners.

Streamlining Instruction

A final point within this finding is that some teachers believed that using technology for some aspects of instruction streamlined the learning process by enabling students to perform certain learning tasks more efficiently. While this does not necessarily have a direct influence on the teacher-student relationship, it has the potential to free up more time for teachers to work with individuals, to respond spontaneously to ‘teachable moments’ and to allow students to pursue personal learning interests. These kinds of activities hold the potential, at least, for teacher-student relationship building. While there is no guarantee that this will occur, there were examples within the interviews that seemed worthy of mention here.

Some learning tasks can be completed more quickly using computers. The reduction of time spent on more mundane tasks leaves more time available for higher order learning tasks such as interpretation, synthesis and analysis. A science teacher explained how this enabled him to make better use of laboratory time by using computer probes for data collection.

So, what we’ve done is made my teaching streamlined a lot more, because the kids not only have access to the documents so they can pre-read, they can get access to the information, but just even through science labs, we were using some technology that was useful, with their laptops and being able to record data just using the sensor technology that can plug through their inputs onto the laptops. So that sped up a lot of just data collection in general, which is time well used in the lab, and just giving them more access to analyzing and critiquing and understanding the data as opposed to just raw data collection. So it really helped them that way. (24A – 3 – 20)

Even in the art classroom, there were examples where the students made use of technology to learn concepts more efficiently by using hardware and software that enabled them to manipulate elements within the target medium.

What we do is we use it more like you would use a pencil, so some kids want to use Photoshop for the preliminary stuff, some people use the Wacom tablet. I've integrated it in a number of steps towards a larger portrait in the traditional medium. It's awesome for things like abstraction and cubism and stuff like that where you can do the layering. And they can get a mock-up of what they want to do. And also, I use it a lot for portraiture and when they're setting light, particularly in the Renaissance, we set them up, they take their self-portraits and then they go in and they alter the contrasts... so it's faster, right. Faster learning those concepts. (25B – 2 – 2)

Teachers also appreciated the technology-enabled ability to bring up a visual such as a map, an image or a video in response to an arising teachable moment. Because it is not always possible to anticipate where a class discussion might lead, or what questions students might ask, a teacher cannot possibly assemble supporting visual materials in advance. The ability for the teacher or a student to quickly locate web-based visual material to support an emerging discussion or unexpected question was described as very helpful.

For example, *To Build a Fire* is a short story by Jack London and I would use it to talk about descriptive language, personification of nature, and other ways that the language is being used by the author to create an effect. And so now what I can do with that assignment is I can set it up so that the kids can instantaneously get the context through videos from You Tube that show the Klondike Trail and how snowy it is and show the time period, so they'll see that right away, they get the context much more quickly. There's a thing about it being 75 below and we can instantaneously check out what happens when it's 75 below, what does that look like Celsius, Fahrenheit. So all the little details that the kids have questions about – I just say, 'Okay, you guys find that out right now,' and they go and find that out. It really lets them get

engaged. So I don't say, 'Well, I'll tell you next class.' They can instantaneously do that. (25A – 4 – 5)

Teachers have always understood the benefits of providing visual content to support learning concepts delivered orally or by text. The Internet has made it possible for both students and teachers to bring these to bear on the learning process even when unanticipated questions or ideas arise spontaneously during a class. Increased access to and use of web-based resources has also helped teachers to explain and teach concepts more efficiently thereby streamlining some aspects of instruction.

Summary

This section has discussed a variety of ways in which teachers perceived the pedagogical dimension of their relationships with students had been altered by the use of laptops and instant access to web-based resources and communication channels. The roles of both teachers and students within the relationship have evolved as a result of their regular access to technology and new forms of learning enabled by ubiquitous computing.

Finding 2: The Balance of Power and Control in the Teacher-Student Relationship

A distinguishing characteristic of the teacher-student relationship is the inherent power asymmetry (Pomeroy, 1999; Frymier, 2000). Teachers exert their power by exercising control over many instructional decisions such as the sequence and pacing of instruction, choice of learning resources, what student input will be invited or allowed and countless other choices related directly to instruction and classroom management. These are certainly legitimate uses of power as the teacher is the professional in the

classroom who is authorized and expected to control and manipulate the instructional variables in order to help students achieve certain learning outcomes. This section examines teachers' perceptions of the influence of classroom technology use on the balance of power within the teacher-student relationship. It examines some of the same data as the previous section but through the lens of the power dimension of the relationship. Teachers in this study perceived that the open access to knowledge enabled by students' use of laptops in the classroom led to a shift in the balance of power within the teacher-student relationship. Acting as a catalyst for learner empowerment, laptop use has the potential to reduce the power asymmetry that characterizes traditional teacher-student relationships.

Learner Empowerment

In this laptop-equipped learning environment, teachers frequently allowed students to access the knowledge base via the Internet rather than relying exclusively on traditional text-based, teacher-determined learning resources. Students acquired information they could then contribute to the lesson. Under these circumstances, the teacher cannot accurately predict what information the students will access and bring forward. In some cases, the information is extraneous to, or in conflict with the teacher's content knowledge on the topic. This has the potential to redirect the lesson on an alternate trajectory. Yet many respondents believed that inviting students to participate in this way shifted the balance of power in their relationships and some described their classrooms as more "egalitarian" or "democratic" or stated that the students were on a more "equal footing" with the teacher. More often they used the term "empowering"

when describing how granting students more freedom to search out, utilize and present information altered the balance of power. One participant explained,

I think that it has made, for want of a better word, a more egalitarian classroom, I think. Where you can tap into the knowledge of the student or the students can drive more of the learning within the class, so their questions can drive it. I just think it's taken away the thought that you are the expert, because there's so much information now available to everyone, you know, as I said, that with the Beowulf, the students could find information I didn't know. So I can't claim to know everything about that text anymore because they're immediately going to find other (information). So I think it's more about a shared learning environment that the technology... not the technology, but the access to more information allows the students to become more expert if they're willing to do the research... (23A – 4 – 17)

Another teacher described how she allowed students to access information on line when they posed a question that she could not answer.

I think it's less that I am the font of all knowledge, handing it to the children. It puts them on a, what I would say a somewhat more equal footing because, yes, I know a lot about the subjects that I teach, but I don't know everything. And sometimes the students will come up with an amazing question, and I'll say, 'That is such a great question. I don't know the answer. Do you think you can find the answer?' So, it empowers them, which I think is the way the more ideal classroom is going to be. That it's not the teacher that knows it all, and you're treating the children like they know nothing. They have the tools to be able to access the information. (3A – 9 - 11)

Increased student access to information and knowledge enabled students to supplement the teacher's knowledge, bring new learning resources into the classroom and learn things related to the course content that the teacher did not know and could not have taught them. Knowledge and information flowed up and down within the teacher-student relationship as described below:

It's not so much a top-down deliverance of information. It's sort of, okay, bring stuff into the classroom if you see it and then we can all learn. So I think that allows a very different way in which we can teach. The way that we grew up as students in the school was always very top-down. And now the kids can start bringing stuff in to help, you know, sort of widen their knowledge base and share it, so it's really quite cool to see that happen. (24A – 10 – 10)

If the adage that “knowledge is power” holds any truth, this phenomenon describes a shift in the balance of power between teachers and students.

Some teachers discussed the value of extended discussions that occurred among teachers and students as a result of students searching out supplementary information on topics being discussed in class. These discussions sometimes took place outside of class time when students emailed teachers links to websites that presented views in support of, or contrary to, something that the teacher had stated or taught during a lesson. One teacher described how these learning exchanges enhanced the teacher-student relationship.

I've had lots of students send me links when they're doing their research outside... they'll send me a link and they'll say, 'hey Mr. (name), you've got to take a look at this.' And often, it's 'bang on', you know, it either supports what we were talking about, or in many cases, and I encourage those just as much, refutes what we were talking about. And then we can come back as a group and discuss that later. So I would say it (the relationship) is definitely enhanced. (24C – 25 – 21)

Many teachers acknowledged that students brought things into classroom discussions that they themselves did not know and could not have taught. Most teachers did not seem concerned about this and even initiated activities during the class that would be quite likely to lead to that outcome. For example:

Yesterday, in an AP Literature class, I decided to start the study of Beowulf just by asking them to find out what they could in 10 minutes from a quick search and we then shared all the different nuggets of information that they had... and actually they came up with, and I've taught Beowulf for a long number of years, but they came up with five pieces of information I didn't know. (23A – 2 – 4)

Even when students access information that proves to be incorrect, that furnishes another teachable moment about the reliability of sources.

Although teachers acknowledged that computer access to information might diminish students' perceptions of their expertise, most were very comfortable with that shift because they perceived benefits to the classroom dynamic and their relationships with their students. Some teachers were more concerned about how parents might interpret this sharing of power, particularly parents from cultures where the teacher was expected to be the dominant authority figure in the classroom. For example:

So that's a big shift, and it's a shift that kids adjust to fairly well.
Parents - perhaps not, because a lot of parents still like the idea of a teacher being up there telling the students what to do. (25A – 9 – 11)

Overall, teachers in this study embraced opportunities to empower their students to find their own sources of information and to incorporate their findings along with the teacher's knowledge of the subject matter. They welcomed the notion of sharing their power by allowing students to have more control over the selection and use of learning resources and information, and were comfortable with students understanding that the teacher's knowledge had limitations.

Individualizing Student Inquiry

In addition to allowing students to source information on a teacher-identified topic, teachers in this study also exploited information technology to enable students to select their own topics within certain parameters. Before each student had a laptop, topics of inquiry were limited by the resources available in the classroom, community, or the library. Although many schools had computer labs or mobile computing work stations, teachers could not be certain that every student would have the access needed to complete a project or make effective use of class time. Individual, full-time access ensures that each student will be able to obtain information on any topic without competition for limited, in-school resources. This is a game changer that enables teachers and subsequently students a broader choice of topics or lines of inquiry. In turn, students extend and pursue their personal interests in the course content by accessing a wider variety of on-line, media-rich resources and they make personal connections to what they are learning. One respondent explained that,

Laptops allow for more dynamic classroom work, where students are able to not only do the textbook questions, but go beyond the textbook. It's a tool for them to go beyond that, and to trigger their interest and, explore on their own, which is where real learning occurs, when students are able to attach value to what they're learning and if they're curious. (24B – 2 – 12)

Other participants made similar observations and remarked that individualized learning opportunities within the prescribed course objectives fed students' natural curiosity or inquisitiveness and teachers felt that this was motivating for students. Some respondents also believed that empowering students to pursue their own interests made the learning more meaningful and increased their engagement as indicated in the following excerpt:

I mean I think that it's so much more powerful and so much more meaningful for the kids to be able to choose a culture to research or a composer to research of their own choosing. How much more engaging and how much more meaningful for them as students and hopefully as lifelong learners to see that they have the choice. (23D – 9 - 10)

One respondent in the study made an interesting point about how teacher bias in the selection of topics and learning materials was reduced by student access to the Internet. Teachers in the fine arts have considerable latitude in the works that they choose to use for instructional purposes whether those are particular works of art, musical pieces or plays. However, budget and space limitations associated with the purchasing and storage of these resources in the form of books, images or manuscripts cause teachers to make choices that may be influenced by their personal biases. In other words, when forced to choose, they may select music, art or plays that they enjoy or prefer. Because some of these resources, such as virtual art galleries, are available at no cost over the Internet, teachers can accommodate student access to a wide range of learning materials that are not filtered through the teacher's biases. As one teacher explained,

And it's so much about teacher bias too, when you're forced to choose, right? I'm not interested in the Impressionist time, so I probably would have chosen to teach something else, where that actually engages fifteen-year-olds. You know, and I'm forty-five, so... it takes away a lot of my bias. (25B – 5 – 4)

This represents another variation of teachers sharing power or control with their students in the form of decision-making enabled by electronic access to a wider variety of student-selected learning resources or topics.

While most curricula include prescribed learning outcomes, they often allow considerable latitude in the resources and learning activities used to achieve them. The use of technology in the classroom makes it possible for teachers to grant students more

freedom in the selection of topics and related learning resources. Instead of a teacher determining that all of the students are going to learn about a specific topic by using teacher-selected materials, teachers can share some of these decisions with students to achieve the same learning outcomes and give students more control over their learning. Teachers in this study believed that in doing so, they sparked student interest and increased their motivation.

Students as Teachers

During the interviews, teachers provided some interesting examples of students taking on the role of teacher. In some instances, this was the result of the student having some technical knowledge about the use of the hardware or software that the teacher did not have and the teacher learned from the student how to perform certain tasks or simply invited the student to teach the class how to perform tasks that the teacher could not. In other instances, students unexpectedly assumed teaching roles because the in-class use of a web-based resource took the lesson in an unintended direction.

As so-called ‘digital natives’ (Prensky, 2011) students are often more adept than teachers in the use of hardware and software applications. While tech-savvy students may be somewhat threatening to teachers who are accustomed to knowing more than their students about the learning resources that they intend to use, students’ technical knowledge often empowered them to play a more significant role in instruction. One teacher explained how playing the role of technical expert empowered some students:

...it’s very good for the child when you don’t know how to do something, and you’re going to them as the expert. And that happens all the time. It’s power. It makes them feel powerful, it is, you know, wow, I get to show my teacher how to do this. If we have a problem when

we're trying to show a video, there's always going to be somebody in the class that knows more about that particular program than what you do. 'Oh gosh, it's stuck. How do I get it unstuck. Oh, I want to go back to the previous scene. How do I get it to go back to the previous scene?' I mean, the kids are going to know how to do that - probably more so than you are. (3A – 33 – 5)

Not only can students help the teacher in overcoming technical problems and advancing the lesson, but there is also an endearing and reciprocal effect from being invited to help that some teachers believe has the potential to enhance or strengthen the relationship. The data collected in this study contain examples such as this:

I think that kids are definitely more savvy in certain ways, for sure, which is good, because I'm here to learn from them too. So if I can learn from them, it enhances that trust in that relationship too. They feel empowered. So it's good, I think, that they feel as though they're contributing and it really just allows them to become more engaged in whatever they're doing at school. They can then give back to our staff and me in particular... (24A – 31 – 5)

Another teacher who was teaching a class for the first time described his experience when he encountered a technological issue amidst a group of students with whom he was unfamiliar. He asked if anyone in the class could show him how to use the technology and several students jumped up to help. He described the experience as follows:

And it was almost like immediately because I empowered them and gave them the chance that we started off our relationship there that turned into five years of so many different activities and things. But they had the chance to show that they had skills, right? Even though in another context, perhaps my first meeting with them wouldn't have been so positive. (3C – 40 – 5)

Teachers have always used technology such as film projectors, video players, overhead projectors and audio playback devices in their classrooms. But these were much simpler

to operate than computer hardware and software applications and more easily managed by the teacher without student assistance.

Besides teaching teachers or other students how to solve a technical problem or perform a task using a particular software application, the use of web-based resources sometimes takes the class in an unpredicted direction. Unlike textbooks or videos, which tend to encourage a linear approach, the hyperlinked nature of Internet resources causes the user to move back and forth within and between websites as the navigational norm. We have all experienced this when we have sat down to a quick search for something and three hours later find that we have been drawn into a series of hyperlinked adventures, diversions, or inquiries. And even if one remains on a single website, the complexity and layering of the site's architecture may take you to unexpected places. When a teacher makes use of a textbook or a video in class, assuming that they have lesson planned it, there are likely few surprises. On the other hand, if a teacher decides to utilize one or more websites during a lesson, it is unlikely that they will have navigated the entire site in advance. Use of live websites during class therefore involves certain risks and also certain opportunities. A single, but cogent example of where this can lead was revealed by one participant in this study. She had planned to access and project on to a SmartBoard a British Library website called Turning the Pages which contained digitized manuscripts of some very old, original texts. The plan was to look at William Blake's Notebook which related to their studies. After doing that, some other old texts on the main menu of the site attracted some student interest. One of them was an ancient Chinese text in the form of a scroll. A Chinese student agreed to come forward and share the text with the class through translation.

...and she went to the front of the class and opened the text and began to read it in the Chinese in the classroom, and she could still understand all the characters, a part from... to say, oh that must be a really old character. But she took over the class, so she's reading in (school name), this Chinese text from the British Library, and she's basically teaching the students, you know, what's going on here... (23A - 10 - 7)

I am not suggesting that instances like this are daily or even common occurrences.

However, the example illuminates how the in-class use of Internet resources poses the risk of changing the intended pathway of the lesson but might also lead to unexpected opportunities that empower students when the teacher is willing to relinquish some control.

Moving from Expert to Referent Authority

Teachers exercise various types of authority in their efforts to influence student behavior and oversee the learning process (French & Raven, 1959). Expert authority which is based primarily on the teacher's subject knowledge may be eroded when students are empowered by greater access to knowledge and this may require teachers to rely more on their referent authority, which is grounded more in their personal relationships with students. Teachers in this study expressed a variety of perceptions about the nature of their authority when asked how the use of technology influenced the balance of power in their relationships. Some felt that because they could no longer be viewed as the sole "knowledge figure" in the classroom, their authority must be based more upon relational elements such as trust or respect.

And the authority for me in the classroom is built on respect. And the knowledge you have of your subject and the willingness to continue to learn with the students, so there's still, I think, a respect for authority there, but I don't think it's any longer founded on "This person knows

everything... this person is just by virtue of being a teacher, an authority figure.” I think you have to win the respect and authority. I think it’s actually a more difficult role now for young teachers. (23A – 8 – 14)

As mentioned earlier, student knowledge in technology-rich classrooms is acquired through multiple sources besides the teacher and the textbook. There are instances when this student-sourced knowledge may be used to challenge the expert authority of the teacher. One teacher explained that students, acting on their motivation to maximize their test scores, have occasionally engaged in a “power struggle” over the correct answer. He explained,

They’re just looking to try to find a way to get a couple extra marks. They know that their answer isn’t the best, but they’re going to try to argue that the wording of the question, based on what they’ve read, is not appropriate. And so that’s sometimes where we can get into a little bit of a power struggle, because they’re trying to assert their knowledge that, ‘well what I know is correct,’ and yet, when I’m looking at my answer key, I’m saying, ‘no, this is, this is the best answer.’ (24C – 15 – 1)

Some teachers in the study initially anticipated that they and others might feel vulnerable to losing the respect of their students once students came to understand that teachers did not have all of the answers or hold all of the knowledge. Most overcame any initial anxiety as their experience with using technology increased and they adapted to the evolving roles within the pedagogical dimensions of their relationships as described in the first section of this chapter. Many expressed the view that they experienced better relationships with their students when those relationships were not based upon the teacher’s expert knowledge. The example below articulates the perception that when teachers acknowledge that they can learn things from their students, they reveal a more ‘human side’ of themselves as teachers.

So originally I was a little worried... I think a lot of teachers think that the respect that is due to them is based on the fact that they know more than the students, so to open it up and not be the person who knows that much more than the students I think is fearsome to some teachers because they're scared that if they show weakness by not knowing something, that they're losing power. But I've actually found that I've engaged much, much better and I've always engaged with – very well with my students, but I think I've engaged much better by sort of showing that human side of teaching as well, which is 'I don't know how to do that. Can you show me how?' (25A – 7 – 3)

Although most teachers in this study expressed a generally high level of comfort acknowledging that there were many things that they did not know about topics related to their course content, a number of them felt that it was still important to feel very confident with the core content of their subjects. In other words, it seemed as though their comfort with students bringing new information to the lesson was based upon some balance between that and students' perceptions of the teacher's own expertise. With that balance in place, there was little concern about the erosion of their authority. One teacher described this as follows:

I think that I'm pretty confident with the material that I teach, and I'm okay with the fact that I don't know some stuff...My perception is that students sense that I'm confident with the core material that I teach, and that to them it's a sign of strength that I... sometimes we have to go to the computer to find out information...No, I don't see that as eroding my authority, and I think that technology probably empowered them more. (24B – 16 – 10)

It is evident from the data collected that teachers have different perspectives on how technology use within the classroom affects their authority over students. Most do not believe that their authority has been eroded by students' direct access to information, but some feel that there has been a shift from expert to referent authority in their interactions with their students, and among them, many see benefits in the latter. This

final excerpt captures how many participants felt about how the balance of power has a profound impact on the teacher-student relationship.

I think any time we have a real power imbalance, I don't think that's necessarily a healthy relationship. And if you're trying, if you really care about the relationship you have with your students, then I think it does need to be on a somewhat more equal footing. And that's not to say that you want to be their friend, but I think it's nice when there's a sharing of the power within the space. I think it also...it's a more respectful relationship. You're acknowledging that they are also a knowledgeable, powerful person that can also access that information.
(3A – 10 – 9)

Summary

This section has presented the finding that teachers in this study perceived computer-enabled access to knowledge and information had an influence on the balance of power within the teacher-student relationship. Many have characterized that shift as one that empowers students and reduces the power asymmetry inherent in teacher-student relationships.

Finding 3: Supporting Students through On-line Communication

It is commonly understood that communication is a vital element in building and maintaining human relationships. Technology has opened new communication channels such as email and social media, which have altered the communication patterns of modern society. Teacher-student relationships have also been touched by these innovations and in this school setting, teachers and students found themselves communicating frequently through email. Traditionally, most teacher-student communications have been face-to-face with perhaps the occasional telephone

conversation. In this environment, where students and teachers are equipped with laptops and continuous internet access, electronic communications have become a significant component of their relational interactions. Teachers in this study perceived that technology-enabled, on-line communication helped them to build and maintain closer bonds and stronger relationships with students. This section describes teachers' perspectives on how the use of electronic communication has altered their communications and ultimately their relationships with their students.

A Virtual Space for Teacher-Student Interaction

Technology use creates an on-line presence for teachers and students and a virtual space in which they can interact in different ways than in the physical space of the classroom. Some teachers believe that their interactions within this virtual space fundamentally alter the nature of their relationships with students within the physical space of the classroom. One respondent made an interesting observation about how interactions that took place in this virtual space altered his relationships with students.

I would say it's a different type of closeness. The closeness before would be more during the class relationship, and now I think that that classroom physical wall isn't there, so that you can actually have that learning going on throughout time. So the physical barrier of the walls is like, 'Okay, you come into this class and now you act as an English student.' Now I think the expectation more is that throughout life you act as a learner and it doesn't necessarily have to be English, and in fact English and Math and everything can be incorporated. And so I think the physical space of school is now different because there's an online space of a school as well. (25A – 28 – 12)

The point here would seem to be that physical walls and structures of a school communicate cues to students that narrow their interpretations of their roles or identities

at any given moment (e.g., I am an English student at this moment). Whereas the virtual space in which on-line communications occur lacks these parameter-setting physical structures providing students with a broader view of their roles and identities.

One interviewee made an interesting observation about how communication within this virtual space could help to bridge differences in gender, age and ethnicity. Referring to spontaneous conversations held in the evenings or on weekends with students on topics related to her course, she stated:

I think it builds relationships 'cause you have a common ground, and I'm a middle-aged woman and they are a fourteen-year-old boy, and we have nothing in common – Indo-Canadian vs. you know, Canadian, white, whatever I am, Caucasian, so it creates a common bond beyond having witnesses in the classroom...(25B – 23 – 10)

Perhaps the absence of visual cues that remind people of their differences (e.g., skin colour, gender, age) help to focus on their similarities such as shared interests in sports, art, music or other commonalities.

One other interesting point was made by a teacher who was relatively new to the school community. He soon discovered the utility of his on-line presence in establishing relationships with students and explained how it helped him to become integrated more quickly into the community.

But coming in here, all of a sudden I have an online presence that can be supportive to the kids, so it was a nice way to sort of build a different bond that would strengthen our personal, everyday seeing each other kind of relationship too. So it helped facilitate that, and it helped strengthen the way in which I interact with the kids in the hallway and they realize that they can communicate in many different ways with me as a new teacher. And so, I think that accelerated my becoming embedded into the community in that way. (24A – 36 – 20)

Overall, teachers seemed to value their on-line presence and were interested in exploring its opportunities and potential for connecting with students in the future.

Supporting and Caring for Students

Online communication within the school context differs fundamentally from face-to-face communication in several important ways. Among these is the fact that it provides the mechanism for teachers and students to communicate easily outside the classroom or school setting and outside of regular school hours. Online communication extends teachers' abilities to provide both academic and emotional support outside of class and teachers in this study perceived that this helped to strengthen relationships as their students responded positively to their expressions of care.

On the academic side, students continue to learn in the evening and on weekends by reading, doing homework, and completing assignments and projects. In doing so, they often encounter problems that require the assistance of the teacher. Prior to the adoption of laptops, the unavailability of the teacher outside of school hours has meant that students occasionally find that they are unable to complete learning tasks and this can have academic consequences and sometimes lead to feelings of frustration or anxiety. Teachers in this study reported that on-line communications enabled them to not only provide the academic support to help students in the completion of their home study, but also to alleviate their anxiety or frustration. Many believed that this enhanced their personal relationships with students and there were multiple comments in the interview data similar to the statement below:

I think that it (email) allows me to communicate. I think that actually strengthens the relationship because students know that their teachers are looking out for them. (24B – 27 – 21)

Some teachers in this study also explained that email provided a communication option that helped them overcome communication challenges posed by certain classroom dynamics or specific student personality characteristics. In the excerpt that follows, one teacher explained how she used email to overcome the communication obstacles posed by peer dynamics and the introverted or shy nature of a particular student. The excerpt clearly indicates a high level of care, concern and sensitivity on the part of the teacher but these sentiments would have been very difficult to communicate to the student during class time. Electronic communication provided the channel through which her thoughts could be conveyed.

Especially, like I said, the ones that are harder to get to know. Your quieter ones, your ones that are trying so hard to be cool in class that you're just not going to have many teacher/student interactions with them, because they're more intent on their peers. I find that I can reach them through email. And I can reassure them through email. If, for example, I hand back a test and somebody has really done poorly overall, but there's something that they did well somewhere within that, I can use it as a way to, to try to build them up and say, 'I could tell that you were upset today in class,' and I would never get the opportunity to say this in person, because you can't do that in front of their peers...But I can sit down and quickly send an email saying, 'I could see you were upset today by your overall mark that you received on your Humanities quiz. I just want you to remember, though, how well you actually did on the first section, and you got an 18 out of 20 on that section, so that tells me that you studied. I'm not thinking that you didn't study. I think that there must be something that's happening, though, in the study process that made it so that you didn't do well on the second section. Let's meet and talk about that.' (3A – 24 – 5)

It could be argued that the same outcome might have been accomplished if the teacher simply pulled the student aside after class and had a similar, face-to-face conversation. However, the hectic nature of the school day with student and teacher movement being driven by bells, and the lack of private space often makes it impossible to have timely conversations of this nature.

Teachers described many other ways in which they supported student learning outside of class time through the use of technology. This particular school utilizes a course management platform called Schoology where teachers can post learning resources, course outlines, due dates, assessment materials and messages for the class. Occasionally teachers receive an email from one student that alerts them to the fact that there may be some wide-spread confusion about expectations for an assignment students are working on at home or about something that was presented in class. Or a student may pose a question where the teacher feels the entire class may benefit from a response. In these cases, teachers can post information on Schoology which supports the learning of the entire class. One teacher explained how this supported their relationship building with students.

The other thing I found actually really helps with that relationship is that sometimes they post a question. They don't just email me, they post it so the class can see it, so they post it on our update saying, 'Just confirming that this is what we have to do. I'm kind of confused about this section.' And I can answer the question to that one person, but everybody else will see it. (3B – 25 - 19)

In addition to the school's course management platform and email system, some teachers were utilizing other websites to offer additional support outside of class time. One participant described an on-line tutorial site with which he was experimenting.

There's a site online called scribbler.com where you can do online tutorials. So I could set up a whiteboard basically online and kids could hear my voice and see me in the evening and they could ask a question. So I'm interested in this just generally. I want to see how this works. So I did mention to my class, you know, 'I'll be online probably this week so if you have a question or if you just want to say hi and check it out feel free to do that'. (7A – 32 – 21)

The use of these kinds of sites was not widespread among teachers in the study but several offered examples of various types of chat boards that they had tried or were interested in trying. These differ from email in that they are less personal, broadcast forms of communication. However, they do provide another avenue for supporting groups of students.

Another use for electronic communication was for students and teachers to stay in touch while students were absent. This included elite athletes who were training as well as students who were travelling, on exchanges or absent due to illness. Teachers could answer questions, send materials or simply reassure them about concerns arising from their absence from class.

Well, if a student has a question – and they're not able to get to me... if they're sick or they've been on a trip or they're on an exchange in Australia, I would be able to answer that question and then that would make them – I would imagine – that would make them feel supported or cared about. (7B – 30 – 15)

Email also enabled students to be more accountable or responsible by touching base with their teachers when they were absent or going to be absent from school. These communications were often simple and brief but the effort made to connect or respond was more significant than the actual content of the message. One teacher captured this as follows:

There is very little expense on yourself, to send a quick email off, saying, 'don't worry about it,' you know. And I think it also helps when they're emailing you, 'I was away on Friday.' It helps the relationship in the sense that they'll touch base, right, and then I feel better and you feel better and 'tell me what I missed,' and you can just say, 'we'll talk about it on Monday.' (25B – 19 – 18)

Parents play an important role in the educational partnership with the teacher and the student and teachers in this study often referred to their use of electronic communications with parents to engage them in supporting students' learning. These communications provided parents with a window through which to see how teachers were supporting their children. Teachers felt that this fortified their relationships with parents and helped them work together in the best interests of the students.

I guess where I see it happening is we have some high-end kids, athletes that may be off for extended periods of time, for example, elite training like hockey and riding horses or skiing. So you're communicating with the kid, you're communicating with the parent, the parent feels that the kid is getting what they need, and so we are able to share stuff and then even when they're away they're online, they get access to our communication and their parents are definitely making sure that things are happening when they're away and keeping up with their academics as much as they can. (24A – 28 – 6)

Engaging parents in this way is often more efficient by email since teachers have limited time during the day to call parents, many of whom work and are difficult to reach by telephone. Many parents check their email frequently and have access to it both at home and at work.

Teachers used various modes of on-line communication but there was an overall feeling that the ability to support students outside of class time using technology had a positive influence on their relationships and often made them 'closer' because students felt that they were being supported both academically and emotionally.

I would say closer and I would say because the biggest piece is the communication outside the classroom piece. But even the fact that they have many more different ways of getting help so even if it's not, you know, through communicating they have — if they're not in the classroom — they have the Academic Centre they can get things from or they have other online resources which I've directed them to that can help them. So they just feel that much more supported. So if you have a relationship like a teacher/student relationship which is based on learning and accomplishing something, and they feel that they're more than likely going to accomplish something, then it's going to make the relationship better naturally too... (3C – 35 – 8)

In thinking about the efforts made by teachers to support students outside of class time, I could not help but wonder what the downside might be. Teachers' time and personal boundaries were one issue that came to mind and these are discussed later in this section. But a comment made by one teacher caused me to ponder whether or not there was a tipping point in the amount of extra support provided by teachers. How much help or support is too much? One teacher touched on this in his remarks.

Yeah, we talk about that all the time. That's the biggest piece of feedback we get from our alumni here is that – 'You know what it was like at (school name).' 'It was great but you babied us too much' right? I hear that, but you know still you think... You support them a lot initially because they do need that support and I think it does eventually build up their self-confidence and that's why they're able to take off when they get a little bit older. (3C – 38 – 10)

As members of a helping profession, it seems that most teachers will instinctively use whatever means are available to them to help and support their students. Electronic communications provide new opportunities for teachers to fulfill their roles and they embrace new innovations and learn how best to exploit and adapt them to the benefit of their students.

New Pathways to Approachability and Accessibility

Teachers at this site are very involved in co-curricular programs, tutoring and other professional activities before and after school and at lunch. Teacher preparation time is most often consumed by planning for instruction and related activities. Students are also highly involved in co-curricular activities and typically have busy schedules. The combination of these often makes it challenging for students and teachers to access one another outside of class time. When they do, time constraints often result in less than satisfactory conversations.

Email created another pathway for students to access their teachers and teachers perceive that increased accessibility or approachability helps to build positive relationships.

It's one more tool that I can use to try to establish a good, caring relationship. I want the kids to know that I care about them and that I'm here to help them, and that I'm very approachable and open. (3A – 28 – 16)

Using email, teachers and students can negotiate meeting times that enable more fulsome and meaningful conversations or they can have an on-line dialogue when time permits.

One teacher described this in the following manner:

In the past, I think students might have come to me at quarter to eight, asking a question really quickly and having a very rushed dialogue with me, when I'm rushed trying to get ready for the day as well. And while I appreciated the face-to-face conversation, it might not have been as meaningful, because of the time restraint, or catching me on my way to hockey practice or catching me on my way to a staff meeting or something like that. Maybe my response would be less meaningful. Now, my students email me and craft a question that's thoughtful and that really gets to the point, and because I do get everything on my phone, it's really easy for me to respond with a thoughtful response that's hopefully answering everything they're asking me, so in a way

I'd say it's actually improved the meaningfulness, if that's a word?
Which is weird to say with a piece of technology, but you can't always
catch me at a good time here, because there's so many things going on.
And so I feel like if I can provide a really good answer that I've thought
about to a question through email, then I'm better serving their needs.
(3B – 24 – 14)

Teachers in this study stated that students often emailed them the day before to set up a tutorial or meeting time the following day. These messages were usually short and it was not time-consuming to reply. Teachers also generally felt that students understood that they might not get a response right away to an email sent during the evening. In the excerpt below the teacher explained some of the value and benefits of this kind of organizational, on-line communication.

With my own current students, the email conversations are usually not long. They're usually terse, but concise and friendly. 'Can we have tutorial tomorrow?' and this is at 7:30 at night, so okay, 'what time do you want to do that?' So, I'll be at home and say 'we'll see you at lunchtime tomorrow.' So, it's really short and terse - it's just a really quick way to communicate with them and it's good. It's healthy in the fact that they get what they are wanting and expecting, whether they expect me to be online at 8:00 at night, you know, sometimes I don't check at night. Sometimes I'll leave my laptop here. Just to separate myself from work and family and in those cases, if I don't get the email, then I'll get it in the morning and I'll just talk to the kids in the hallway, and they'll say 'no problem.' So it's been a great tool for really bonding with the kids in different ways. I need to communicate with them. (24A – 23 – 12)

Since much of adult work life involves arranging to meet with colleagues or clients, there could be some benefit to learning this at a young age.

Some teachers explained that being accessible to students made them feel more connected and that they were appreciative of teachers' efforts to respond to them. In some

cases, teachers expressed the view that they were able to alleviate students' anxieties by responding in a more timely manner to their concerns. For example:

If they know I'm accessible, then certainly they might see me as being more connected to them or something if they know that I'm accessible. I hadn't really thought about that. Because then they don't have to go to sleep at night stressing about this 'thing' because they've had their question answered...I think if I were a student, I think I would appreciate that in a teacher, knowing that they could just quickly get a response for something and then not stress about it all night and worry.
(3B – 31 – 6)

Accessibility and approachability are aspects of the teacher-student relationship than teachers believed could be enhanced through electronic communication. In addition to better meeting students' learning needs, improving these elements also holds the potential for enhancing interpersonal relationships.

Technology and Youth Culture

Electronic communications including email and social media have become an integral part of youth culture and important vehicles for the building and maintenance of relationships. Young people are generally more comfortable with technology having grown up with computers that they have used for entertainment, communication, social networking, productivity and learning. There is considerable controversy around Prensky's (2001) proposal that young people are digital natives and that a generational, digital divide exists between them and older people who have not grown up with technology (Bennett & Maton, 2010; Cameron, 2005; Guo, Dobson & Petrina, 2008; Selwyn, 2009). However, those of us who work with students every day can easily observe their comfort with and reliance on technology.

Because technology is a dominant element in the milieu of youth culture, its use in schools presents opportunities for teachers to build relationships and engage students within that milieu. Participants in this study expressed this in many different ways sometimes using terms like meeting the students ‘in their world.’ One teacher described how she created videos (jings) to explain concepts or demonstrate skills in the media-rich format that students prefer.

I think maybe it’s because of this age that we live in that things can’t all be paper and pen. They’re used to video games and movies and access to moving things — although mine are not like a Hollywood production that’s for sure. But I think maybe they’re used to the digital world and they appreciate that I’m trying to meet them in their world. (7B – 39 – 9)

Most teachers recognized the advantage that technology offered in building relationships with their students and the ways in which it served as an entry point into youth culture. Some went so far as to state that it would be a loss for teachers to ‘opt out’ of technology-based interactions with students because of the central role that they play in relationship building and communication among young people. One participant made the following observation about how technology use enhanced his relationships with students:

I think it’s a closer relationship, because technology is part of the milieu of our culture and especially youth culture, and all of our relationships revolve around technology, and if we didn’t use technology, we would be opting out of an important way in which relationships form in our society. (24B – 34 – 8)

...it’s the milieu, and I think that it’s an even greater part of the way youth build relationships. And to opt out of that... I think that it’s an overwhelmingly important way in which we build relationships within our school and communicate. The communication is obviously a key

pillar in any relationship, and without technology we don't have that.
(24B – 34 – 19)

Teachers interviewed at this site generally agreed with the notion that given the importance of technology to their students, they could not afford to ignore opportunities to communicate and build relationships with them using the available technology and accommodating their preferences for digital resources and communication channels.

Building Trust

Trust is a foundation piece in human relationships. Teachers in this study found that on-line communications and technology use in class created new and different opportunities for building trust in their relationships with students. Two general themes emerged in this area of trust building. The first had to do with teachers trusting students to remain on task in class using the appropriate or permissible on-line resources. There are times when a student is given a task or an assessment where they are not permitted to access certain resources that they could access on line. For example, students writing an in-class essay may not be allowed to access an on-line thesaurus, online plot summaries and so on. It is not always possible or convenient to technically disable students' access to these web-based resources and tools and so the teacher must be able to trust students not to do so. It has been said that we cannot expect students to develop responsibility unless we give them the opportunities to do so and the same could be said for developing trust. Technology presents many new and elaborate ways for students to cheat and teachers must work with their students to develop the trust needed to function within ubiquitous technology environments by creating high expectations in this regard. One teacher described the challenge.

I mean, they're writing an in-class essay for me, they write it on their computer, I am trusting them not to have anything else open. I'll do a little walk-around every now and then but they're so fast at closing a window or minimizing a window that I'm sure some of them do that. But I can't lose my sleep over that because I'm setting an expectation, and, you know, in a staff meeting I'm not online shopping, and I'm doing what I'm supposed to be doing. (3B – 23 – 5)

Using technology presents many new classroom management challenges like the one above. It is also a double-edged sword in that it presents opportunities for students to both build and violate the trust of their teachers. As a result, many conversations about the ethics and etiquette of computer use occur within the classroom.

Some teachers mentioned that electronic communication was useful initially in building trusting relationships; particularly with students who are shy and reluctant to approach the teacher in class. Speaking about her use of email with students, one teacher stated,

I think that it goes a long ways towards building that foundation for us to be able to have that trusting relationship where the kids will feel perfectly able to come up to me in person. Even the shyest, quietest one in the class will start to feel like they can actually come to me in person because it's always easier to do it through email in the beginning.
(3A – 22 – 17)

The excerpts above illuminate some of the trust-building opportunities that technology use affords teachers and students both within and outside of the classroom.

Setting Boundaries and Expectations

There are many structures, protocols, policies and best practice guidelines in place to govern how teachers and students interact within the classroom and during participation in co-curricular activities. Teachers and students are bound by school rules,

codes of conduct and other structures that set parameters around their behaviours. Earlier in this chapter, I discussed the virtual space created by technology wherein teachers and students interact outside of class time using applications like email. The interactions that occur within this virtual space are much less clearly defined and the known boundaries of the classroom are replaced there by ambiguous boundaries. Some schools and professional teachers' organizations have begun to develop those guidelines. For example, this school site had policies on the use of social media that forbid teachers from becoming Facebook friends with students. The Ontario College of Teachers recently released a Professional Advisory on the Use of Electronic Communication and Social Media (2011) advising teachers about appropriate use of social media. But the development of new digital communications channels outpaces the development of practices and policies to manage them.

Teachers clearly see benefits in connecting with students outside of class time; however, at this juncture, they must make their own decisions about some of the rules of engagement and they must also manage expectations related to the opportunities facilitated by on-line communications. Interviews with teachers at this particular site suggested that a tension exists between teachers' desire to support students and the resulting encroachment on their personal time. Some teachers felt the need to set boundaries around the timing and content of on-line communications and there is considerable variation in how teachers manage and feel about this issue.

Many of the respondents seemed to view email as essential but time consuming. A typical response was something like this:

I also know that email sucks up an incredible amount of my day. I probably easily spend two hours a day with email. And yet, I think that

probably in balance, it's probably worth it for the increased contact I can have with the kids — increased positive messages I can get out to the kids. (3A – 30 – 4)

Teachers, like other professionals, have come to accept email as some sort of necessary evil over time – simply a part of living in the 21st Century. They understand that the world outside of the school has also changed in this regard. For example:

I was somewhat offended by the fact that – it seemed to me like ‘Wow, this is an invasion of my private time,’ and of course that's shifted but it still is an invasion of my private time. But I think there's a much bigger overlapping between personal and work for positive and negative. The world does not work a 9:00 to 5:00 way anymore...And so I think as long as there's a give and take where – perhaps at school I may need to deal with some personal banking or things like that – and then at the same time on the weekend, if a student emails me or if there's something going on or if I find a really interesting video I can put it up for everybody to take a look at. And so they see me as a learner. (25A – 24 – 3)

Different teachers in this study set their own standards around when and if they would respond to an evening or weekend email from a student. The three excerpts below demonstrate this variation in their approaches.

In the beginning when students would email me say after four o'clock, I felt like I had to respond to them right away because it was a pressing question that they had or I didn't want to be a bad teacher and not respond to them. I've learned now that I don't have to do that. I tell the students, ‘You know what? If you email me after four o'clock you're not guaranteed that I'll respond to you that evening.’ ‘Or if you email me on the weekend, you might not necessarily hear from me,’ because I've learned to just not do that. And it kind of consumed me before because I would always be online and feel like I have to respond to questions because ‘Oh, what if the student didn't understand it clearly?’ (24D – 31 – 10)

So I think you have to take control of when you're willing, and it could be different for people at different stages – people with young children,

people with their own personal lives have to decide what's kind of private time and what's (work) time, but those boundaries have definitely been mingled and eroded. (23A – 21 – 19)

I do get those kinds of questions. I do tell the kids that, 'you can try sending me an email. If it's after six o'clock, I may not respond'...and yet if I am at school and sitting at my desk working and I see an email pop up at seven o'clock, I will respond to it. If I'm still in work mode, I will respond to emails. But I'm not going to just check my email all evening long to see if I have emails from the kids. (3A – 23 – 3)

While some teachers have tried to create fairly clear boundaries around when they will respond to emails, there are those at the other end of the continuum who have made themselves completely accessible. In the example below, the teacher has forwarded her email to her personal cell phone so that she can respond at anytime from anywhere.

I've told them I use my iPhone, I told them that they can email me on my school account or on Schoology and that I will get it and I will respond. And I don't feel that's invasive of my personal time. I really don't. It takes me two seconds to respond back, and I don't mind if it comes to me at home, like at ten o'clock. I got one last night asking about the expectations for this morning and it was really easy to answer. (3B – 25 – 12)

When asked about the appropriateness of content and tone in email messages from students, most teachers felt that students exercised good judgment and did not push the boundaries. Some commented that they had to spend time teaching proper email etiquette and that it was part of their role as the teacher to do so:

...and I think here we're really aware that it's our role to say, "You know what? You need to address your teacher on an email as you would in person and you can't just open up with 'Hey' and 'When can I meet you' or 'Can you be here at this time?'" It needs to be in a respectful tone and it needs to have that respectful language and it needs to address somebody as Mr. or Mrs., and it needs to have a closing, and it shouldn't have all the smiley faces at the bottom or a picture of

Borat...It needs to have all those things, because this is a school. (23B – 29 – 19)

Another teacher described educating his students about limiting email messages to what is really necessary and viewed this as part of their training for the world of work.

On occasion - it's usually at the beginning of the year when students start doing that and if there's too much of it at the beginning I will address the issue in class just about... 'You know, laptops are great. You can communicate' but I said, 'You have to think about what you're sending to people and is it really necessary?' And I said, 'It's not just me. It's not just me saying this...when you're in a workplace and you have a boss. You know your boss isn't going to want to – there's a fine line between what they want to hear about and what they don't want to hear about. So, that's why I'm telling you that — just as part of your education about appropriate use.' (7A – 38 – 15)

Respondents indicated that most electronic communications for students were relatively formal and related directly to course work. There were very few situations where students utilized email for personal self-disclosures or to exchange information not related directly to school.

I would say usually they're very formal and direct. You know, 'Mr. (name), I don't understand this question.' And then they put the question in, and that's it. And then, when I give them the answer back, I try to give them as much as I can without me having to spend, you know, twenty-five minutes to formulate a response to it. (24C – 27 – 13)

Overall, teachers felt that students needed occasional reminders about the formality and respect required in electronic communications with their teachers and this appeared to mirror the high expectations for face-to-face communications within this school culture. The content of messages was generally school-related and even if a message contained information of a personal nature, it fell within the context of school

performance. An example might be a student mentioning that he or she was upset due to marital issues between her or his parents as a reason for not performing well on a test. Teachers tended to set their own boundaries in terms of when they would respond to email messages outside of school.

Some of the boundaries imposed by teachers or the school were eased or removed after graduation. A number of respondents mentioned extending relationships with alumni through Facebook or email. For example,

and then with alumni, I find that I'm communicating a lot with the Grade 12s who graduated last year, and would be through Facebook too, and so in that case, some of the relationships have been fostered and enhanced through that, which is great... so keeping in touch... (24A - 22 - 18)

For some, it was like beginning a new chapter in a relationship with a former student via electronic communication, particularly when students are living in other parts of the country, attending university or having begun their own careers.

Well alumni, um, for sure, because we can now talk, and, you know be relaxed and look at each other's work and I show them mine, and we can talk about what it means, and all that stuff. Sometimes it's more mature. (25B - 19 - 1)

Alumni support is a very significant factor in the long-term success and development of independent schools. The ability for teachers to maintain ongoing connections and relationships with alumni benefits all parties and electronic communication is clearly an enabler in this regard.

The Value of Face-to-face Communication

It should be mentioned that despite the potential benefits of electronic

communication with students, some teachers perceive that face-to-face interactions such as involvement in co-curricular activities are more potent than on-line communications in building close relationships. This finding is not surprising given the high value that this particular school places on teacher involvement with students outside of the classroom, and virtually all teachers participate in some way in the co-curricular program. As one teacher stated,

I still think the best way of knowing students is working with them in the real world – on canoe trips, music trips, in the classroom dialogue, but I think for some students, particularly those who are very quiet or shy or not so engaged in speaking in the classroom, it's definitely an avenue where you can understand the human side of the student a little bit. (23A – 22 – 5)

This excerpt represents a common thread that electronic communication is no substitute for face-to-face interactions in getting to know students and building relationships with them. But it extends the ability to do so; particularly with certain kinds of students.

Another teacher felt that email interactions had more to do with managing things than with relationship building and she described it in this way:

No, I don't think I know them better because I think that comes in the personal interactions, like with coaching or doing the play... which is not to say I don't know my students who are not in my team or in my play. But I think really getting to know somebody doesn't happen with (email) and these are like management emails... (3B – 27 – 1)

Whatever value electronic communications may have in the building and maintenance of teacher-student relationships, some teachers had a strong preference for achieving that outcome through face-to-face interactions facilitated by co-curricular involvement.

The Potential for Conflict

Some of the literature on teacher-student relationships suggests that positive or secure relationships are characterized by low levels of conflict (Pianta, 1999). Factors that increase the level of conflict are therefore deemed to be undesirable and cause for concern. This study revealed that online communications between teachers and students have the potential to increase conflict which could in turn have a deleterious impact on these important relationships. Some teachers felt that email communication was inherently problematic. Like other forms of written one-way communication, it lacks the voice inflection, eye contact and other forms of non-verbal expression that help to clarify the message. This may lead to failure in properly portraying the intentions of the sender or issues related to misinterpretation by the reader. For example, tone can be difficult to capture and interpret in email messages; particularly those that are composed or read hastily. There were some strong feelings expressed in the interviews about this point.

Email to me is the most evil thing in the world, because, and I've learned from experience, that it's the mood of the reader that will dictate what the meaning is. And it doesn't matter how politely you try to word it, in fact sometimes when we really try to be polite, you know, if you're in a bad mood, you'll read it sarcastically and that's not what you intended...(24C – 30 – 16)

Another respondent pointed to the difficulties inherent in encoding the desired tone in an email message as follows:

There are disadvantages, and sometimes the kids get the tone wrong in email. Email is a completely different kind of communication in and of itself. And so, I guess it can affect the interpersonal because the kids get the tone wrong, you know, they tend to tell you what they want to have happen as opposed to asking. But you can get that wrong in conversation too. (23A – 25 – 2)

Teachers as a whole in this study did not express significant concern about improper use of email increasing the level of conflict in their relationships with students. There were certain instances where this occurred, but it was by no means a dominant theme in teacher responses. If anything, it appears that the value that teachers perceived in on-line communication exceeded concerns about the escalation of conflict.

Summary

The use of electronic communications enabled teachers to provide extended academic and emotional support for students outside of class time within the virtual space created by their on-line presence. Teachers increased their accessibility but needed to balance this by setting boundaries around their personal lives and time. Students appreciated the efforts of teachers to engage with them in the digital world and opportunities to build trust are created through those interactions. Teachers did not view on-line communication as a substitute for face-to-face interactions in relationship building and maintenance, and they understood that the former had the potential to generate conflict.

Conclusion

This study produced three major findings about teachers' perceptions of the influence of a laptop computing program on the teacher-student relationship and these were supported by a number of related, underlying themes. Firstly, teachers in this study perceived that their pedagogical relationships with students and the traditional roles of teachers and students within these relationships are altered by the use of laptops in the classroom and the instant access to on-line information and communication channels

enabled by the Internet. Secondly, teachers perceived that the open access to knowledge enabled by students' use of laptops in the classroom leads to a shift in the balance of power within the teacher-student relationship. Acting as a catalyst for learner empowerment, laptop use has the potential to reduce the power asymmetry that characterizes traditional teacher-student relationships. And finally, teachers perceived that technology-enabled, online communication helped them to build and maintain closer bonds and stronger relationships with students. Chapter Five elaborates with a discussion of the findings.

CHAPTER FIVE: DISCUSSION OF FINDINGS

Introduction

This chapter provides further discussion and analysis of the findings presented in the previous chapter. The discussion is framed by the research questions posed by this study and presented within the context of the literature reviewed in Chapter Three with a view to developing a deeper understanding of the findings. Since this study does not use a single theoretical framework as a lens through which to examine the influence of technology use on the teacher-student relationship, a number of different theoretical perspectives are explored throughout the discussion.

Changes in the Pedagogical Relationship

The first research question in this study asked, “How does one-to-one computing influence the role of the teacher with respect to the pedagogical relationship?” Earlier in this dissertation it was acknowledged that the pedagogical and interpersonal aspects of the teacher-student relationship are intertwined and resistant to tidy separation. However, this section of the discussion will focus primarily on dimensions more associated with pedagogical interactions and later sections will focus more on interpersonal elements of the relationship.

Teachers in this study perceived that regular technology use brought about significant changes to their roles and practices in their pedagogic interactions with students. These can be summarized briefly as follows:

1. a shift toward more learner-centered instruction;
2. development of new/different mediation and classroom management techniques;

3. sharing of traditional teacher roles with others;
4. new roles for teachers/students in acquiring and constructing knowledge;
5. new opportunities to motivate and engage students;
6. new opportunities to build and participate in a community of learners;
7. streamlined instructional practices that altered patterns of interaction with students.

A number of theoretical constructs serve as useful lenses through which to explore these relational changes to the roles of teachers and students as they engage in technology-supported learning. There are also some interesting connections and intersections among these theories.

A More Learner-Centered Approach

Many of the teachers in this study believed that the regular use of networked laptops and access to on-line resources via the Internet supported a pedagogical shift toward a more learner-centered approach to instruction. The potential for ICT to act as a catalyst in this shift is well documented in the literature (Smeets & Mooij, 2001; Wheeler, 2001; Schofield et al., 1997; Kerr, 2004; Alberta Education, 2008; Tapscott, 2001) and this study corroborates that conclusion. To better understand the significance of this phenomenon, it is useful to turn to the literature on Learner-Centered Psychological Principles or LCPPs (Task Force on Psychology in Education of the APA, 1997). LCPPs embrace the recognition of individual learner characteristics combined with best practices in teaching with the intention of maximizing students' motivation and achievement levels (McCombs & Vakali, 2005). They include 14 research-based principles that essentially define the term 'learner centered.' In her discussion of the

research underpinning learner-centered principles, McCombs and Vakali (2005) argued that ICT and networked learning communities have great potential to support learner-centered classrooms. “Positive impacts through Web-based technologies now make it possible to support complex non-linear learning in ways that connect individual learners in meaningful dialogue, learning, and change across traditional boundaries of teachers, students, schools, classrooms, and individual communities” (p. 1586).

There are other benefits associated with learner-centered instructional practices. In his meta-analysis of learner-centered teacher relationships, Cornelius-White (2007) concluded that “learner-centered teacher variables have above average associations with positive student outcomes” and these included motivation, participation/initiation and satisfaction (p. 134). This literature on LCPPs assists in building an understanding of the connections in this case study between technology use, a move toward learner-centered pedagogies and the high levels of student motivation that some teachers reported. A stronger connection emerges when examining some of the specific LCPPs. For example, *Principle 8: Intrinsic Motivation to Learn*. This principle states that, “Intrinsic motivation is stimulated by tasks of optimal novelty and difficulty, relevant to personal interests, and providing for personal choice and control” (McCombs & Vakali, 2005, p. 1585). This description correlates with numerous accounts by teachers in this study who claimed that laptops enabled them to give students greater personal choice around project topics and use of on-line resources and to pursue personal inquiries; all of which enhanced their motivation to learn. Even more germane to the purpose of this study is the connection between motivation and positive teacher-student relationships. In her study of teacher-student relationships among middle school students, Davis (2006) found that student motivation was a factor in the quality of their relationships with teachers. Specifically,

she stated that academic motivation and behavior regulation abilities were both strong predictors of teacher-student relationship quality. These connections among ICT use, LCPPs and student motivation help to illuminate the mechanisms through which an ICT-induced shift toward learner-centered pedagogies has the potential to increase student motivation, improve certain student outcomes and enhance teacher-student relationships.

Situated Learning

Situated learning theory (Lave & Wenger, 1991; Rogoff, 1990) provides another lens through which to examine the shifting role of the teacher in his/her pedagogical relationship with students. From a situated learning perspective, we understand that learning is 'situated' in certain forms of social co-participation wherein students, viewed as apprentices, gain increased roles in expert performances through '*legitimate peripheral participation*' under the guidance of a master (Lave & Wenger, p. 29). In this particular case study, the traditional roles of teacher/student (master/apprentice) break down as students occasionally serve as experts on technology use or bring new subject knowledge to the classroom. ICT enables students to easily access knowledge that may previously have belonged only to the teacher. The 'community of practice' is broadened to include students and teachers working together in the co-construction of knowledge as opposed to a polarized community wherein novices (students) have only limited roles. McCombs and Vakali (2005) observed this stating that, "in learner-centered electronic learning environments, all people associated with the system are learners whose status changes from novice to expert as tasks and goals change" (p. 1587). This was indeed the case at the site of this study where teachers often stood back as students took the lead in teaching teachers or other students how to complete tasks, utilize software applications or

demonstrate learning through electronic media. In situated learning terms, it appears that ICT and the knowledge accessed through its use enable increased or accelerated access to the 'community of practice' which includes 'expert performances' by both students and their teachers whose roles oscillate between *legitimate peripheral participation* and full participation.

A Sociocultural Perspective

Sociocultural learning theory based upon the work of Vygotsky (1978) is related to situated learning theory in that both assert that cognition is developed through social interaction. Unique to Vygotsky's work is the notion that a "more knowledgeable other" (MKO), most often the teacher, interacts with the learner within the ZPD mediating the students interactions with various aspects of the learning environment, engaging in cooperative or collaborative dialogues and assisting the student in moving to a higher level of ability than he or she would otherwise have been able to attain independently. The social-cultural aspect represents the social and cultural context of the classroom environment as well as the students' and teachers' backgrounds including their previous knowledge. Vygotsky and others have acknowledged that peers may sometimes serve as MKOs for one another within social learning activities and this reality has given rise to a variety of cooperative learning and constructivist teaching methods. However, in this technology-rich teaching environment, there is an even broader range of interactions within the ZPD with multiple possibilities in terms of who or what plays the role of MKO and the nature of the MKO's mediation activities. For example, a student could be guided through the ZPD to a higher level of cognition through personal interactions with a computer application or a You Tube video sourced by the teacher or the student. Or an

extension of the teacher's MKO role might be represented through a teacher-created 'jing' as described earlier by one teacher in this study. As the interactional possibilities within the ZPD broaden beyond teacher-peer and peer-peer to include peer-computer and peer-outside expert, so too does the mediational role of the teacher who necessarily develops new strategies to mediate students' interactions with the technology and access to on-line resources. Increasingly this means teachers allowing more knowledgeable students to take the lead in learning activities like demonstrating how to use a software application such as a film-making program. Access to an expanding body of software applications, on-line resources and students' self-acquired ICT knowledge adds complexity to the pedagogical role of the teacher as he or she orchestrates new learning activities within the context of constantly evolving technology-based learning possibilities. Sutherland et al. (2004) wrote about this phenomenon warning against the oversimplification of the teacher's evolving role from 'teller' to 'facilitator'. "We view the teacher's role as involving a complex shifting of perspectives from the 'more knowledgeable other', to co-constructor of knowledge, to the vicarious participant" (p. 420).

Rogoff (1990) claimed that students take an active role in their learning that includes shaping the structure of the instruction itself by providing cues as to when additional assistance by the teacher is required and when students can take more responsibility by acting more independently or even taking the lead. This form of pedagogical give-and-take can be mediated through what Hennessey et al. refer to as "Technology-integrated Instructional Conversations" wherein teachers and students negotiate what form of assistance or scaffolding is required by individual learners partially based upon sociocultural variables including previous knowledge or ability to

access knowledge independently as needed. Many teachers in this study provided examples of these conversations which frequently occurred as teachers circulated around the classroom during computer-based learning activities assessing individual students' requirements for learning assistance and timing interventions accordingly.

Teacher as Facilitator of Learning

Kozma (2003) through the SITES M2 case studies in 28 countries also found that teachers were using ICT to modify their roles from "primary source of information to one who provides students with structure and advice, monitors their progress and assesses their accomplishments" (p. 13). Hennessy et al. (2005) also acknowledged that the shifting roles of teachers toward facilitation, corresponds with a shift in students' roles within the pedagogical relationship. "Pupils are correspondingly perceived as becoming more independent, active and responsible learners, and this resonates with the cognitively active, reflective role of the learner portrayed within sociocultural accounts" (p. 268). But Hennessey also argued that there was a need for teachers and administrators to develop better pedagogies to effectively leverage technology use. Teachers in this study did not appear to be stressed or overwhelmed with the complexity and evolution of their mediation or facilitation roles. Indeed many spoke positively and enthusiastically about the evolution of their pedagogies and embraced the emerging roles of students in the co-construction of knowledge. This may be due to the school's investment in ongoing professional development and the fact that technology use is relatively well established within the school culture and teachers have had considerable time to develop and refine their teaching practices in keeping with their evolving roles. Some teachers specifically indicated that their comfort levels had increased with time whereas they were nervous or

concerned about laptop use in the early days of the program. Earlier studies often occurred in educational settings where technology use was relatively new or where student access was somewhat limited unlike the one-to-one computer deployment in this case study.

A number of teachers in this study perceived that laptop computers better enabled them to employ constructivist approaches to teaching which embody many elements of sociocultural learning theory and situated learning theory. This finding is supported by the work of Jonassen et al. (1999), claiming that technology use had great potential for supporting constructivist instructional strategies. Constructivist philosophies embrace several elements of the theories discussed above including the belief that knowledge is not transmitted by the teacher but co-constructed by teachers and students through teacher-mediated interactions. Constructivist pedagogies are then characterized by: “reflecting multiple perspectives, increasing complexity, diversity, bottom-up, inductive, apprenticeship, modeling, coaching, exploration, learner-generated” (Jonassen et al., 1999, p. 7). While teachers in this study did not frequently articulate these theoretical elements in their interviews, the descriptions of their practices often reflected ICT-induced pedagogical shifts that reflected many of these constructs.

It should be noted that ubiquitous computing alone does not automatically cause all teachers to shift to constructivist pedagogies. As Windschitl and Sahl (2002) concluded, “teachers’ interrelated belief systems about learners” influence their instruction decisions around the use of technology (p. 195). However, technology facilitates and possibly encourages pedagogical shifts for teachers who are predisposed to them based on their beliefs about learning.

In this section I have examined my findings with respect to the evolving pedagogical roles of teachers vis-à-vis their students and how these are being shaped by the use of technology in the classroom. Analyzing these through different theoretical lenses helps to generate an understanding of how and why this pedagogical aspect of the teacher-student relationship is changing and teachers and students continually renegotiate their roles as the integration of technology continues to present new and dynamic opportunities for learning.

The Balance of Power and Control

The second research question in this study focused on the power dimension of the teacher-student relationship. It specifically asked, “How does the increased access to information afforded by one-to-one computing influence the teacher-student relationship with respect to learner autonomy and teacher control?” The findings revealed that teachers in this study perceived that open access to knowledge enabled by students’ use of laptops led to a shift in the balance of power within the teacher-student relationship. The technology acted as a catalyst in reducing the power asymmetry that characterizes teacher-student relationships. More specifically, teachers perceived that students were empowered in their learning, had increased opportunities to explore topics of interest to them and acted as experts at times during instruction. The type of authority used by the teachers shifted from expert toward referent authority.

Teacher Control and Learner Autonomy

Teacher control and learner autonomy might be seen to have an inverse relationship. That is to say that the more control teachers exercise over the learning

process, the less autonomy students have in terms of their ability to exercise choice and learner independence. The concepts of power, authority, control, autonomy and empowerment are useful constructs through which to examine and discuss the findings related to this research question. These concepts, which were discussed briefly in Chapter Three, are closely linked and in some ways interactive. While a thorough discussion of each exceeds the scope of this dissertation, it is worthwhile to make a few points here that may serve to focus and clarify the following discussion. Borrowing from Cornelius and Herronkohl (2004), I view power in the teacher-student relationship as “existing on a balance scale, with situational factors causing the positions of persons in an environment to constantly shift and change with the potential of being tipped in different directions” (p. 469). The primary “situational factor” under examination in this study is the extensive use of technology in the classroom and the information and resources to which it provides access. Power is viewed as relational and “reciprocal” in that both teachers and students have power and negotiate the rights to control certain aspects of the learning process (Cothran & Ennis, 1997, p. 543). Wertsch (1998) argued that “the emergence of new cultural tools transforms power and authority” (p. 65). Wertsch offers a complex view of artifacts and tools; technology itself plays various roles, and in use can be both a technical tool and a “cultural tool.” Wikis, blogs, email, asynchronous threaded discussions, and the Internet are cultural and technical tools. This case study provides evidence that these technologies and the processes and learning activities that utilize them significantly shape and reshape the power asymmetry in the teacher-student relationship.

Empowering Learners through the Integration of Technology

In discussing the balance of power in their relationships with students, the idea of empowering students through the use of technology emerged as a prominent theme among respondents. The literature offers many different definitions of empowerment (e.g., Ashcroft, 1987, Block, 1987; Luechauer & Shulman, 1993; Frymier, Schulman & Houser, 1996) and it is unlikely that all of the teachers in this study would hold a shared definition of the term. With that being said, an analysis of the discussion on the topic would suggest that their interpretation of the term was similar to that of Fisher (1989) who described it as “an internal state in which students see themselves as responsible for, in control of, or the source of their own learning” (p. 6). From this perspective, the balance of power shifts or tips toward students as they are given more control or autonomy over elements of their learning and allowed to contribute more to the learning process within the classroom.

The findings of this study include numerous examples whereby students were allowed to search out their own sources of information on the Internet and then contribute subject knowledge to the lesson. Students appeared motivated in responding to these opportunities and their actions met several of the criteria that Houser and Frymier (2009) proposed as being indicators of learner empowerment including “student’s feelings of competence to perform a task that is meaningful and has impact of the situation” (p. 35). Mabry and Snow (2006) argued that feelings of empowerment were also increased when students were given greater choice. It is worthwhile to note that teachers in this study were able to give students choice in selecting sources of information because they had instant access to the knowledge base via the Internet. The added efficiency enabled by the technology made it practical to offer students this opportunity in that it could be exercised

quickly as opposed to sending students to the library to seek information, which would have been impractical within the time constraints of the lesson. Without this technology-enabled choice, teachers would be more likely to rely on the prescribed text or other teacher-selected resources thus diminishing opportunities to empower students.

Fostering Student Autonomy

The teacher behavior described above and elsewhere in the findings would fit some of the key criteria for what Reeve (2006) would refer to as an “autonomy-supportive style” of teaching (p. 226). Drawing on self-determination theory (Deci, Vallerand, Pelletier & Ryan, 1991), Reeve argues that certain teacher behaviours mobilize students’ “inner motivational resources” by nurturing and supporting their personal interests and preferences allowing them to exercise choice in the way that they work and in pursuing their particular learning interests as teachers in this study have done through the use of technology (p. 226). Reeve claims that autonomy-supportive teaching styles generate a wide range of beneficial student outcomes compared to controlling teaching styles including improved academic achievement. However, more germane to this study is his conclusion that autonomy-supportive teaching can improve the teacher-student relationship. “Teacher-provided autonomy support constitutes a pivotal element in offering students a high-quality, growth-promoting relationship” (p. 234). Schofield and Davidson (2003) also found that Internet use increased student autonomy and enhanced the teacher-student relationship both directly and indirectly. Indirectly it did so because students engaged in Internet use required less teacher control which reduced tension, and it did so directly through the increased motivation, enjoyment and autonomy that students experienced when using the Internet. These observations concur with the

finding of this study that interpersonal aspects of the teacher-student relationship were enhanced through technology-based learning activities that fostered student autonomy and control.

When students, as revealed by this case study, are allowed and encouraged to locate on-line learning resources, which they then contribute to the classroom discourse, there is another interesting phenomenon that occurs in the power dynamic between teachers and students. Unlike the use of a single information source such as a textbook, accessing multiple texts will almost certainly result in diverging perspectives on a given subject. This creates new roles for the teacher who must not only teach students how to compare and critically assess the validity of online information, but as King and O'Brien (2005) explain, also assumes "the non-authoritarian role of the teacher who must become a facilitator to blend meaning from multiple sources" (p. 46). This suggests that since the teacher is not the single source of the knowledge, he or she does not hold the expert authority and must therefore negotiate meaning or co-construct the knowledge with the students. Lensmire (2000) states that treating students as contributors to the subject matter is one form of giving students authority. The allocation of authority to students and the shared construction of knowledge or meaning reduce the inherent power asymmetry within the teacher-student relationship.

In addition to the choice that students were sometimes given in selecting learning materials, some teachers in this study also reported that the use of technology enabled them to choose topics of inquiry (e.g., research projects) that the teacher or school would not have been able to support due to limitations in resources, teacher expertise or teacher bias. As mentioned above, Reeve (2006) identified the provision of choice as an important aspect of autonomy-supportive instruction claiming that teachers nurture

students' "inner motivational resources" when they align instruction with "students preferences, interests, sense of enjoyment, sense of challenge, competencies, and choice-making" (p. 228). Thomas and Velthouse (1990) also predicted that providing individuals with increased choice would elevate their sense of empowerment and Deci et al. (1991) concluded that autonomy-supportive teaching methods preserve students' natural curiosity or intrinsic motivation. These ideas are congruent with Schofield's (1997) findings that computer use motivated students because it increased their control and fed their curiosity.

Student as Expert

A commonly acknowledged source of teachers' power or authority is their expert knowledge as perceived by students (French & Raven, 1959, 1968; McCroskey & Richmond, 1983; Tauber, 1985). Lave and Wenger (1991) also point out that "legitimate peripheral participation" is shaped by the power relations within the social structure; in this case, the classroom. As legitimate participants in the process of co-constructing knowledge, students negotiate with their teachers for control over certain elements of the learning process. Students are empowered as their participatory roles expand or as Lave and Wenger explain, "As a place in which one moves toward more-intensive participation, peripherality is an empowering position" (p. 36). Teachers in this study have identified many situations in which students have acted as experts in resolving technical issues, demonstrating software use, identifying online learning resources, contributing subject content and even using their knowledge in a way that redirected the path of a lesson. In these ways, they have acted more like experts than students or what Lave and Wenger (1991) would have referred to as "masters" rather than "apprentices"

(p. 29). Teachers in this study perceived that by allowing these forms of participation, students felt empowered. This correlates with the findings of other researchers (Mouza, 2006; Mabry & Snow, 2006; Niles, 2006; and Fisher, 1989). Schofield and Davidson (2003) in their study of the impact of Internet in schools also found that the phenomenon of students sharing their knowledge to assist the teacher and other students in resolving technical problems led to a “reversal of the usual knowledge disparity between teachers and students and tended to increase student independence” (p. 71). Furthermore, Burns and Polman (2006) found that this type of “role reversal” created an atmosphere more conducive to interpersonal communication between teachers and students (p. 376). Where expert knowledge is perceived as a source of power, it seems reasonable to assume that a reduction in the knowledge disparity between teachers and students would be accompanied by a corresponding shift in the balance of power in their relationships.

From Expert to Referent Power

Several teachers in this study acknowledged that they could no longer claim to be experts in their subject matter or dispensers of knowledge since knowledge was readily accessible via the Internet and many students had superior technology skills. This was discussed in an earlier section where teachers perceived themselves more as facilitators of learning and co-participants in the construction of knowledge. Some teachers expressed the view that this shift necessitated a greater need for a strong relationship with students that was built on elements such as respect. Power that is built upon positive, caring, respectful relationships would fall into the category of referent power according to French and Raven’s (1959) categorizations of the bases of power. Referent power is seen to be less coercive than other forms and unlike legitimate power or what Dworkin (1987)

refers to as role authority, where power is legitimized by virtue of one's position, referent power requires the building and maintenance of effective interpersonal relationships. The form of power that was evidenced in this study when teachers relinquished control over certain elements of the learning process and autonomy-supportive teaching styles is more in keeping with what Cummins (1994) referred to as "collaborative relations of power" where, "power is not fixed, but can be generated by interpersonal relations; it is something created in the relationship and shared among participants" (p. 299).

Teacher's whose power is grounded in their expert knowledge might be concerned about how the introduction of technology into the classroom has the potential to erode that power. For example, in their study of the impact of ICT in Scottish Schools, Condie and Simpson (2004) found that despite identifying some clear benefits to ICT initiatives, one third of the teachers reported feeling "threatened" by their students' expertise with the technology (p. 79). That was clearly not the case in this study where the vast majority of teachers expressed comfort and saw relational benefits in empowering their students to utilize technology. This may be due, in part, to longstanding traditions within the culture of schooling. Sutherland (2004) noted that even in cases where student knowledge and expertise were high, "students still perceive the teacher as the knowledge provider because of inherited traditions of schooling" (p. 420). In addition, a number of school variables specific to this case might explain this discrepancy. For example, being an IB World School places a strong emphasis on inquiry-based learning which, by design, relies less upon the teacher's knowledge base. The school also has small class sizes that provide greater opportunities for relationship building among teachers and students. In addition, the school has had a one-to-one computer program for many years and teachers have been provided with extensive professional development in

the area of technology integration. During the roll-out process, teachers were given laptops a full year before their students received them. These situational factors may help to explain their relative comfort with the use of technology and the absence of any feelings that their power or authority was being undermined by students' ICT expertise and empowerment. Mehlinger (1996) warned that,

The use of new technologies will have a profound effect on schools. The very relationship between students and teachers will be challenged because technologies enable learners to gain control of their own learning. In the past, schools have been places where people in authority decided what would be taught (and possibly learned), at what age, and in what sequence. They also decided what would not be taught – what would not be approved knowledge. The new technologies provide students access to information that was once under control of teachers. (p. 4)

Much of what Mehlinger predicted has indeed materialized. However, the challenges to the teacher-student relationships in this case study appear to have yielded a positive outcome whereby teachers perceive a healthy sharing of power and see students as motivated, self-determined and empowered through their use of technology.

This section has discussed the findings associated with research question #2 examining the influence of one-to-one computing on various aspects of the power dimension of the teacher-student relationship including: learner autonomy, empowerment and teacher control. In the next section I will turn my attention toward the role that one-to-one computing has played in shaping communication patterns between teachers and students.

New Patterns of Teacher-Student Communication

The third research question in this study asked, “How has one-to-one computing shaped the nature and patterns of communication between teachers and students?” The findings have indicated that computer facilitated communications such as email, on-line discussion boards and the school’s on-line academic platform (Schoology) create virtual spaces for teacher-student communication that eliminate traditional classroom boundaries and communication codes. They create new pathways through which teachers and students can access and approach one another. They also create the potential for conflict and relational boundary violations and do not replace the need for face-to-face communication between teachers and students. This section examines these findings within the context of the literature that exists on this subject, which is rather limited for K-12 education.

CMC was widely used by teachers and students in this case study. Although teachers and students in any school (regardless of its networked capabilities) might occasionally communicate through various electronic means, putting a computer in the hands of every student and teacher significantly alters communication patterns. For example, in schools where only some students have computers or handheld devices, the teacher cannot send out messages intended for the entire class without privileging those who have access. Providing every student and teacher with access to various forms of electronic communication eliminates that problem and elevates the legitimate use of CMC substantially making this an area of interest in terms of its potential to influence the nature of teacher-student relationships.

A Virtual Space for Teacher-Student Interaction

Access to online communication tools provides a virtual space in which teachers and students can interact. That space is fundamentally different than the physical space of the school in that it lacks certain barriers like time and space (Doherty & Mayer, 2003; Manning, 1996; Bloch, 2002). For example, certain school organizational structures such as the timetable create the need for students/teachers to move from class to class at specific times leaving limited opportunities for students and teachers to have private, face-to-face conversations about academic or personal issues. Co-curricular activities at lunch time and after school exacerbate the problem and increase the likelihood that important conversations might be compromised by extreme time constraints. Email allows students and teachers to contact one another and communicate about important matters outside of the constraints of normal school day.

The nature of their communication in this virtual space is also affected because the parameters and social norms that shape discussion in the electronic medium are much different than those present within the classroom culture and space. For example, because of its asynchronous nature, an electronic discussion in the form of a series of emails essentially enables a student to “hold the floor” as long as he or she wishes without the time constraints of a face-to-face discussion in the classroom or the teacher’s office (Wertsch, 2002, p. 107). Whereas in the classroom, the teacher has the authority to decide who will speak, for how long and which ideas will be put forward, on-line discussions are not subject to such controls. As Doherty and Mayer (2003) state: “In contrast to the informal, democratic discourse style of e-mail communication, oral classroom discourse is typically highly structured, dominated and controlled by the teacher, with grossly asymmetrical rights to speak, choose the topic and allocate turns” (p. 596). In their study

of middle school students, Niday and Campbell (2000) also found that both students and teachers had “personal access to and control over the technology” (p. 60). This finding aligns somewhat with Lave and Wenger’s (1991) notion of technological transparency, which is essential to healthy communities of practice (pp. 102-103). In these ways, online discussions also shift the balance of power between teacher and students as discussed in the previous section.

Electronic discussions that take place in this virtual space (e.g., extensions of discussions that begin in the classroom and continue online) can also be liberating in terms of overcoming differences in status among various participants that may be the result of position, academic standing, gender, age, class or race. Hawisher and Moran (1993) have written about this “equalization phenomenon” stating that online discussions may, “encourage students who are sometimes silenced because of their status, race, handicap, or gender to ‘speak up,’ to participate in ways that they avoid in traditional class settings” (p. 634). Teachers in this study experienced this phenomenon when shy students would come forward in this way. It was also reported that students who preferred to have a private conversation with the teacher, rather than one that might be overheard by peers, would sometimes use e-mail to initiate a conversation.

For most students, learning continues after the school day ends. When they are at home in the evening doing homework, reviewing their notes, studying for tests or doing online research, questions arise and so do new ideas related to the things they are learning. Email enables them to share questions, ideas and academic concerns with their teachers. Teachers have the ability to respond to these communications and teachers in this study often did so during the evening and on weekends. The electronic communication medium extended their ability to provide academic support for students

as well as social-emotional support. The latter will be discussed further in the next section. Since positive teacher-student relationships are characterized by high levels of teacher support (Pianta, 1999; Reeve, 2006), it is not surprising that teachers in this study making use of the opportunity to support students through electronic communications reported improved relationships with their students.

Collectively, these examples demonstrate that students in this one-to-one computing environment experience new, technology-enabled pathways through which they can approach and access their teachers. Teachers, in turn, can access and respond to students, timing their interactions so that they are not constrained by traditional school structures or cultural norms. The virtual space in which these interactions occur is more democratic and free of some of the organizational structures and sociocultural encumbrances students experience within the physical space of their school. These findings concur with those of Niles (2006) who argued that technology altered the nature and substance of communications between teachers and students and offered new opportunities for relationship building.

Relationship Closeness

The final research question in this study asked, “How do one-to-one computing and laptop-enabled communication affect the closeness of teacher-student relationships?” The findings indicate that teachers perceive the use of computers during class and their use to connect through email outside of class helped them to build and maintain closer bonds and stronger relationships with students. In particular, CMC outside of class time assisted teachers in supporting and demonstrating care for students and helped to make inroads into youth culture. Computer use both in and out of class generated trust-building

opportunities. This section seeks to explain and develop a deeper understanding of how students' and teachers' use of computers could elevate relationship closeness by examining some of the relevant research.

While "closeness" is not a consistently defined term when applied to relationships, it commonly implies that elements such as trust, warmth or intimacy are present and some affinity exists between the individuals involved. Reeve (2006) used the term "relatedness" to represent the notion of closeness and stated that "it revolves around a sense of warmth, affection and approval for students" (p. 233). Teachers in this study described a number of activities that they believed helped to build closer relationships with students. Examining these activities more closely and reexamining some of the phenomena described in earlier sections through different conceptual lenses helps to generate an understanding of the dynamics around technology use and the building of closer relationships. For example, earlier in this paper it was proposed that technology served as a catalyst in the movement toward more learner-centered pedagogies.

Cornelius-White (2007) identified a group of learner-centered teacher-student relational variables that included "warmth" and "empathy" and found that these had "above average associations with positive student outcomes" (p. 134). Similarly, Schofield and Davidson (2003) observed that when students were using the Internet in class, teachers were more likely to circulate and interact with individuals or small groups and spend less time on whole-group instruction. Teachers and students in their study described their relationships as, "warmer and less adversarial during Internet activities than at other times" (p. 72). Other studies have also cited improved teacher-student interactions and relations during computer-based learning activities (e.g., Burns & Polman, 2006; Alberta Education, 2006).

In an earlier section, I discussed how various aspects of technology use could shift the balance of power in the teacher-student relationship. This power shift may also help to explain perceptions of closer relationships. Dobransky and Frymier (2004) found “that when students perceive shared power, they also feel closer (greater intimacy) to their teachers and feel more positively toward the class and its content (affective learning)” (p. 220).

There is a significant body of literature that discusses closeness as it relates to teacher immediacy. The concept of immediacy behaviours as a communication variable in relationships was first advanced by Mehrabian (1971) and immediacy has since come to be understood as a perception of closeness between people (Frymier & Houser, 2000). I wondered whether the presence of a computer screen between teacher and student might inhibit the teacher’s ability to utilize certain non-verbal immediacy behaviours such as eye contact, smiling and certain gestures. This would be significant in that immediacy behaviours not only enhance students’ perceptions of closeness, they also have a positive impact on motivation which associates positively with learning (Christophel, 1990; Frymier, 1994). Witt and Schrodt (2006) have stated that teacher non-verbal immediacy also correlates positively with “student affect for the teacher and the course” (p. 4). I intentionally probed this during each interview. Contrary to my unspoken hypothesis, teachers reported moving about much more during computer activities and their closer proximity to individual students most probably enhanced rather than limited their ability to demonstrate both verbal and non-verbal immediacy behaviours. They often found themselves standing next to, behind or much closer to individual students than they would be during whole-group instruction. This is consistent with the findings of

Schofield and Davidson (2003) who also reported that interaction with individuals and small groups during activities that involved Internet use afforded teachers increased opportunities to connect with individual students on a range of personal and academic matters and provided a more private context for giving feedback and getting to know students as individuals. Furthermore, “some teachers revealed personal feelings, perspectives or vulnerabilities during encounters with individual students or small groups of students working on the Internet more than they did otherwise in whole-class situations” (p. 73). In short, laptop use appears to foster pedagogical approaches that enable proximal interaction with individual students increasing the opportunity for certain verbal and non-verbal immediacy behaviours known to enhance students’ perceptions of relational closeness.

Trust Building

Trust is another element of the teacher-student relationship and Dobransky and Frymier (2004) found that trust along with intimacy (closely related to immediacy) were both indicators of the “interpersonal-ness” of teacher-student relationships (p. 212). Teachers in this study provided a number of examples where they felt that computer use in class provided certain trust-building opportunities. Opportunities, of course, are not always embraced. But some teachers in this study expressed the belief that allowing students to demonstrate that they could be trusted to make appropriate use of the technology provided new relationship-building opportunities. Appropriate use might include remaining on task during computer use (e.g., not checking email or surfing during class), avoidance of inappropriate websites, using only approved resources during assessments and resisting any temptation to plagiarize in ways that are easily facilitated

through technology. The development of trust with those who respond positively to such opportunities should only help to develop a closer relationship. In this study, teachers gave examples of where they used email after school hours in ways that would suggest to students that they had their best interests at heart because they were taking their own personal time in the evening or on a weekend to respond to questions or follow up on something that had occurred in class. Wooten and McCroskey (1996) have stated that teacher behavior of this kind is likely to increase the level of trust.

The discussion above deals primarily with in-class technology deployment. In the next section, I will turn my attention to the examination of the ways in which teachers and students utilize CMC outside of the classroom and the potential that this holds for building closer relationships.

Connecting Outside of Class

Some teachers in this study described email interactions with students at home that clearly went beyond providing academic assistance to providing emotional support. They spoke of relieving anxiety related to academic and personal issues, extending empathy following an emotional incident in class or relieving general confusion by responding to a question posed by one student and posting this for the whole class. These interactions extend beyond the academic realm into what is sometimes referred to as the pastoral care aspect of teaching (Marland, 1974). Best (1999) defined pastoral care as, “The commitment of schools (and teachers) to the all-round well-being and development of the child as a person (and not just a pupil)” (p. 3). Frymier and Houser (2000) described efforts to meet students’ emotional needs and motivating them to succeed as “ego support” which I believe describes the efforts of some students in this study. Within

the context of the ethic of care (Noddings, 1984) these efforts by teachers would be described as “ethical caring” motivated by the teacher’s desire to “meet others with care” (Goldstein, 1999, p. 659). The point here is not to suggest that teachers who communicate with students through computer-mediated means are more caring, supportive or empathetic. However, email facilitates the ability of teachers to extend care and support for students outside of the regular school day and teachers in this study perceived that doing so caused students to feel cared for and supported, which fostered closer relationships.

Dobransky and Frymier (2004) studied the impact of out of class communication (OCC) on teacher-student relationships finding that OCC correlated positively with the relational elements of control and intimacy (closeness). While their studies focused on older students and face-to-face communication, there is evidence that the same could be accomplished through electronic OCCs (Witt, 1997; Walther, 1996, Guerrero & Miller, 1998). Witt argued that, “perceptions of interpersonal distance can be reduced through the use of communication media such as telephone or e-mail” (p. 5). Walther (1996) revealed a number of benefits of CMC and coined the term “hyperpersonal relationships” to describe relationships developed on-line that were closer than those developed through face-to-face interaction (p. 5). These ideas support the findings of this study wherein teachers perceived that efforts to support students outside of class time through CMC sometimes led to the development of closer relationships between them.

A final point about closeness has to do with engaging with students in their world. One teacher in this study made the very strong point that technology is a dominant feature of youth culture. It shapes the way that they learn, communicate and entertain

themselves. As such, it provides an opportunity to connect with youth on their terms. One teacher explained how delving in to youth culture helped her to connect with her students.

I think a closer relationship with students, because again, there's a lot more we can talk about. I use YouTube as an example. I try to keep up with what's current in terms of pop culture and the Internet and the technology allows us to do it. And when the students know that I know things that are going on, they're like 'Oh, she knows,' you know, 'she knows what's going on.' I think it's made our relationship closer, but at the same time, you know, I'm still keeping my professional [relationship] with the students. (24D – 37 – 4)

Doherty and Mayer (2003) have stated that teachers and students communicating over the Internet can help to build relationships and change their way of knowing each other. They claim that,

Communication technology offers a space where care and content can coexist and be mutually supportive. The electronic medium is a comfortable and invigorating environment for young people – teachers can join them there on their ground and on their terms. (p. 599)

To opt out of engaging with students through their preferred means would appear to be a lost opportunity for building closer relationships.

This section has explored the question of how one-to-one computing and laptop-enabled communication affect the closeness of teacher-student relationships. In-class use of technology facilitates pedagogies and learning activities that better enable certain teacher immediacy behaviours and create trust-building opportunities. CMC outside of class provides opportunities for exercising pastoral and ethical caring and supporting students' emotional needs. The use of multimedia and email create points of engagement that align with the preferences of youth culture. When exploited, these computer-enabled

opportunities can increase the level of closeness or intimacy that teachers perceive in their relationships with students.

Electronic Communication — Issues and Challenges

Despite there being some clear academic and relational benefits to email communications between teachers and students, this capability also introduces a number of challenges such as the potential for boundary violations and conflicts generated by the content or tone of electronic messages. In addition, some teachers and students simply prefer face-to-face communications over email. The following discussion highlights some of these issues and challenges.

Despite the existence of various professional codes of conduct, boundary issues in teacher-student relationships have not been thoroughly defined or explored. Online communications add to the complexity of this issue and the media have furnished us with some egregious violations that have been enabled by online interactions. Aultman, Williams-Johnson and Schutz (2009) examined teacher's perspectives on relationship boundaries and developed a typology consisting of eleven boundaries. Among those, two seem germane to this study. The first has to do with boundaries around the teachers' personal time. A number of studies have expressed serious concerns about teachers' workloads and the possibility of teacher burnout (e.g., Hargreaves, 2000, 2012; Aultman et al., 2009). The findings of this study indicate that many teachers receive emails from students in the evening or on weekends. Even though their sense of obligation to respond to those varied widely, some indicated the need to set boundaries or manage students' expectations in this regard. Hawisher and Moran (1993) have expressed the concern that traditional boundaries that teachers have set such as office hours, do not work with email

and they suggest that email may give students too much access to teachers while increasing their workloads. Responding to student emails after hours also erodes the separation of home and work life. Aultman et al. (2009) expressed the concern that, “not having boundaries may lead to burnout and neglect of other important areas of a teacher’s life” (p. 642). Hawisher and Moran (1993) have also pointed out that the nature of the medium is such that it “seems both to demand and provide for a rapid response” adding to the pressure to provide a timely response (p. 632). The excerpt below indicates the range of levels of concern around this; however, leaving it up to the individual teacher to establish his/her own boundaries based on their personal circumstances, may lead to problems down the road as parents question why one of their child’s teachers responds promptly to evening emails while another does not.

I’ve heard lots of people complain about that in the staff room. My personal experience is, is that if I knew the student said, ‘You didn’t respond quickly enough,’ I’d probably laugh at them and tell them, it’s Saturday night, you know, I’m watching Hockey Night in Canada. I need a break too! (24B – 33 – 18)

In the future, there may be a need for the school to set consistent standards to protect those who might be more vulnerable to becoming overworked or feeling that expectations are unreasonable.

A second boundary area identified by Aultman et al. (2009) in their typology is the communication boundary that deals with issues such as the level and appropriateness of self-disclosure by a teacher or student and the nature of topics discussed. Teachers in this study reported that most of their conversations with students were business-like in that they related to academic or management issues such as a student communicating that he or she would be absent from class due to illness or travel. There were a few examples

within the transcripts of students sharing some family or personal issues. The nature of email is such that it suggests a private or intimate conversation, even though the possibility of messages being forwarded and shared with others suggests a different reality. Bloch (2002) cautioned that some students may wish to create a “social relationship” with teachers in the hope of improving grades or for other “personal reasons” (p. 122). Hawisher and Moran (1993) also expressed the concern that the level of “reflective scrutiny” typically given to written letters is absent in email communications as are the “constraints and inhibitions” that might cause one to censor his/her remarks during face-to-face interactions (p. 631). Furthermore, the absence of body language and other paralinguistic cues that might provide feedback as to the boundaries of a conversation are also absent on line. These are pitfalls inherent to the medium that may increase the likelihood of students or teachers crossing traditional, ethical boundaries that normally draw a line between personal and professional interactions. And unlike face-to-face communications, a written record of every interaction exists in the hands of the sender, the receiver and the network administrator suggesting a range of implications from accountability to extortion.

Attachment theory explains that low levels of conflict and high levels of closeness and support are defining elements in strong teacher-student relationships (Pianta, 1999). Technology-enabled boundary violations as discussed above have the potential to introduce conflict into these relationships. Teachers in this study identified one other shortcoming of email communication that is not a boundary issue but one that can create conflict nonetheless. This has to do with getting the tone of a message to match the intention of the sender. Getting the tone wrong may be the result of the manner in which a student addresses a teacher (e.g., “Mr. Smith” vs. “yo, dude”). Social networking has its

own language which may not be appropriate for student-teacher interactions if it lacks the respect required to maintain positive relationships within the school context. Other examples include the imprecision of hastily composed messages using language unsupported by clarifying visual cues. Hitting the send button before careful consideration of the linguistic nuances of the message can be perilous. There are some symbolic devices to help mitigate the dangers such as the use of emoticons, like smiley faces ☺ that indicate that something was a joke or intended to be funny (Hawisher & Moran, 1993). But these are less powerful than the visual cues of a face-to-face conversation that allow people to adjust language and clarify when they sense misunderstanding in the receiver. And as Bloch (2002) explains, the reduced ability to clarify and correct misunderstandings can be problematic for students. “Email may be deceptive to students in terms of the degree of both linguistic and grammatical control that is required as compared to oral communication” (p. 132).

A final point about the use of email is that some respondents in this study simply expressed a preference for face-to-face communication in relationship building. They preferred this method especially when discussing matters that might be of a more personal nature. This may be due to some of the limitations discussed above and the need to have the full benefit of facial expression and other cues that might clarify sentiments around personal exchanges. Some explained that students often used an email message to organize a face-to-face meeting for both academic and personal conversations. While face-to-face conversations may be more challenging to organize within the confines of a busy school day, they may be well worth the effort in building and maintaining positive teacher-student relationships, especially when the personal preferences or language needs of the conversation are not well aligned with the characteristics of electronic messaging.

This section has explored some of the issues and challenges posed by CMC including the possibility of certain boundary violations and the introduction of conflict into the teacher-student relationship. While some teachers have demonstrated various attempts to mitigate these challenges, others prefer to avoid them through the use of face-to-face interactions.

Summary

The purpose of this chapter was to examine the findings of this study within the context of the academic literature reviewed in Chapter Three. The specific research questions of the study served as the organizational framework for the discussion. First, the influence of ubiquitous computing on the pedagogical aspects of the teacher-student relationship was examined through the theoretical lenses of sociocultural theory, LCPPs as well as constructivist and situated learning theories. This analysis offered an explanation of the changes that occurred in the pedagogical relationship and the re-constituting and ongoing negotiation of teacher and student roles in a technology-rich learning environment. The second section provided an analysis of the balance of power using the concepts of power, authority, control, autonomy and empowerment as the basis for investigation. This provided a deeper understanding of how technology served as a catalyst in the empowerment of students and sharing of control. The third and fourth sections examined the impact of computer use and CMC on teacher-student communication patterns and relationship closeness respectively. The theoretical constructs of immediacy, socio-communicative style, trust and asynchronous electronic communications were used in explaining how fundamental changes occurred in the way

that teachers and students communicated and the influence of computer-mediated communication on perceptions of relational or psychological closeness. The final section illuminated issues related to email communication which included the potential for boundary violations and increased conflict.

It is clear that extensive technology use does influence teacher student relationships and the roles that each play within those relationships. There are obvious relational benefits to ubiquitous computing in this specific school setting and new challenges emerge for both teachers and students. The final chapter draws conclusions from these findings and provides recommendations for educational practice and future research.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This final chapter provides an overview and summary of this research study and presents the overall conclusions. It also discusses some limitations of this study and makes recommendations for various stakeholders based on the findings. Lastly, it provides some direction for future research.

Summary

The purpose of this study was to investigate teachers' perceptions of how a one-to-one computing program influences various dimensions of the teacher-student relationship and the roles of teachers and students within that relationship.

My interest in the subject stems from my involvement in technology integration in independent schools, which have been the context for my practice as a school leader for many years. While there is a large body of research on the use of technology in classrooms, much of that understandably focuses on academic learning outcomes. A comparatively small body of research exists on the subject of how extensive technology use influences the relationship between teacher and student. I had the sense from my experience that ICT was more than an inert element in the pedagogical and interpersonal interactions between teachers and students and had the potential to affect these unique and complex relationships. Since strong teacher-student relationships correlate positively with many student outcomes as discussed in Chapter Two, it was important to understand how ICT use might alter them. Within my own context of independent schools, this had elevated significance with respect to the importance of alumni to our schools. Alumni

frequently identify relationships with teachers as one of the most significant and valuable elements of their education. As alumni support is essential in the long-term success of independent schools, anything that might improve or weaken the teacher-student relationship is worthy of further study.

A qualitative case study approach was adopted in undertaking this research. Four research questions were developed to frame the study and accomplish its purpose. The questions were as follows:

- 1) How does one-to-one computing influence the role of the teacher with respect to the pedagogical relationship?
- 2) How does the increased access to information afforded by one-to-one computing influence the teacher-student relationship with respect to learner autonomy and teacher control?
- 3) How has one-to-one computing shaped the nature and patterns of communication between teachers and students?
- 4) How do one-to-one computing and laptop-enabled electronic communication affect the closeness of teacher-student relationships?

A single site was selected for this case study. The site was a K-12, co-educational non-denominational, independent, day school with a school population of about 680 students located in a suburban area. Its mission includes the preparation of students for a university education and it offers a rigorous academic program and a full range of co-curricular activities. It has an ethnically diverse student body whose families have above-average incomes. The school first implemented a one-to-one laptop computer program in 2005. Using surveys and invitations a cross-section of faculty members representing a variety of subject disciplines were selected as interview subjects.

The research methods utilized in this study reflect practices appropriate for qualitative case study research. Data collection was accomplished through semi-structured interviews of 15 teachers within a single site. Surveys were utilized to identify and select interview subjects representing a variety of disciplines with a range of teaching experience and technology expertise. Interviews were conducted on the site over a one month period in the fall of 2011. The interviews were recorded and later transcribed and field notes were written during the interview process. Analysis of the interview data produced a series of findings discussed in chapters four and five.

Conclusions

This study examined teachers' perceptions of the influence of one-to-one computing on both the pedagogical and interpersonal aspects of the teacher-student relationship with the understanding that these are intricately intertwined. This section presents the conclusions derived from the study.

The findings at this particular school site, demonstrate that ubiquitous computing can act as a powerful catalyst that can alter the roles of teachers and students within the learning process. The extensive use of networked computers as central learning tools provided unfettered access to information enhancing the participatory roles of students in the co-construction of knowledge. Students were empowered to access and contribute content diminishing the teacher's role as a dispenser of knowledge. In this technology-rich environment, teachers were inclined to adopt pedagogies that shifted the focus of instruction to a more learner-centered approach. Teachers and students adopted new roles in response to new opportunities and demands created by CMC, computer-mediated

instruction, and access to digital resources. For example, teachers developed new strategies for mediating student interactions with computers and the Internet as well as new classroom management strategies related to computer use in the classroom. As students became more capable of directly accessing knowledge and information, the teachers drew more on pedagogical expertise than subject knowledge and developed interventions that served to facilitate student learning as opposed to acting as a primary knowledge source. Taken collectively, these changes represent a fundamental shift within the pedagogical domain of teacher-student relationship and the roles of teachers and students in the learning process.

Teacher-student relationships have been characterized by an inherent power asymmetry. Networked laptop computers put new tools and resources in the hands of students and these offer students more autonomy in their learning when teachers willingly relinquish some control. Access to the knowledge base enables students to supplement or even challenge the teacher's knowledge. At the very least, it puts teachers and students on a more equal footing and helps to establish what teachers in this study referred to as a more "egalitarian" or "democratic" classroom.

Easy access to online learning resources also provides students with greater control over how and what they learn, the depth of their exploration and the sequence and pace at which they learn. Teachers are able to give students greater choice of topics for projects and independent studies and students can source the material they need to learn. The hyperlinked nature of web-based resources also allows students to approach material in a non-linear fashion. Pace sequence, depth and content have traditionally been predominantly controlled by the teacher. The use of technology has provided students greater control over these dimensions of learning and resulted in less reliance on the

teacher's expert authority. Technology use also created situations where students acted as experts in solving technical problems, teaching software/hardware applications and contributing new knowledge to the lesson. Teachers in this study believed that empowering students in these ways enhanced learning, increased student motivation and strengthened their relationships with students.

Communication is an important element in building and maintaining human relationships. Online or CMC expand the means and opportunities for teacher-student communication. Email both extends and challenges the traditional boundaries of schooling from the boundaries of the school day to the boundaries of teacher accessibility. Online communications expand and create new opportunities for teachers to support and care for students both academically and emotionally. They also have the potential to create boundary violations around communication content and personal time.

Computer-mediated conversations via email are asynchronous in nature. As such, they allow students to "say their piece" without fear of interruption, but also without the visual cues that sometimes help to guide or censor conversation. While this has the potential to introduce conflict into the relationship, teachers in this study felt that benefits such as the increased opportunity to build relational trust and closeness outweighed the potential perils of electronic communication. They also felt that the virtual space created through their on-line presence was a comfortable space for students to meet them because of its prominence and acceptance in youth culture.

Overall, teachers perceived that technology use in this setting served to enhance teacher-student relationships by creating new and different opportunities for relationship building. Since it has been shown that high quality teacher-student relationships correlate positively with a host of student outcomes including motivation and academic

achievement, this adds value to ubiquitous computing as a learning tool in the 21st Century classroom. Enhanced teacher-student relationships appear to be an unintended byproduct of technology integration; however, these benefits are certainly worthy of further study and exploitation.

Limitations of this Study

This case study was undertaken in a single school site. The site school is an IB World School wherein inquiry-based learning and risk taking are encouraged as part of the approach to instruction. This school invested heavily in professional development around technology integration and has a well-established laptop program. Saye (1997) argued that singular technology studies cannot be relied upon to produce conclusive results. Because of the unique context of this school, these findings are not broadly generalizable to other school settings. For example, this school represents an above average socio-economic community and Schofield (1997) points out that outcomes of computer use in schools are influenced by “social structural factors” including the relative affluence of students. The school also attracts students of above average ability and Dillon and Gabbard (1998) state that students of higher ability benefit from more control over technology-based learning activities than students of lower ability. That said, other Canadian independent schools that fall within this genre and have similar profiles are likely to experience similar results.

Although all teachers involved in the laptop program (grades 5-12) at the site school were invited to participate in this study, a number chose not to be involved. It is possible that those who opted out have a less favourable view of technology use in their

classrooms. If that were the case, the results of this study may be exaggerated in terms of the positive effect of technology use potentially producing somewhat of a halo effect.

This study focused on teachers' perceptions of their relationships with students. It is possible that teachers and students might have different perceptions of their relationships. For example, Wubbels and Brekelmans (2006) found that teachers had a higher appraisal of certain aspects of their relationships than that of their students. Where a teacher perceived that a student was empowered by a particular situation, the student may perceive that differently – at least the degree of empowerment. Self-reporting itself may be a limitation as interview subjects may have personal “blind spots” or may interpret events differently than other observers might perceive them.

The network environment at this site had a number of controls in place to manage certain aspects of technology use. For example, Facebook was blocked as were other sites deemed to be potential distractions or whose content might be inappropriate. Social networking continues to be of growing significance in interpersonal communications and new applications continue to emerge as important cultural tools. Teachers in this study had differing assessments of the benefits of social media in education. Because these sites are blocked, there was no opportunity to study the impact of social networking on teacher-student relationships even though it may offer interesting opportunities and also create difficult challenges. The choices that schools make in blocking or enabling certain on-line resources may also influence the impact of technology on both pedagogical and interpersonal relationships.

Recommendations

This section presents a series of recommendations arising from this study. These include recommendations for pre-service teacher education, in-service professional development, school leaders or policy makers, teachers and researchers.

Recommendations for Teacher Education

This study has shown that the extensive use of networked computers as classroom learning tools can have a profound influence on instructional strategies, classroom management, mediation strategies and ultimately teacher-student relationships. As new teachers enter classrooms where technology plays an increasingly significant role in learning, it will be essential to modify teacher education programs to better prepare them to manage and exploit powerful, new applications and devices. This includes developing instructional strategies that optimize technology use and enable effective mediation of students' interactions with the knowledge base using computers and other networked devices. Universities should partner with schools that have experience with ubiquitous computing in order to provide meaningful practicum experiences that allow pre-service teachers to experience and learn about these environments by working alongside experienced teachers in the field. Knowing where boundary violations might occur and the challenges and opportunities that ICT creates will help new teachers to have a successful beginning in technology-rich environments. Knowledge about useful software applications, on-line resources and technical skills alone will not adequately prepare teachers for the complex interactions among hardware, software, curriculum, pedagogy the Internet and the relational implications of teacher-student interactions in networked learning environments. Understanding how to facilitate learning in these environments

will become increasingly important relative to content knowledge in one's discipline.

Finally, new teachers would benefit from having a strong understanding of the potential for using technology in ways that strengthen relationships with their students and subsequently improve learning outcomes.

Recommendations for Teacher In-Service

As emerging technologies push the boundaries of effective learning strategies, teachers will need access to ongoing professional development opportunities in order to continue their learning and professional growth. As technology presents new challenges such as social networking and new technology-based distractions, as well as new opportunities such as professional collaboration tools, teachers will need opportunities to collaborate in the development of new strategies, standards, classroom management techniques and shared expectations for their students. They will also need time to assess emerging web-based resources that often require much more scrutiny and evaluation than the latest provincially-approved textbook. Teachers will need time to share ideas and to reflect on their own practice in a rapidly changing environment. One or two professional days per year will not be adequate if teachers are to become proficient users of the available technology, particularly if the school day is being extended by expectations for further contact with their students through electronic communication in the evenings and on weekends.

It may be helpful to create blocks of time within the school day where small groups of teachers can come together to critically reflect on their use of technology and develop best practices within the contexts of their particular school settings. It may also be helpful to develop opportunities and protocols for teachers to pair up in classroom

observations that focus specifically on the analysis of computer-mediated learning interactions and their impact on teacher-student relationships. Follow-up discussions and reflection within the context of some of the research in this area could assist teachers in refining their practice through ongoing collaborative engagement. Where feasible, action research opportunities in this area could be explored within the school setting.

Recommendations for Administrators and Policy Makers

This study revealed that individual teachers exercised considerable autonomy in how they employed technology in their own classrooms. They also set their own boundaries and managed expectations about things such as when they would respond to an email after hours. This may work in a small, closely-knit school community such as the site of this study. However, in much larger schools and districts where one might find a much wider band of student and parent expectations, there may be the need to create policies that set parameters around some aspects of technology use to protect teachers and students from unreasonable expectations and other potential problems around on-line interactions. For example, some districts have already begun to develop policies around the use of social networking. Technology enables new capacities, which if used inappropriately, can be problematic. For example, social networking can serve as an enabler in cultivating inappropriate teacher-student relationships. Teachers and students would be well served by the explicit articulation of what constitutes an appropriate, professional teacher-student relationship within the context of the technology-rich environment in which they now find themselves working together. Some teacher professional organizations such as the Ontario College of Teachers (2011) have produced advisories on the use of email and social networking. These may be inadequate in the

protection of students and teachers in an environment where the acceptable use of rapidly emerging new social networking and communication tools is somewhat lagging or ambiguous.

Where schools or districts are considering the roll-out of one-to-one computing programs, training for teachers should not be limited to how to use the technology. They should also receive training on effective, technology-based instructional practices, classroom management and mediation strategies, and learn about how to optimize relationships with their students through technology use. Being able to anticipate problem areas and embrace new instructional practices will be as, if not more important than learning hardware and software applications.

Recommendations for Teachers

It would be helpful for teachers to understand that computers and other networked devices are powerful technical and cultural tools, enabling new participatory structures. CMC such as email, social networking and on-line collaboration applications such as Wikis or discussion boards have the potential to alter human interactions and influence relationships. This study has also shown that technology can act as a catalyst in shifting the balance of power within the classroom and the relationship dyad. There is no guarantee that technology use will automatically yield positive outcomes that enrich the classroom culture. These new opportunities and capabilities must be thoroughly understood and carefully managed. The idea of empowering students sounds wonderful, but in the end, the teacher is still the professional in the classroom who must orchestrate the learning process by managing an increasing number of variables including the use of technology. Decisions become more numerous and impactful as teachers must mediate

students' use of hardware, software and web-based resources with which their students may have greater expertise. Teachers therefore need to recognize and distinguish among those occasions where it may be appropriate to relinquish control, share control or fully assume control. Ultimately, the teacher still holds the greater responsibility for what happens within the classroom and care must be taken to ensure effective and appropriate use of such powerful technologies.

Teachers can take advantage of the relationship building opportunities afforded by on-line communication channels and utilize them to provide academic and emotional support for their students. In doing so, it will be important for them to manage their online presence prudently by maintaining the highest ethical standards and establishing appropriate boundaries around their personal lives.

Recommendations for Researchers

This study focused on teachers' perceptions of the influence of ubiquitous computing on teacher-student relationships. A natural next step would be to collect data on students' perceptions and compare the results. Because this case study was bounded within a single school site, further research in a variety of school contexts with similar computing programs would be necessary in order to generalize and develop theory around the current findings.

At the time of this study, a group of new networkable devices are growing in popularity including tablets and smartphones. These have many of the same capabilities as laptop computers, particularly in the area of communication and social networking. The tendency has been to ban the use of these devices because of their potential for misuse for things like cheating, texting in class, taking and sharing inappropriate photos

and so on. However, these devices are certainly commonly accepted tools in modern society and generally less expensive and cumbersome than laptops. Rather than banning them, additional research on how best to utilize their capabilities for educational purposes and minimize their misuse would be helpful to educators and students.

Schools will also need to come to terms with social networking because Facebook, Twitter and the next generation of these Web 2.0 apps are also part of mainstream culture. The current strategy of prohibition or blocking may not be the best way to manage them in the long term. If collaboration is indeed an important attribute for 21st Century learners, discarding tools that might assist with collaboration because they are difficult to manage may be a poor choice. Further research is needed to understand what, if any, benefits these hold for learning and whether they are desirable instruments for building and maintaining strong student-teacher relationships. Students seem to have a natural affinity for these applications and there may be ways to leverage them for learning purposes both within and outside the classroom.

This particular study drew upon a broad body of research and theory in teacher-student relationships and learning as discussed in the literature review. That research design decision precluded the possibility of a deep exploration of any one particular theory related to this topic. The present research may have served to extend some theoretical perspectives through their exploration within a new or different context. For example, it examined power relations among teachers and students within the context of a one-to-one computing environment revealing that certain approaches to technology use have the potential to diminish the teacher-student power asymmetry. However, future research based on a single theory, for example the role of technology in fostering

autonomy-supportive motivating styles (Reeve, 2006) could help to extend depth in specific theoretical domains.

Finally, more research is required to understand the optimum levels of computer-assisted support that teachers should provide to students outside of class time. At least one respondent in this study wondered how much was too much support and at what point it becomes excess handholding that does not serve students well when they enter post-secondary education or the workforce. Is there such a thing as too much care and attention, and if so, what guidelines would be helpful to educators faced with the endless possibilities created by online communication?

This study has given me the opportunity to reflect critically on an important element of my professional practice, which is a primary objective of the EdD Program. During my career, I have been involved in major technology roll-outs in two different independent schools. We implement educational innovations because we anticipate and believe that they will have certain benefits and yield positive educational outcomes for our students. Through this study, I have come to understand that our innovations have outcomes and implications that reach far beyond the intended objectives. Their complexity and interaction with other educational variables and the synergies that evolve often exceed the knowledge that we have drawn upon in making the decision to act. In this case study, I have learned that the integration of ubiquitous computing has very significant implications for teacher-student relationships – a possibility that never entered into the decision to implement these programs. This has led me to understand that as educational leaders, we need to broaden the scope of our thinking and our research if we hope to more fully understand the potential implications – both the possible benefits and detriments of our educational innovations.

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APPENDIX A – Interview Questions

Interview Questions – Form 2 (October 3)

- 1) Tell me about your experience with using laptops in your classroom.
- 2) How has the use of laptops in your classroom shaped or altered your instructional practices? Can you give me some examples?
- 3) Has your role as the teacher in the learning process changed in any important ways since you began to use technology in your teaching and if so, how?
- 4) From your perspective, how does the expanding access to knowledge and information afforded by Internet access influence the instructional or pedagogical relationship that you have with your students?
- 5) Has technology use by students shifted the balance of power in your relationship with them (e.g. with regard to learner autonomy or teacher's authority). What has your experience been in this regard?
- 6) How does this one-to-one laptop program influence your classroom organization or control strategies?
- 7) In addition to what teachers actually say to their students during instruction, they are also known to communicate through certain non-verbal behaviours such as eye gaze, smiles, nods, body position, gestures, vocal inflection and so on. How does the use of laptops affect your ability to use such non-verbal communication gestures? Are there substitutions for this?
- 8) How has the use of electronic communications such as e-mail affected your interpersonal relationships with students?
- 9) How often do students share/discuss aspects of their personal lives outside of school through electronic communications? Can you give an example? How do you feel about that?
- 10) On average, would you say that your use of technology for teaching and/or communicating with students has created a closer or more distant relationship with students?
- 11) It has been suggested that students are sometimes more knowledgeable than their teachers about certain aspects of technology. Has this been your experience and if so, has it affected your relationships with students in any way?
- 12) What other dimensions of the teacher-student relationship do you feel are influenced through regular technology use?

APPENDIX B – Candidate Selection Survey

Name (for contact only - no names will be used in study)

The 28 response(s) to this question can be found in the appendix.

Summer Contact Information (phone)

The 27 response(s) to this question can be found in the appendix.

Age

The 28 response(s) to this question can be found in the appendix.

Gender

Response	Chart	Percentage	Count
Male		30%	8
Female		70%	19
Total Responses			27

Years of Teaching at Southridge School

The 28 response(s) to this question can be found in the appendix.

Current Subject(s) Taught:

The 28 response(s) to this question can be found in the appendix.

Years of Teaching Experience with Laptops (where each student has their own computer)

The 28 response(s) to this question can be found in the appendix.

Current Grade(s) Taught:

The 28 response(s) to this question can be found in the appendix.

How would you rate your level of expertise at integrating technology into my teaching as:

Response	Chart	Percentage	Count
Novice		7%	2
Intermediate		75%	21
Advanced		18%	5
Total Responses			28

Approximately what percentage of your class time would you say involves students using laptops?

Response	Chart	Percentage	Count
less than 20%		25%	7
between 20-30%		32%	9
between 30-40%		21%	6
between 40-50%		7%	2
more than 50%		14%	4
Total Responses			28

Answer the questions below using the following scale:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Responses
1. Using technology has altered my teaching practices significantly.	0 (0%)	2 (7%)	4 (14%)	15 (54%)	7 (25%)	28
2. I am confident in my ability to effectively use technology in my teaching.	0 (0%)	1 (4%)	4 (14%)	18 (64%)	5 (18%)	28
3. Part of my role as teacher includes building positive relationships with students.	0 (0%)	0 (0%)	0 (0%)	2 (7%)	26 (93%)	28

4. Some students feel more comfortable communicating with me by e-mail as opposed to face-to-face.	2 (7%)	4 (14%)	5 (18%)	12 (43%)	5 (18%)	28
5. I spend considerable time communicating with students electronically outside of regular class time.	1 (4%)	7 (25%)	4 (14%)	13 (46%)	3 (11%)	28
6. Using technology has been detrimental to my relationships with students.	8 (29%)	15 (54%)	5 (18%)	0 (0%)	0 (0%)	28
7. Technology use has decreased the amount of time I can spend helping individual students during class.	10 (36%)	16 (57%)	1 (4%)	1 (4%)	0 (0%)	28
8. I feel that technology use has increased the level of conflict between me and my students.	9 (32%)	16 (57%)	1 (4%)	2 (7%)	0 (0%)	28
9. Technology use allows me to empower my students more than traditional teaching methods.	0 (0%)	2 (7%)	5 (18%)	18 (64%)	3 (11%)	28
10. Using technology decreases the amount of classroom discussion.	7 (25%)	16 (57%)	3 (11%)	2 (7%)	0 (0%)	28
11. Students are inclined to share	2 (7%)	12 (43%)	8 (29%)	6 (21%)	0 (0%)	28

more information with me about their personal lives or feelings by e-mail than in person.

12. Using technology limits my ability to connect with students on a personal level.

13. I value the relationships that I build with my students.

14. Technology use limits my ability to use non-verbal gestures such as smiles and eye contact with individual students.

15. Using technology requires a higher level of classroom management or control over student activities.

	11 (39%)	13 (46%)	3 (11%)	1 (4%)	0 (0%)	28
	0 (0%)	0 (0%)	0 (0%)	2 (7%)	26 (93%)	28
	7 (25%)	13 (46%)	4 (14%)	4 (14%)	0 (0%)	28
	2 (7%)	4 (14%)	8 (29%)	10 (36%)	4 (14%)	28

APPENDIX C – Initial Letter of Contact and Invitation

Letter of Initial Contact and Invitation

Dear <<name>>,

For my doctoral research at UBC, I am conducting a study to learn about teachers' perceptions of how extensive technology use in the classroom affects the teacher-student relationship.

Specifically, this refers to one-to-one student laptop programs where each student has his/her own laptop and access to the Internet, e-mail and other networked resources on a regular basis. The use of laptops has the potential to alter the ways in which teachers and students interact and the quality of teacher-student relationships are known to influence certain elements of the learning experience. Hence, I think it is important to understand what, if any, influence technology use has on this important relationship. I am writing to invite you to consider participating in this study along with other members of the faculty at [name of school].

The aim of this letter is twofold. First, it describes the purpose and method of the research study. Second, it requests that you agree, in writing, to participate in the study. Please indicate your decision to participate in the study on the attached *Consent Form* and return it before June 15, 2011.

Participation will initially involve completion of a brief on-line survey. The final question of the survey asks if you would be willing to participate in a personal interview, approximately 60 to 90 minutes in length. Not everyone who agrees to be interviewed will be selected for an interview. Instead I will try to obtain a variety of perspectives and a representative sample by interviewing people of different levels of experience, gender and expertise, teachers of different subjects and people with varied perspectives based upon their survey responses. If selected, I will be conducting the interview at a time convenient for you. The interviews will be audio recorded and transcribed. Your identity will be protected by codes and pseudonyms, and I may check with you in advance of using any direct quotations from the interview in my dissertation. Any concerns that you have could also be discussed after reviewing analyses of the data.

This study has been approved by the UBC Behavioural Research Ethics Board and the [name of school School] Board of Governors. The names of participants will not be revealed to other study participants, school administrators or governors.

I will follow-up within the next week or so to see if you are interested in participating or you could e-mail the attached consent form to indicate your interest. I am also happy to speak with you personally to answer any questions you may have and provide information that you may need to make a decision about participating.

I look forward to hearing from you soon.

Sincerely,

William Jones, Doctoral Candidate , Department of Educational Studies, UBC

APPENDIX D - Consent Form

CONSENT FORM

The Influence of Technology Use on Teacher-Student Relationships

Principal Investigator: Thomas Sork, PhD
Department of Educational Studies
University of British Columbia

Co-Investigator: William Jones
Department of Educational Studies
University of British Columbia

Purpose:

The purpose of this study is to understand teachers' perceptions of how a one-to-one computing program influences various dimensions of the teacher-student relationship and the roles of teachers and students within that relationship. You are being invited to take part in this research study because you have experience teaching in a school that makes extensive use of technology for instructional purposes and provides each student with her or his own laptop computer in particular grades.

Study Procedures:

You will be asked to complete an online survey that should take less than 15 minutes to complete. From those who complete the survey, a smaller number of individuals will be asked to participate in a personal interview, approximately 60 to 90 minutes in length. The selection process will endeavour to provide a representative sample of different levels of experience, gender, expertise, subject(s) taught, confidence and varied perspectives on technology use. With your permission, the interview will be audio-recorded and then transcribed to assist with data analysis. You will be provided with a written transcription of the interview and have the opportunity to edit or remove text. Your permission will be sought before any direct quotations from the interview are included in the dissertation.

Confidentiality:

If you agree to participate in this study, your identity will be kept strictly confidential through the use of codes and pseudonyms. Participants will not be identified by name in any reports of the completed study. The completed consent form will be kept separate from the data. All documents will be identified only by code number, stored and secured in compliance with UBC's Behavioural Ethics Board policies and kept for five years in accordance with UBC policy. The only other individuals who may have access to the data are the members of my supervising committee including: Dr. Tom Sork, Dr. Nancy Perry and Dr. Stephen Petrina. They are also bound by the terms and conditions of confidentiality outlined above.

