COMPULSORY LAPTOP PROGRAMS: TEACHERS’RESPONSES TO THE ADOPTION
AND IMPLEMENTATION PROCESS

by

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ABSTRACT

This thesis presents a multiple-method investigation of teachers’ responses to the adoption and implementation of a compulsory laptop program (CLP). It reports on the beliefs, opinions, and behaviours of teachers responsible for translating a CLP into classroom-based reality. The study is based on data collected from 18 interviews, 2 focus groups, and classroom observations of 5 teachers obtained from teachers and administrators at one Canadian independent school, as well as an online survey data from educators at nine independent schools across Canada.

The purpose of the research was to investigate the impact of adopting and implementing a planned change initiative by examining teachers’ responses to a school-wide mandated curriculum initiative by focusing on their perceptions of (a) requisite participation, (b) essential components, and (c) changing roles when implementing a CLP.

The findings of the study include four supports for teachers trying to implement a CLP into teaching practices. First, clearly communicate and revise shared, benchmark-driven policies on an ongoing basis to assist in unifying an understanding of the program. Second, address teachers’ self-imposed pressures within a CLP by ensuring individual teachers’ intrinsic motivation and affective needs are respected and addressed. Third, provide teachers with job-embedded learning opportunities to work individually and in small groups, and with access to knowledgeable resources in order to connect technological, pedagogical, and content knowledge, to meet just-in-time needs. Fourth, adopt an implementation model that is fluid and addresses elements affecting a teacher to provide a more inclusive and realistic method for explaining and supporting what may occur when teachers engage in implementing a CLP.
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CHAPTER 1: INTRODUCTION

Information and communication technologies (ICT) are ubiquitous, permeating many aspects of our lives. While a glance around a local coffee shop suggests that more and more members of our society are using ICT for work, information-gathering and personal purposes, employing tools and services such as laptops, cell phones, hand-held GPS devices, Facebook®, Skype® and Twitter®, this high-tech culture is not the norm in schools. Despite the fact that over the past 35 years computers have increased in quantity and portability and decreased in price and size—factors that should have been the catalyst for schools to acquire more of them to enhance teaching and learning—little has changed in the classroom with respect to ICT integration (Klopfer, Yoon, & Perry, 2005; Plomp & Pelgrum, 1992; Ringstaff & Kelly, 2002; Sivin-Kachala & Bialo, 2000). Moreover, even in those schools that have capitalized on decreasing costs and increasing availability by acquiring abundant hardware, there is empirical evidence to suggest that little change has occurred with respect to teaching practices and learning opportunities (e.g., Dunleavy & Heinecke, 2007; Marcinkiewicz, 1994; Riel, 1994; Ringstaff & Kelley, 2002). The technological divide between the worlds inside and outside of school walls has been an issue of interest to researchers since the advent of the first desk-top computers some 30 years ago. Ever-changing models of ICT implementations in schools continue to stimulate diverse empirical examinations of interest to educators in many roles, including policy-makers and front-line teachers (Penuel, 2006). One recent model for ICT implementation has been to place multiple desktop computers in laboratories or classrooms; however, research suggests that

1 Facebook is a free social networking site that allows users to connect and interact with other members of the online community.
2 Skype is free software that allows users to make telephone calls over the Internet. It also has video capabilities.
3 Twitter is a free social networking service that allows users to send short messages (micro-blogs) and to read other users updates.
even when hardware is in a computer-to-student ratio of 1-to-1, it is not enough to promote changes to teaching and learning (e.g., Donovan, Hartley, & Strudles, 2007; Sandholtz, Ringstaff, & Dwyer, 1997; Silvernail & Lane, 2004).

If one of the general purposes of education is to prepare students to be successful and productive citizens of the world by functioning adeptly in their chosen professions and being contributing members of society, then schools must play a role in preparing them to be responsible consumers and users of technology (Livingston, 2006; Webb, Heck, & Tait, 1996). There is a tacit acceptance and widespread acknowledgement that the integration of ICT is important: reform agendas and documents in all curriculum areas in all provinces now mandate a transition from traditional rote learning to a more contemporary problem-based approach that calls for the use of ICT. The goal of such curriculum policy is to embed technology seamlessly into teaching and learning in meaningful and productive ways (Sclater, Sicoly, Abrami, & Wade, 2006).

If the barriers of the past (e.g., unreliable hardware, access to hardware, inadequate hardware, complicated software programs) are not as prevalent in classrooms today, then researchers must identify the other factors that are preventing technology from taking a foothold in the classroom to make sense of and narrow the divide between how teachers and students use ICT in their personal and professional lives, and in the classroom. Clancey (1995) believes that it is imperative we “study what people do, understanding better how they interact with each other, their tools, and their physical environment” (p. 29). Clearly, if we are to better understand the successes and failures of educational innovations, we must focus on the contexts and the people involved. Since teachers are the main arbiters of all classroom activity, it would seem
necessary to better understand their role in the process of actualizing curriculum policy through ICT implementation.

To date, the existing literature in the field of adopting and implementing educational innovations has focused primarily on details and discrete events in the sequence of educational change with respect to ICT, such as how to provide the necessary infrastructure to support its use (e.g., Ainley, Bourke, Chatfield, Hilman, & Watkin, 2000; Livingston, 2006). Little empirical research has focused on studying teachers as key agents in school change in an ICT context; yet, the literature indicates that classroom teachers play a major role in the adoption and implementation of ICT in schools (Fullan, 2007; Fullan & Stieglbauer, 1991). Educational innovations can fail primarily because of teachers, be it their lack of knowledge of the innovation, their skill in using the innovation, or their beliefs towards the innovation (Spillane, Reiser, & Reimer, 2002). For an educational implementation as important as ICT in the classroom, it would seem especially important to describe the ways in which teachers themselves can be enablers of or barriers to change.

In the sparse body of teacher-focused studies around issues of ICT implementation, data collection methods have largely been limited to reflection (Hines & Pearl, 2004), speculation (Sumsion, 2000), or self-study (Penuel, 2006). In one of the few empirical studies to examine teachers’ concerns about educational reform in general, Hargreaves (2004) interviewed 50 teachers about their emotional relationship to their work, professional development, and experiences of educational change. He found that mandated policies led to teacher’s emotional negativity about and mistrust of administrators, whereas self-initiated change…evokes enthusiastic and effusive emotional responses from teachers who become energized and motivated by the benefit of fulfillment and accomplishments they see in their students and themselves. (p. 304)
One of the few Canadian studies focusing on teachers integrating technology included 764 elementary and secondary teachers in Quebec’s public and private school system. The study investigated personal and environmental characteristics as well as teachers’ beliefs towards and purposes for implementing computer technology in their classrooms (Wozney, Venkatesh, & Abrami, 2006). These researchers concluded that a teacher’s main reason for computer integration is “expectancy of success and perceived value” (p. 173). They found that the amount of time teachers use computers for personal reasons is a good predictor of the amount of computer technology they use in the classroom. Of particular interest was their finding that a teacher’s use of computers in the classroom is primarily non-educative, rather it is used for the purposes of obtaining and recording information.

One empirical study from Australia focused specifically on the impact of laptop programs (programs that provide a 1-to-1 ratio of laptops to student) on students, teachers, the curriculum, and the classroom environment (Newhouse, 2001). Questionnaires were administered to forty teachers, asking questions about teachers’ concerns regarding portable computing environments and their use of the computers. The recommendations from this study reveal the need “to provide comprehensive targeted professional development for teachers…and to modify the curriculum to take account of the potential of computer applications” (p. 218). Although this research did study teachers, it does not provide any concrete evidence about the relationship between teachers’ concerns for laptop programs and their uses of the laptops, nor does it describe how these relationships inform teacher professional development and school policies. My work begins to fill such gaps since its goal is to describe teachers’, feelings, beliefs, and behaviours towards the implementation of a compulsory laptop program.
As laptops and other handheld devices (e.g., graphing calculators, global positioning systems, personal digital assists) become more affordable for parents and students, educational institutions are becoming, or should become, increasingly interested in the academic role they may play in the teaching and learning process (Chan et al., 2006). Even though the concept of the laptop school is not new (for over 15 years there have been such implementations around the world, i.e., Australia, United States) little information has been shared about them, nor have they been used as models to guide new implementations in other countries.

Laptop Programs

The most recent phenomenon in the almost four decade history of computers in school is the emergence of the ‘laptop school’. It is becoming more and more common to find schools, districts and states that are providing each student and teacher with a laptop computer to support academic learning in the United States today. In Canada, although a small number of schools and school boards have adopted such a program, to date, there has been no large-scale implementation by any province or territory.

Laptop schools assume a variety of forms. Some schools provide a bank of laptops for each student to use in a particular class, while others provide a laptop for each student to use during the school day (Warschauer, Grant, Real, & Rousseau, 2004). The majority of laptop schools, however, require a student to own their own laptop, usually purchased or leased through the school or school board, for use at both school and home (Donovan, Hartley, & Strudler, 2007; Penuel, 2006). Typically included with the purchase of the laptop is productivity software such as school-issued word processing, presentation and spreadsheet applications, and Internet access tools (Penuel, 2006). Not only are laptop programs varied in their choices of hardware, format and school structure, there are also many ways laptop programs in schools are labeled.
Terms used to describe these programs include ubiquitous computing, one-to-one computing, laptop programs, and digital assistance (e.g., Andrews, 2006; Davies, 2004; Livingston, 2006; Silvernail & Lane, 2004; Zucker, 2005).

Given the wide range of language and contexts used to describe laptop programs, for the purpose of this study, the focus will be on compulsory laptop programs (CLP) that include the following features: (a) laptops are mandated—both students and teachers must have one if they are to be members of a particular school community; (b) laptops are student owned and can be used at school and at home; (c) software applications for educational purposes are pre-installed on the laptops; and (d) Internet access within the school is provided at no cost to teachers and students.

Rationale for Study

Although laptop programs have been in existence for more than 20 years, very few have been studied. Of those that have been the subject of empirical research, most have been examined through lenses such as practical recommendations and steps for embarking on a CLP or documenting how and when laptops were being used (e.g., Livingston, 2006; Penuel, 2006). To date, none have studied the effects of a CLP policy from a teacher’s perspective. Despite extensive professional development efforts that support ICT in the classroom, the limited studies that incorporate teacher observations into their methodology still indicate that teachers continue to use computers to maintain their current teaching methods rather than to promote innovative practices (Cuban, 2001; Ringstaff & Kelley, 2002; Sandholtz & Reilly, 2004). When teachers maintain their traditional teaching methods, research suggests that it is because they are comfortable in their present practice or are unsure of how to become better users of technology.
for learning (Zardoya & Fico, 2001). There is nothing to suggest that teachers are intentionally trying to limit computer use in their teaching practices.

Given that there appears to be no personal intent to avoid implementing innovative teaching practices, it is necessary to better understand why teachers behave and act the way they do when technology is burgeoning all around them. What are the reasons underlying the reality that so many classroom teachers are not harnessing the powerful uses of the technology that is transforming society and dramatically changing the way most of us live and work? To answer this question it is necessary to listen to teachers’ voices when they are asked about their concerns and questions regarding ICT, or when they are asked to describe their current use of ICT and what they need as learners in the laptop school.

Purpose of the Research

The purpose of this research is to study the impact of adopting and implementing a planned change initiative by examining and documenting teachers’ responses to a school-wide mandated ICT initiative: the compulsory laptop program (CLP). By focusing on the feelings, opinions, needs, and behaviours of those responsible for translating innovation policy into classroom-based reality, this research aims to generate a set of actionable recommendations that support change facilitators in the adoption and implementation of an educational innovation. The results of this study will also add to the existing body of knowledge about the adoption and implementation of an educational technology innovation and provide implications for further educational research and practices (McMillan & Schumacher, 2006). Finally, this research may also contribute to the development and refinement of models, or theoretical explanations that assist in clarifying the phenomena that occur during the adoption and implementation process of an educational innovation.
This research provides a unique context in that many of the typical ICT barriers found in most studies (e.g., Cohen, 1994; Desimone, 2002; Zhao, Pugh, Sheldon, & Byers, 2002) were absent in this particular case (e.g., lack of funding, lack of hardware, lack of software). In the absence of these barriers, this study illuminates what happens from the teachers’ perspectives when a mandated laptop program is adopted. As one of the first studies of its kind, focusing on documenting and explaining teachers’ perceptions about the uses, concerns, strengths, and challenges faced in a compulsory laptop environment, it is hoped that this research will make a significant contribution to the limited body of literature in this field.

Research Questions

The primary questions define the scope of the research. The enabling questions guide the research direction.

*Primary Questions (PQ)*

This research answers three primary research questions.

1. How did teachers respond to requisite participation in a school-based laptop program?
2. What components of a compulsory laptop program initiative did these teachers perceive to be essential?
3. How did teachers describe changes to their professional role in a compulsory laptop school environment?

*Enabling Questions (EQ)*

The research is guided by the following enabling questions.

1. What questions and concerns did teachers raise about the compulsory laptop program? (PQ1)
2. How did teachers describe the barriers preventing them from fully implementing a laptop program into their daily classroom program? (PQ1)

3. In what ways did teachers think that the CLP positively influences their teaching practices? (PQ2)

4. What were teachers’ levels of use of the laptops? (PQ3)

5. In what ways were laptop school teachers using the laptops? (PQ3)

Research Setting

This research includes two settings. The principal setting is an independent secondary school in southern Ontario. The compulsory laptop program (CLP) at this school was initiated in 1997: implemented in Grade 9 in 1998; grade ten in 1999, Grade 11 in 2000; and Grade 12 in 2001. A private school was selected based on the trend that laptop programs in the United States and other countries (e.g., Australia and Britain) began in private schools and filtered into various public schools, districts, and states (e.g., Henrico County, State of Maine).

Educators from nine independent secondary schools in Canada, all of which had teacher-student laptop computer ratios of 1-to-1 in the classroom served as a second setting. The teachers actively involved in the compulsory laptop program (CLP) at the principal site and schools across Canada provided valuable information for meeting the purpose of this research and answering the research questions.

This dissertation attempts to document teachers’ responses to the adoption and implementation of compulsory laptop programs. The review of literature and theoretical framework address policy-making and enactment processes, adoption and implementation models of educational innovations, educational change theory, facilitators and inhibitors of planned change, teachers’ beliefs, adult learning theories, and teacher professional development.
models. The method of data collection for this research involved both quantitative and qualitative methods through an online survey and case study approach. The findings inform the discussion, highlighting that understanding teachers’ thoughts, behaviours, feelings and beliefs play an important role in the effective adoption and implementation of a compulsory laptop program.
CHAPTER 2: REVIEW OF LITERATURE AND THEORETICAL FRAMEWORK

Overview of Chapter

This chapter presents a review of literature and theoretical framework for understanding teachers’ responses to the adoption and implementation of a planned change initiative—the compulsory laptop program (CLP). The review of literature and theoretical framework encompass six issues relevant to this study: policies for adopting and implementing innovations; educational change theory; facilitators of planned change; teachers’ beliefs and practices; inhibitors of planned change; and teacher professional development (TPD) models. The literature relating directly to technology initiatives and laptop programs are embedded within the issue that the specific studies address. Finally, a summary of the chapter describes the connections between the review of the literature and the theoretical framework. The chapter begins with a history of laptop programs.

The History of Laptop Programs

Laptop programs in private and public schools have been in existence for over 20 years in Australia, 17 years in the United States, and 11 years in Canada. A few schools in other countries, such as Britain, have since adopted and implemented laptop programs. The most thorough account of the history of the laptop program was written by Johnstone (2003), in which he provides an extensive account of the emergence of laptop programs in Australia and, to some extent, the United States. Livingston (2006) added to Johnstone’s research by providing examples of some of the initial schools, districts, and states within the United States that implemented laptop programs. To date, there has been no written account of the history of laptop programs in Canada. What follows is the history of laptop programs from its origin in Australia to the United States, to Canada, and globally.
The Methodist Ladies College (MLC), a private girls’ school, located in Melbourne, Australia was the first school to adopt and implement a laptop program (Johnstone, 2003). This initiative came about as a result of a pilot program involving 30 Grade 7 students. The pilot, conducted in 1988, hoped to emphasize independent learning activities that integrated desktop computers (located in a computer lab) into core subjects (e.g., History and English). From the pilot study emerged the conclusion that there was a necessity for computer access at school and at home. To address this need, administrators and one teacher decided to mandate that students in one of three Grade 7 classes and all Grade 4 students to purchase a laptop. “The world’s first laptop classes commenced…on Monday 12 February 1990” (Johnstone, 2003, p. 208). The pilot study led to over 400 students in Grades 4 to 7 implementing the laptop program in the following year.

In 1992, Trinity Grammar, an independent boys’ school also located in Melbourne, was the second school to implement a laptop program for Grades 5 to 12 in which Microsoft Office was the primary software used. Whereas, MLC’s goal for the laptop program was to embed laptops into traditional lessons, the goal of Trinity Grammar’s laptop program was to transform education (Johnstone, 2003) by encouraging alternative forms of teaching and learning through laptop technology. By 1994, a growing number of private schools in Australia had adopted and implemented laptop programs (e.g., Kilvington, and Geelong Grammar) (Johnstone, 2003).

The first public school to implement a laptop program, also from Australia, was Frankston High. During the first year (1994), donated laptops were given to one Grade 7 class. By 1996 there were, three laptop classes with the parents paying for the machines. And this was remarkable because… the socio-economic demographics of the town of Frankston were very much
middle to lower. In such a place, parents do not spend thousands of dollars for something unless they think it will have real benefits for their children. (Johnstone, 2003, p. 244)

*The United States*

A laptop program was implemented for the first time in a single private school in the United States in 1992, at Brewster Academy, New Hampshire. Then, in 1995, more administrators in the United States became interested in the concept of laptop programs due to concerns about budget cuts affecting the number of computers in the classroom (Johnstone, 2003). At the same time, Microsoft Corporation was interested in understanding how students in laptop programs were using their software; this resulted in the Anytime Anywhere Learning Project launched by Microsoft Corporation in 1996. The project was to provide a laptop computer to every child in order to embed technology into curriculum objectives and student learning (Microsoft Corporation, 2005). One year later, in 1997, “implementation of the [laptop] program occurred in 52 schools across the United States” (Gulek & Demirtas, 2005, p. 5). Examples of these schools included: The Peck School, Morristown, New Jersey; Mott Hall in Harlem, New York City; three middle schools in Beaufort County, South Carolina, and Emerson Elementary and Forest Ridge School of the Sacred Heart, both located in Washington State (Johnstone, 2003).

By the year 2000, it was estimated that “800 schools with 125,000 students and teachers participated in the laptop program” (Gulek & Demirtas, 2005, p. 5). At the school level, The Urban School, a private school in San Francisco, implemented their laptop program in 2000 (Livingston, 2006). The laptop program was then adopted and implemented at both district and state levels. For example, Henrico County School District in Virginia launched their laptop initiative in 2000-2001 by providing 18,000 laptops to middle school students—30,000 laptops
were in the program by 2006 (Livingston, 2006). In 2002, the state of Maine required that all Grade 7 and 8 students have a laptop computer.

**Canada**

The Anywhere Anytime Learning Project piqued the interest of various administrators in independent schools in Canada. Although, to date, there is no written account of the adoption and implementation process of laptop programs in Canada, one school within the Canadian Association of Independent Schools (CAIS) became the first to implement such a program with their Grade 9 students and teachers in the year 1998. By 2001, the laptop program was implemented in all Grades 9 to 12 classes. More schools within CAIS adopted the program in the following years.

In September 2003, the Peace River North School District was the first known public school system in Canada to adopt a laptop program. They implemented the Wireless Writing Program (WWP) providing one-to-one laptops to Grades 6 and 7 students. The laptop program involved 1150 students, and 37 teachers in 17 schools. The WWP was “designed to improve student writing achievement” (Jeroski, 2003). Also in 2003, the Eastern Townships School Board located in Quebec implemented the Enhanced Learning Strategy which involved providing laptops to 4500 Grade 5 and 6 students. The actual number of schools in Canada implementing laptop programs, however, is presently unknown.

**Global Initiatives**

Under the leadership of Nicholas Negroponte and Seymour Papert, pioneers in the field of computers in schools, the Massachusetts Institute of Technology (MIT) Media Lab created the One Laptop per Child (OLPC) Project in 2005. The project’s mission is to “provide educational opportunities for the world’s poorest children by providing each child with a rugged, low-cost,
low-power connected laptop with software designed for collaborative, joyful, self-empowered learning” (MIT, 2008). To date, there have been over one million laptops given to children in over 23 countries.

A new reality of one computer for every child, now in thousands of private and public school classrooms, appears to be spreading slowly throughout diverse educational institutions internationally (Zucker, 2004). Given the relative newness of 1-to-1 computer programs in schools, “there has not yet been enough research to keep pace with policymakers’ and practitioners’ calls for guidance and for reliable information about what happens when every student has a computer” (Zucker, 2004, p. 371). Penuel (2006) agrees that “the educational technology research communities’ collective knowledge about one-to-one initiatives has not to date kept up with the rapid expansion of these initiatives or with their breadth” (p. 329).

In 2001 Penuel (2006) found “just 19 studies that had analyzed outcomes” (p. 329) of laptop programs. Since then, most of the research completed on laptop programs has been completed through self-study reports by individual schools, districts, or states, rather than rigorous evidence-based research, aimed at evaluating the effectiveness and consequences of laptop programs (Zucker, 2004). This research will add to the limited literature in this emerging field of educational innovations.

Policies for Adopting and Implementing Innovations

This section describes the various definitions of policy and integrates the definitions into cyclical phases of policy-making. Policy adoption and implementation theory are then described in order to develop a framework for identifying educational policy adoption and implementation processes. These theories and literature provide a framework for understanding teachers’ responses towards compulsory laptop program policies.
Policy Definitions

The literature on policy definitions suggests that ‘policy’ is inconsistently defined due to the numerous tacit definitions in existence (Guba, 1984). Starling (1988) believes that all definitions of policy contain, “a general statement of aims or goals…a guide that delimits action” (pp. 1-2). Hope (2002) took this definition further, stating that, “a policy can be defined as a politically derived intervention whose purpose is to resolve a perceived societal problem” (p. 40). For example, in general the perceived failure of public schools is seen as a societal problem. Hence, legislators focus on improving teacher certification, increasing principal and teacher accountability, and improving performance and curriculum standards. In contrast to these researchers, the Oxford Dictionary (2000) and the American Heritage Dictionary of the English Language (2000) suggest that policy also includes an action plan that is adopted by an individual or an organization. This action plan has been omitted from many definitions of policy.

The seminal work of Guba (1985) provides the most comprehensive definition of policy by combining elements of the various definitions. His work influenced all later work and in spite of efforts by others, his rich definition is still the standard. He identifies three levels of meaning. Policy-in-intention is described as an action guide (or plan) involving strategies to solve existing problems. It is described as, “the accumulated standing decisions of a governing body [policy framers] by which it regulates, controls, promotes, services, and otherwise influences matters within its sphere of authority” (p. 64). Policy-in-implementation means “sanctioned behavior, formally through authoritative decisions, or informally through expectations and acceptance established over time” (p. 64). He describes this domain of policy implementers as “lower-level subordinates” (p. 64). The third level is described by Guba as policy-in-experience, which
means “the effect policy-making and policy implementation has on the clientele” (p. 64). This encompasses the domain of the policy target groups (e.g., students).

By merging the varied definitions of policy, policy-making is seen as involving three cyclical phases (see Figure 1) (Bowe, Ball, & Gold, 1992; Timperley & Robinson, 1997)—allowance is made for movement back and forth between phases during any one policy initiative.

![Figure 1. Cyclical phases of policy making. [adapted from Bowe et al. (1992), Guba (1985), and Timperley & Robinson (1997)]](image)

The policy definitions and types of policies identified in the literature will assist in understanding teachers’ perceptions about what the compulsory laptop program (CLP) policies are and their behaviours during classroom implementation—the intended, actual, and in-use policies. Any gaps between the three phases of CLP policy implementation will be identified in this research.
Adoption and Implementation of Innovations

This review of literature suggests that the term ‘implementation’ is often viewed as only one of a number of stages reflecting “typologies such as ‘partial’, ‘moderate’, and ‘full’ implementation” (Desimone, 2002, p. 438). Implementation definitions appear to assume that adoption of an innovation occurs first—once the innovation is adopted then its implementation follows. The definitions range in opinion about what defines implementation and when implementation actually occurs. The literature on curriculum implementation suggests that curriculum begins with a plan known as the intended curriculum and becomes a reality once implemented by teachers in their classrooms (the enacted curriculum) (Ornstein & Hunkins, 2004). This view suggests that the change is stable once the innovation is adopted and implemented (see Figure 2); however, developmental literature suggests that adoption and implementation are iterative. It may be that the definitions of adoption and implementation of a policy combine the various criteria outlined in the literature but can be categorized into four levels that are non-linear and based on policy-makers’ reviews, revisions, and creations of new policies about the innovation.

The implementation of an innovation can be seen to occur only after the innovation has been implemented, in this case by teachers, and the policy is in use (Phase 3 of policy-making). Upon reviewing the various definitions of implementation, it is evident that ‘policy-in-use’ can be interpreted in a variety of ways. For some authors it is viewed as occurring during the change progress, while others believe it continues until all intended goals and benefits are realized by the organization.
During the Change Process

Some definitions state only that implementation of an innovation occurs when that innovation is adopted and used (Baier, March & Saetren, 1986; Deschamps, 1988). Successful implementation is viewed as the stage where stakeholders are implementing common strategies based on shared goals and commitment (Floyd & Woodbridge, 1992). There is consensus among some authors that implementation occurs once the change has been put into practice (Baronas & Louis, 1988; Bradley & Hause, 1995; Fullan and Pomfret, 1977; Marsh & Willis, 2007). An implementation gap is described as “the gulf between strategies conceived by top management and awareness at lower levels” (p. 27), and unsuccessful implementation is caused by middle- and operating-level managers being ill-informed and/or unsupportive of the chosen direction. If this view was translated into schools, then it means that teachers are responsible for causing any gap between policy and implementation. This may not be true, however, since there can be a lack of understanding by the implementers of the policies and how the policies are to be

---

**Figure 2.** Levels of educational policy adoption and implementation of an innovation.

| Level 1: Adoption | • The policy is accepted by the system. |
| Level 2: Initial Implementation | • The policy is distributed to local stakeholders. |
| Level 3: Partial Implementation | • The policy is being interpreted, adapted, and used to varying degrees. There is an overall effort to reach the vision, mission, and goals of the program, but they may not have been attained. |
| Level 4: Complete Implementation | • The policy has become the status quo (routinized) within the community. The goals of the program are being met and the policy has become a norm within the school and classroom. |
enacted. Communication by administrators about policy to teachers may also cause implementation gaps, rather than the implementers themselves.

The above group of authors view implementation as complete once the innovation had been adopted and put to use, and suggest that implementation is complete early in the change process. These definitions, however, lack clarity about the quality or effectiveness of use that is required for an innovation to be implemented completely and thus I question their premise. I believe there to be different phases of implementation in compulsory laptop programs which are completed in the later stages of implementation, rather than at the beginning of the process. This study identifies teachers' behaviours towards an implementation process and their feelings about how they interpret their level of implementation after acting upon their particular views of the intended goals and benefits of the mandated change.

After Realizing Intended Goals and Benefits

A number of studies from research in policy identify similar patterns of policy implementation that suggest implementation occurs after realizing the intended goals and benefits of the innovation (Alavi & Joachimsthaier, 1992; Griffith & Northcraft, 1996; Gottschalk, 1999; Klein & Sorra, 1996; Rhodes and Wield, 1985). They suggest implementation occurs when there is committed use by the implementers, the expected goals have been reached, and when the innovation has become a regular part of the implementer’s professional routine.

This group of authors view implementation as occurring when goals have been met, behaviours have changed, and the innovation has become a norm within the organization; the system or innovation has reached the status quo. These definitions take into account the levels of use of the implementers, but not the concerns that they may have about using the innovation. I would argue that the concerns implementers have
about the innovation they are required to implement will have an impact on how they implement it, when they implement it, and even whether or not they actually implement it. This research addresses teachers’ concerns in an attempt to make sense of their levels of implementation for the CLP policies.

After synthesizing the above definitions of policy and implementation, policy implementation of ICT in education can be defined as the activities, behaviours and beliefs groups or individuals have in attempting to meet the vision and goals of policy. It is through an examination of responses toward a CLP that this study attempts to explore implementation through the lens of teachers. There have been no studies, to date, about how policy (intended, actual or in-use) affects the adoption and implementation of compulsory laptop programs. However, in order to better understand teachers’ beliefs and behaviours, there are three adoption and implementation of educational innovation models that pertain directly to this study: The Concerns Based Adoption Model (CBAM), The Apple Classrooms of Tomorrow (ACOT) and The Adopter Categorization Model. These models still apply today in terms of adopting and implementing an educational technological innovation.

Adoption and Implementation Models of Educational Innovations

The 1990 research efforts on technology in education began to investigate the adoption of computers in classrooms (e.g., Marcinkiewicz, 1995; Sandholtz, Ringstaff, & Dwyer, 1992). Some studies centred on teachers’ concerns about innovations and focused on the concerns of teacher candidates as they began to work with the innovation and developed their pedagogical skills. The Concerns Based Adoption Model (CBAM) (Rutherford, 1977) was developed from Fuller’s (1969) work and has since been used frequently to study the process of implementation of educational innovations (Hall & Hord, 2006), although not necessarily technological in nature.
The Apple Classrooms of Tomorrow (ACOT) model (Dwyer, Ringstaff, & Sandholtz, 1991) is the first model to focus specifically on practicing teachers’ implementation of increased student-computer ratios. The Adopter Categorization Model developed by Rogers (2003) focuses on measuring the level of adoption of an innovation by individuals within a system. All three models are based on a stage theory of development for individuals involved in adopting and implementing an innovation. It is these models that provide, in part, a theoretical framework for understanding teachers’ feelings, beliefs, behaviours, and perceptions during the implementation of a compulsory laptop program.

The Concerns-based Adoption Model

The CBAM, first published by Hall, Loucks, Rutherford, and Newlove (1975), is an empirically-based conceptual framework which outlines the developmental process that individuals experience as they implement a new innovation (i.e., a program or process that is new to the individual) (Hord, 1986). It has since undergone further validation over the past 30 years (Hall & Hord, 2006). The two major explanatory and diagnostic components to this model that relate directly to this study are the Stages of Concern (SoC) and Levels of Use (LoU).

The SoC identifies the feelings and perceptions about the innovation—the personal dimension (Hall, George, & Rutherford, 1998)—and is composed of seven stages of concerns (see Table 1). Teachers with unrelated concerns are placed in the awareness stage. Teachers who have self-concerns or low impact concerns are considered to be in either the informational or personal stage. Teachers with task-oriented concerns are categorized in the management stage. Teachers with high impact concerns are organized into either the collaboration or refocusing stage. The SoC are measured using a 35-item questionnaire which results in concerns profiles that can be illustrated both numerically and graphically. The SoC framework assumes
that individuals move in sequence from one stage to another as they use the innovation over time. There has only been one study conducted, to date, about teacher concerns during initial implementation of a 1-to-1 laptop initiative at the middle school level. Haretley and Strudler (2007) used the CBAM stages of concern questionnaire and interviews to determine teachers’ concerns. They found that teachers were primarily concerned about how the innovation would affect them personally—their time, planning and practices.

Whereas the SoC “addresses the affective side of change (people’s reactions, feelings, perceptions, and attitudes), Levels of Use (LoU) has to do with behaviours and portrays how people are acting with respect to a specific change” (Hall & Hord, 2006, p. 159). The LoU dimension consists of eight classifications describing how individuals behave with an innovation. Three non-use and five use levels have been created (see Table 2). A semi-structured interview, involving a list of guiding questions, is used to measure the LoU of an innovation by individuals (Loukes, Newlove, & Hall, 1998). Each level is defined by seven categories for descriptive purposes, and includes knowledge, acquiring information, sharing, assessing, planning, status reporting, and performing. Again, as with the SoC, there appears to be a developmental progression from one level to the next as the innovation is used over time. Table 2 helps stakeholders understand the behaviours associated with each level of use. Hall and Hord (2006) describe the model as adaptive to the implementation process; this may be an important feature for teachers implementing a CLP into their teaching practice as it seems to be a complex process of change.
Table 1

**Typical Expressions of Concerns about an Innovation**

<table>
<thead>
<tr>
<th>Type of concern</th>
<th>Stages of concern</th>
<th>Expressions of concern</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrelated</td>
<td>0. Awareness</td>
<td>I am not concerned about it.</td>
<td>Little concern about or involvement with the innovation is indicated.</td>
</tr>
<tr>
<td>Self</td>
<td>1. Informational</td>
<td>I would like to know more about it.</td>
<td>A general awareness of the innovation and interest in learning more detail about it is indicated. The individual seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner, such as general characteristics, effects and requirements for use.</td>
</tr>
<tr>
<td></td>
<td>2. Personal</td>
<td>How will using it affect me?</td>
<td>Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organization, decision-making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self or colleagues may also be reflected.</td>
</tr>
<tr>
<td>Task</td>
<td>3. Management</td>
<td>I seem to be spending all of my time getting materials ready.</td>
<td>Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.</td>
</tr>
<tr>
<td>Impact</td>
<td>4. Consequence</td>
<td>How is my use affecting clients?</td>
<td>Attention focuses on impact of the innovation on clients in his or her immediate sphere of influence. The focus is on relevance of the innovation for clients, evaluation of outcome including performance and competencies, and changes needed to increase client outcomes.</td>
</tr>
<tr>
<td></td>
<td>5. Collaboration</td>
<td>I am concerned about relating what I am doing with what my co-workers are doing.</td>
<td>The focus is on coordination and cooperation with others regarding use of the innovation.</td>
</tr>
<tr>
<td></td>
<td>6. Refocusing</td>
<td>I have some ideas about something that would work even better.</td>
<td>The focus is on the exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing innovation.</td>
</tr>
</tbody>
</table>

(adapted from Hall & Hord, 2006, pp.139-140)
Table 2

*Levels of Use of the Innovation*

<table>
<thead>
<tr>
<th>Level of use</th>
<th>Typical behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-users</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Non-use</td>
</tr>
<tr>
<td>I</td>
<td>Orientation</td>
</tr>
<tr>
<td>II</td>
<td>Preparation</td>
</tr>
<tr>
<td>Users</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Mechanical</td>
</tr>
<tr>
<td>IVA</td>
<td>Routine</td>
</tr>
<tr>
<td>IVB</td>
<td>Refinement</td>
</tr>
<tr>
<td>V</td>
<td>Integration</td>
</tr>
<tr>
<td>VI</td>
<td>Renewal</td>
</tr>
</tbody>
</table>

| Non-users    | An individual has little or no knowledge of or interaction with the innovation. |
| I            | An individual is taking action to learn more about the innovation. |
| II           | An individual has decided to use the innovation, but the use has not started. |
| III          | The implementer is actively engaged with the innovation through experimentation. |
| IVA          | The implementer has been given sufficient support and has mastered the innovation. |
| IVB          | The implementer begins to reflect and assess the innovation and its benefits to clients. |
| V            | The implementer adapts the use of the innovation for the benefit of the client. |
| VI           | The implementer is exploring major modifications to the innovation or looking to replace it altogether. |

(adapted from Hall & Hord, 2006, p. 160)

*Apple Classrooms of Tomorrow Model*

Throughout the 1980s and 1990s, Apple Incorporated supported a research program entitled Apple Classrooms of Tomorrow (ACOT). The program provided a number of American schools with computer resources for classrooms and then hired researchers to observe the effects of the technology on the teaching and learning process. It involved stakeholders from the national, state, and local levels—researchers, educators, students, and the Advanced Technology Group at Apple Computer Incorporated. The teachers involved in the program were volunteers and the ultimate implementation goal was to change teaching instruction and learning (Dwyer, Ringstaff, & Sandholtz, 1991). The program began in 1985, with 32 teachers and 650 students in ACOT classrooms. “ACOT’s mission was formative: to explore, develop, and demonstrate powerful uses of technology in teaching and learning” (p. 46).
The ACOT research shed light on what happens when schools have a large number of desktop computers placed in classrooms. The findings of Dwyer, Ringstaff, and Sandholtz (1991), substantiate CBAM results. For example, their work suggests that teacher change is an evolutionary process involving five stages that identified specific expectations and supports for moving teachers to the next phase (see Table 3). This model offers a frame for identifying predetermined prescribed PD they view as essential for teachers in each phase of their evolution during the adoption and implementation process. This model is quite prescriptive and has definite supports in place for teacher professional development; it leaves no room for teachers to voice their own concerns about support needs because the supports are predetermined for each phase of development. I would suggest that listening to individual teachers’ views about what they perceive they need in terms of professional development is also important for understanding teachers’ beliefs, behaviours, and perceptions towards implementing a CLP.

Table 3

Support for Instructional Evolution in Adopting Technology-Rich Classrooms

<table>
<thead>
<tr>
<th>Phase</th>
<th>Expectation</th>
<th>Support needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Entry</td>
<td>• Volunteer team • Critical mass of technology present for teachers and students</td>
<td>• Routinize planning time to develop shared vision and practice • Excuse staff from as many district requirements as possible • Create opportunities for staff to share experiences with non-participant colleagues</td>
</tr>
<tr>
<td>2. Adoption</td>
<td>• Keyboarding • Use of word processors for writing • Use of computer assisted instruction (CAI) software for drill and practice of basic skills</td>
<td>• Basic technical support to develop teacher’s confidence and ability to maintain hardware and facilitate student’s use • CAI, keyboarding, and word-processing software and training</td>
</tr>
<tr>
<td>3. Adaptation</td>
<td>• Basic instructional activities are individualized and self-paced • Students composing on computers</td>
<td>• Develop flexible schedule to permit peer observation and team teaching • Introduce and discuss alternative pedagogies</td>
</tr>
</tbody>
</table>
Course of study evolving as result of student productivity and changing expectations of teachers

Train staff in use of tool software: spreadsheets, databases, graphics, hypermedia, communications

Introduce video disc and scanner technology

4. Appropriation

- Increase focus on higher-order skills
- Experiment with interdisciplinary, project-based instruction, team teaching, student grouping, scheduling and assessment strategies
- Conflict with traditional schedules and assessment techniques

- Routinize peer observations and group discussions of events and consequences
- Reexamine project mission and goals
- Build awareness of alternative student assessment strategies
- Encourage and support conference attendance and teacher presentations

5. Invention

- Establish higher learning standards
- Implement integrated curriculum
- Balance strategic use of direct teaching and project-based teaching
- Integrate alternative modes of student assessment

- Encourage collaboration between teachers and researchers
- Encourage teachers to write about and publish their experiences
- Explore telecommunications as a way to keep teachers in contact with innovators outside the district
- Create opportunities for teachers to mentor other teachers

**Adopter Categorization Model**

The Adopter Categorization Model which identifies individual roles in change is one aspect of Rogers (2003) Diffusion of Innovations Model. As with ACOT, this model is premised on the belief that individuals within a system adopt an innovation in an “over-time sequence” (p. 267) and this allowed Rogers to create adopter categories for the use of innovations. He developed five categories to describe an individual’s level of adoption of an innovation (see Table 4). From studies of innovation diffusion dating back to the 1940’s (e.g., Rogers, 1958; Rogers, 2003; Ryan & Gross, 1943), Rogers has been able to calculate the average percentage of individuals falling within each category within a system (see Table 4).
Table 4

Adopter Categories and their Characteristics

<table>
<thead>
<tr>
<th>Adopter category</th>
<th>Average percentage of individuals</th>
<th>Adopter characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovators</td>
<td>2.5</td>
<td>• Venturesome</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Resources available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ability to understand and apply complex technical knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Copes with high level of uncertainty – risk taker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Accepts setbacks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Social network outside local circles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• May or may not be respected by peers</td>
</tr>
<tr>
<td>Early Adopters</td>
<td>13.5</td>
<td>• Sought by change agents and potential adopters for advice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Help trigger critical mass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Respected by peers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decreases uncertainty about innovation by adopting it</td>
</tr>
<tr>
<td>Early Majority</td>
<td>34</td>
<td>• Deliberate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Interact frequently with peers – very influential in implementation process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Take time in decision to adopt innovation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not leaders</td>
</tr>
<tr>
<td>Late Majority</td>
<td>34</td>
<td>• Skeptical and cautious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• May be an economic necessity or a result of peer pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Do not adopt innovation until most individuals in the system have</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Most of the uncertainty surrounding the innovation must be removed</td>
</tr>
<tr>
<td>Laggards</td>
<td>16</td>
<td>• Traditional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The last to adopt the innovation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Possess no opinion leadership</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prefer isolation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Suspicious of change facilitators and innovations</td>
</tr>
</tbody>
</table>

(adapted from Rogers, 2003)

This model, like ACOT, suggests that the adoption and implementation of an innovation by individuals is linear, the innovation is usually introduced by leaders within a system, and the concerns of the majority of grassroots stakeholders involved in the process are not sought out or
acted upon. Unlike CBAM and the ACOT model, this model only provides insight into an individual’s location along the innovation adopter’s continuum. Although this model does not provide information on professional development interventions required to move non-users and users along the continuum, it will be helpful in understanding where teachers place themselves in terms of their levels of experience with laptop use.

The three models for adopting and implementing an innovation provide stages to describe qualitative differences between groups and individuals, but seem to offer little information about what actually facilitates or inhibits teachers’ levels of involvement in a planned educational innovation change. Unlike the ACOT model, the CBAM, as described by Hall and Hord (2006) appears to be more adaptive to the change process. CBAM offers a frame for describing teachers’ behaviours and concerns during implementation. Hence CBAM will be used, in part, to frame this study. As well, Roger’s (2003) Adopter Categorization Model will provide a frame for categorizing teachers perceived level of experience with laptop technology. The CBAM and Roger’s model will be integrated into this study.

Educational Change

Fullan (2007) and Spillane, Reiser, and Reimer (2002) suggest that change agents more often than not tend to lack the capacity (e.g., knowledge, skills, support) to work in ways that facilitate a planned change initiative. This may be the case with teachers mandated to implement a laptop program into their teaching practices. When teachers are required to change, they construct a tacit and intuitive mental model based on past experiences and they use this model to envision the planned change initiative (Spillane et. al., 2002). For example, Grant, Peterson, and Shojgreen-Downer (1996) completed a qualitative case study of a new California mathematics framework and reported how three mathematics teachers implemented the changes. They found
that the interpretation of the change varied among teachers. Through these differences, the researchers were better able to predict the levels of implementation. In part, it appears the success of implementing an educational innovation depended on the level of commitment among teachers (Marsh & Willis, 2007). In studies researched by Rogers and Shoemaker (1971) six attributes were identified as important for adopting and implementing an innovation: the innovation was perceived as better than present models; the amount of importance placed on the innovation; perceived improvements in student learning; support present values and practices; the degree of difficulty to use the innovation; and implementing the innovation on a small scale first (pilot program). Fullan and Pomfret (1977) suggest that the two most important attributes to successful change was the level of complexity of the innovation and the explicitness of the change process—the less complex the innovation and the more explicit the implementation plan were indicators that greater success with the change would occur.

In a qualitative study on elementary mathematics reform and based on teacher observations, and interviews with one district supervisor, four elementary teachers and unofficial educational leaders (professional development organizers and university faculty), Hill (2001) concluded that inconsistent teacher implementation of the change was not necessarily due to a lack of effort, lack of buy-in or rejection of the change, but rather differences in interpretations and partial understanding of what the intended change was to be. She also found that teachers tended to implement the concrete changes in the initiative (e.g., use of manipulatives), rather than abstract changes that require a deeper understanding and knowledge of the reform. This is not surprising given that a deeper understanding of the reform and how it is enacted appears dependent on attending to a variety of essential implementation components—policies, action plans, support, teachers’ beliefs, and listening to the beliefs, feelings, and behaviours of the
implementer. If these are not understood by stakeholders in the change process, it is likely that only concrete changes will be implemented as they are the easiest types of changes to make. It is changes that challenge belief systems that appear more difficult to implement. It follows then that when educational institutions plan change, either on a large or small scale, there are many factors that could facilitate or inhibit the process.

Facilitators of Planned Change

The literature suggests that the major enabling factors supporting the adoption and implementation of ICT in education can be categorized into four major areas: administrative support, professional development (PD) and training, resources, and teachers’ beliefs and practices, as summarized in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Facilitators of change</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Support</td>
<td>• Leadership (e.g., principal, headmaster, teacher leaders)</td>
</tr>
<tr>
<td></td>
<td>• Teacher awareness of implementation efforts</td>
</tr>
<tr>
<td>PD and Training</td>
<td>• Teachers given necessary knowledge</td>
</tr>
<tr>
<td></td>
<td>• Pre-service</td>
</tr>
<tr>
<td></td>
<td>• In-school training</td>
</tr>
<tr>
<td></td>
<td>• At-home training</td>
</tr>
<tr>
<td></td>
<td>• Gradual implementation</td>
</tr>
<tr>
<td>Resources</td>
<td>• Funding</td>
</tr>
<tr>
<td></td>
<td>• Human</td>
</tr>
<tr>
<td></td>
<td>• Time</td>
</tr>
<tr>
<td></td>
<td>• Materials</td>
</tr>
<tr>
<td>Teachers’ Beliefs and Practices</td>
<td>• Focus on changing beliefs as well as on changing existing practices</td>
</tr>
<tr>
<td></td>
<td>• Use the innovation to help change beliefs</td>
</tr>
<tr>
<td></td>
<td>• Begin with a small group of early-adopters</td>
</tr>
</tbody>
</table>

Administrative Support

Studies show that school districts play an important leadership role in implementing policy by providing local stakeholders with the goals, expectations, priorities for implementation,
and the resources necessary for implementation (Elmore & McLaughlin, 1988; Fullan 2007; Tyack & Cuban, 1995). There is also evidence to suggest that school principals and administrative teams play an influential role in the success of school reform efforts (Fullan 2007; Livingston, 2006; Murphy & Hallinger, 1988).

A qualitative study involving Memphis City Schools, Smith (1997) found that the implementation of policy reforms was more successful when teachers were explicitly aware of their principal’s support, the majority of staff supported the implementation efforts, and teachers felt ownership in the implementation model. The RAND corporation studied a series of New American Schools (NAS) initiatives aimed at implementing non-traditional school designs to improve student learning and achievement. From teacher reports they found that the principal was the most important element in school reform efforts (Berends, Bodilly, & Kirby, 2002; Desimone, 2002). Similar to the Memphis study, these teachers reported they were more likely to implement policy if their principal (a) could communicate teaching expectations and practices clearly, (b) was supportive and offered encouragement, (c) respected teachers as experts in their fields, and (d) was a strong proponent of PD and training.

In an evaluation of a Canadian technology program, Hands on IT (HOIT), conducted for the Learning Partnership, the researchers identified the goals administrators hoped to accomplish in order to support ICT in teaching and learning (Shulha, Lee, & Lock, 1998). Teachers, principals, directors, and university faculty, through interviews and teacher observations, were asked to clarify the various goals of participants. Administrators identified the following goals necessary for success with HOIT: to provide release time for teachers interested and willing to attend ICT workshops, to provide encouragement to teachers infusing computers in the
curriculum in ways that would promote higher order thinking skills, and to be approachable and “act as a sounding board” (p. 3) for the HOIT teachers.

One study of a laptop program in Henrico County Public Schools involved case studies of four schools (Zucker & McGhee, 2005). They analyzed case study data in four schools that included interviews, focus groups of approximately 100 teachers, parents, students and administrators in order to identify structures and resources that influence laptop use in mathematics and science. They suggest that key factors that facilitated teachers’ implementation of laptops is strong support from the central board and school principals in terms of hardware, software, and technical training. Little is mentioned about professional development support that incorporates pedagogy and content into technical support—key issues if teachers are to implement laptops effectively into teaching practices and curriculum. Most of the studies conducted to date on 1-to-1 laptop programs do not focus on administrative support for the program (e.g., Davis, Garas, Hopstock, Kellum, & Stephenson, 2005; Dunleavy, Dextert, & Heinecket, 2007; Grimes & Waeschauer, 2008; Silverman, & Lane, 2004). This may be a result of the mandated nature of most 1-to-1 laptop programs in which administration wants the change; otherwise it would not have been adopted by the school, district, or state.

One study surveyed the literature to determine emergent factors that promoted effective implementation strategies for comprehensive school reform models and used a facilitators and barriers framework for analyses. She found that the more autonomy a principal has over curriculum, instruction, budget, staff, and vision, the more likely implementation efforts will be successful (Desimone, 2002). This may also be true for principals and headmasters4 in CLPs—they have autonomy about decisions regarding when, why, and how the laptop program is implemented in their school.

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4 A Headmaster or Headmistress is defined as the principal of a private, independent school.
These studies suggest that administrative support is key for providing implementers with policies that have explicitly stated goals, expectations, and defined behaviours. There is also evidence to suggest implementation efforts are successful when the school vision is aligned with teachers’ beliefs about the change, and teachers are provided with the necessary encouragement, resources, and professional development to effect successful change. It appears that teachers were involved in many of the studies, but individual teacher responses do not seem connected to administrative support in putting into action TPD strategies to support teachers’ needs for connecting the technology to their beliefs and teaching practice. Exploring the administrative support teachers identify in this study will assist in understanding teachers’ perceptions of the role administration plays in supporting classroom implementation efforts.

*Teacher Professional Development*

Teacher professional development (TPD) is a crucial ingredient for any innovation effort to be successful (Darling-Hammond & McLaughlin, 1995; Lieberman, 1995; Livingston, 2006). Desimone (2002) suggests that teachers view faulty implementation as a result of insufficient PD—they are not provided with the knowledge needed to implement the policy, nor are they provided with examples of successful reform efforts or concerns about the innovation being implemented.

Zardoya and Fico (2001) completed case studies of three Bronx middle schools which implemented compulsory laptop programs (CLPs) in Grades 5, 6 and 7. The laptop program began in the year 2000 by providing 134 students and their teachers with wireless laptops to use both in their classroom and at home. The PD program created for these teachers included 30 hours of in-class and at-home training. The home activities supported classroom instruction in the New York City curriculum standards, and included such activities as using various software
programs (word processing, database, spreadsheet, and multimedia), the Internet, and e-mail. The teachers were provided with a home Internet account that allowed them more opportunity to increase their proficiency with the various applications. Their findings suggest that as a result of this PD and training model, laptop teachers’ frustrations decreased as they became more confident in their ability to implement new ideas and projects into the curriculum, and in making decisions about what forms of technology to use, when to use it in appropriate ways to expand and support learning. However, some teachers resisted this process due to their frustration with the time commitment and training schedule.

Kanaya, Light and McMillan Culp (2005) surveyed 237 Kindergarten to Grade 12 teachers who participated in the ‘Intel Teach to the Future’ professional development program, which focuses on integrating software applications and technology skills into project-based classroom work. Their findings suggest that teachers who participate in highly intensive PD spanning less than three months were more likely to implement “new technology rich lessons or units” (p. 325) than PD initiatives that exceed three months. They also found that intense PD was dependent on the quality of the curriculum content integrated into the PD training. I would argue that for some teachers gaining a deep understanding of course-specific software applications and developing ways to integrate it into teaching practices takes more than three months of intense training; it requires continual reflection and refinements in order to understand the ways a program can be effectively used in teaching and learning.

Research conducted by the Mitchell Institute (2004), a scholarship program that supports Maine high school graduates, produced a final report on the laptop program at Piscataquis Community High School (as part of the Great Maine Schools Project). In the third year of the laptop program, research was conducted through an online survey to all students and teachers as
well as interviews with 12 students and four teachers. The findings reveal that most teachers believe they require more training in specific software programs than what they received. Only 31% wanted more content-specific training in their discipline.

These examples suggest that PD and training models are an important component to implementing innovations in the classroom, but prescribed models that do not address or alleviate teachers’ concerns are ineffective and detrimental to the implementation process. These ineffective approaches focus on learning the technology, rather than focusing on how the technology connects with pedagogy and curriculum content; it appears we may need both. Future TPD activities may need to focus on ways to connect technology, pedagogy and course content, in order for teachers to have a better understanding of how to implement laptop technology into their teaching practices.

Resources

If implementation efforts are to be successful, districts and schools must provide the necessary resources such as funding, human resources, time, and materials (Cohen, 1995; McLaughlin, 1991). Many of these resources, however, are unobtainable due in part to budget cuts in education (Desimone, 2002). In response to this dilemma, some board and school level stakeholders create partnerships with the private sector (e.g., foundations, organizations, businesses) and re-allocate existing resources (Desimone, 2002). In case studies from a national study of innovative schools, Means and Olson (1995) found that eight out of nine school sites were able to launch their technology reform only because they received external funding from private corporations and foundations. In order to accomplish these initiatives, schools need to have authority over their budget and resources. One-to-one computer environments have the advantage of transferring the responsibility for providing computers for student use from the
school to the parent. In these situations, it is the parents who are responsible for ensuring their children have the required technology for their learning. The schools are only responsible for providing the necessary laptop resources to their teachers. It seems with these programs there is now no need to build additional computer labs or purchase more computers for students to use. There should, however, be more funds available to provide curriculum and technology integration support for teachers in CLPs.

Technical support, in the form of repairing malfunctioning laptops and peripheral hardware, was also cited in the literature as essential to successful ICT implementation. In case studies conducted on CLPs, it was found that laptop teachers needed technical support on demand (Folley & Collicoat, 1995; Molina, Sussex, & Penuel, 2005; Wilson, 1995). Silvernail and Lane (2004) studied the impact of Maine’s 1-to-1 laptop program, entitled the Maine Learning Technology Initiative (MLTI) that began in 2002. The program provided all seventh and eighth grade students in the state of Maine and their teachers with laptop computers. A mixed-method approach was used to gather data through online surveys, site visits, classroom observations, and document analysis. They concluded that teachers experience “technical problems and many feel they need more technical support” (p. 33).

Release time for teachers is found to be a key element in effective use of ICT in teaching practices. Tyack and Cubin (1995) believe that teacher preparation and planning time are essential for successful policy implementation efforts. However, Desimone (2002) states that, educational reform in general, “brought an increased workload, but often no increase in preparation time” (p. 452). In a study conducted for the U.S. Department of Education, involving case studies of nine school sites, Means and Olson (1995) found that in order to implement the innovation effectively one of the key supports teachers need is time to learn the
technology and time to integrate it into the curriculum. The qualitative data analysis identified that teachers need a relatively short time period when learning about hardware and software. Providing the necessary time for teachers to think about how to actually integrate technology into their curriculum and teaching practices in appropriate ways was usually ignored during any implementation effort—a key limitation to successful implementation efforts (Means & Olson, 1995). It appears teachers may also need to see examples of successful technology and curriculum integration; a factor that seems to be absent in many PD and resource initiatives.

The limited literature surrounding supports for CLPs does not identify equipment, software and other material as lacking, an issue prevalent in many other ICT implementation efforts. The literature suggests that the main supports CLPs require are human resources (Livingston, 2006; Penuel, 2006). The human element is what McLaughlin (1991) refers to as local capacity—“local expertise, organizational routines, and resources available to support the planned reform” (p. 147). Building local capacity requires listening carefully to teachers’ concerns, observing how teachers use the innovation, involving teachers as PD sources themselves, and using the data to inform TPD practices. These appear to be key elements in understanding teachers’ responses to personal experiences involved when implementing a compulsory laptop program into teaching practices.

Paying Attention to Teachers’ Beliefs and Practices

The literature suggests there has been limited impact of technology in schools (Albion & Ertmer, 2002; Soloway, Norris, & Smolka, 1999; Wurst, Smarkola, & Gaffney, 2008) and indicates that this is attributable to the relationship between teachers’ beliefs and their lesson planning, instruction, and practices (Colgan & Dalgarno, 2009a; Gritter, 2005; Pajares, 1992; Sparks, 2004), and how they use technology (Judson, 2006). Becker (2000, 2001) surveyed
4000 teachers in 1100 schools throughout the United States using the Teaching, Learning, and Computing (TLC) survey. He found that for over 60% of teachers, ICT did not transform their teaching practices. However, he concludes that teachers with constructivist beliefs about teaching and learning use the technology more frequently, in more challenging ways, and have more technical expertise. Unlike some who believe teaching practices change teachers’ beliefs (Kagan, 1992; Pajaras, 1992), Becker found that it is teachers’ beliefs that must precede changes in teaching practices. In a case study of three educators in a laptop program, Windschitl and Sahl (2002), in their analysis of teacher observations and interviews, found that the ways teachers learn to implement ICT are “powerfully mediated by their interrelated belief systems about learners in schools, about what constituted ‘good teaching’ in the context of the institutional culture, and about the role of technology in students’ lives” (p. 165). This study supports Becker’s findings.

Gritter’s (2005) study also supports Becker’s (2000, 2001) findings when he surveyed 402 middle school teachers from Maine’s laptop program. He found that while “teaching philosophy does impact computer use both by the teachers themselves and by the students in their classrooms…nonetheless the best predictor of computer use is prior experience” (pp.7-8), considered either early adopters or early majority users by Rogers (2003), and defined as experienced users in this study. Gritter recommends an emphasis on pre-service computer PD to increase the amount of experience. One of the first and most comprehensive studies of CLPs is the Rockman Report (1999a, 1999b) funded by the Microsoft and Toshiba corporations. It is a three-year evaluation that includes 13 laptop schools and surveyed 450 students and 50 teachers. From the data emerged the findings that (a) the laptops acted as catalysts as teachers transformed their practices from a teacher-centred to a more student-centred approach, (b) more than 80% of
teachers reported an increase in their use of reform-based pedagogy, and (c) laptop teachers showed significant changes in their practices by placing students at the centre of the learning, using two-way discussions, and encouraging student-led inquiry. This study indicates that technology assists teachers in redefining their belief systems and this changes their teaching practices. It may be that both can occur, beliefs changing practices and practices changing beliefs.

Teachers’ beliefs also appear to change through the support and learning provided through interaction with both their students and their colleagues. A case study of Kilvington Baptist Girls Grammar Schools in Australia, one of the first schools world-wide to adopt and implement a CLP, found that teachers and students learned together how to use the laptop equipment and software (Folley & Collicoat, 1995). This study notes that teachers became more contemporary in their teaching practices, as their role changed from a dispenser of knowledge to that of a facilitator. A case study completed at Trinity Grammar School in Australia found that laptop teachers become partners with their colleagues in the design of learning experiences (Shears, 1995). It is believed that these laptop teachers change their role in the classroom in part due to a mentoring program. Teachers are learning from teachers, an approach that theory suggests is a powerful strategy for changing the beliefs and practices of teachers (Fullan 2007; Hargreaves & Fullan, 1992; Theissen, 1992). In CLPs, teachers also appear to be learning from their students.

The literature on teacher beliefs also reveals that implementing technology innovations in education is facilitated by beginning with a small group of early-adopters—teachers who buy in to the innovation (Desimone, 2002; Rogers, 2003; Shears, 1995). In case studies conducted in Australia, the initial group of laptop teachers was able to sustain interest in the innovation, model
exemplary practices, and assist other teachers in understanding how the technology could be implemented in teaching and learning (Desimone, 2002; Shears, 1995). In a study conducted on the first large-scale laptop computer program in Europe (France), Jaillet (2004) surveyed 798 pupils and parents. The findings indicate that students use the laptops much more frequently for personal use rather than for educational purposes. This may suggest that pedagogically, teachers are not using the laptops with their students in curriculum-based initiatives.

The above examples about the relationship between teachers’ beliefs and their practice, suggest that teachers’ beliefs are an important concept to define as they appear to assist in explaining how teachers conceptualize their work. It follows then that teachers’ beliefs, for the purpose of this research, can be defined as teachers’ concepts about what effective pedagogy, curriculum, and learning are within a compulsory laptop program. These examples suggest that more attention may need to be given to teachers’ concerns about their beliefs and teaching practices by the stakeholders responsible for adopting the CLP. By understandings teachers’ beliefs, stakeholders will be better able to support their needs through relevant teacher professional development activities, ongoing experiences with laptop technology, and connecting the technology uses to pedagogy and curriculum. Teachers believing that administrators listen to and value their opinions may increase the chances that teachers will be intrinsically motivated to use the innovation in desired ways. Ignoring any one of the facilitators of change or teachers’ beliefs about teaching and learning, however, means they could actually became inhibitors to the change process.

Inhibitors of Planned Change

The barriers to change framework is extended from the concept of first- and second-order change (Cuban, 1993; Fullan & Stiegelbauer 1991). Fullan and Stiegelbauer state that first-order
change occurs when there are adjustments to current practices, but the original beliefs about teaching and learning remain intact. Second order change challenges teachers’ beliefs about teaching and learning practices and results in new goals, structures, and roles.

Although many teachers today recognize the importance of using technology in their classrooms, they seem to be impeded by barriers. Barriers to ICT implementation can be defined as factors that affect change facilitators’ efforts (Ertmer, 1999). The barriers are categorized into two major areas: first- and second-order barriers to technology implementation (see Table 6).

*First-order Barriers*

First-order barriers to adopting ICT in the classroom are those “obstacles that are extrinsic to teachers” (Ertmer, 1999, p. 49); they are outside the implementers control. These barriers include ineffective PD and training, a lack of resources (e.g., equipment, support, time), and inadequate technical and administrative support (Bradshaw, 2002; Ertmer, 1999; Fairman, 2004; Fullan & Pomfret, 1977; Harris & Smith, 2004; Hill & Reeves, 2004; Hope, 2002; Marcinkiewicz, 1994; Roblyer, 1993; Spillane et. al., 2002).

<table>
<thead>
<tr>
<th>First-order barriers</th>
<th>Second-order barriers</th>
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<tr>
<td>Ineffective TPD and training</td>
<td>Traditional teaching beliefs</td>
</tr>
<tr>
<td>Lack of resources (e.g., equipment, support)</td>
<td>Traditional teaching practices</td>
</tr>
<tr>
<td>Inadequate technical support</td>
<td>Lack of a clear vision</td>
</tr>
<tr>
<td>Inadequate leadership</td>
<td>Lack of shared goals</td>
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At Cincinnati Day School, administration witnessed the results of insufficient PD and training of their laptop teachers. One administrator stated, “There was a considerable number of people [teachers] who left after the first year of the laptops” and admitted it was due to a lack of
PD and training before the program began (Dean, 2000). Another example of what happens when administrative support is lacking is illustrated in an evaluation of the Copernicus Project. This project was a partnership between Seattle school districts, the Toshiba and Microsoft Corporation, and parents (Fouts & Steun, 1997). It was a multi-school district effort to implement ICT into education and was modeled after similar programs in Australia. The evaluation of the initiative stated that the teachers involved believed administration promised them much more teacher training and technical support than was actually provided. They received isolated workshops, but needed one-on-one training. As one teacher stated, “Maybe if I had been trained on how to use it [the technology] better, it would be different” (p. 17). Due to this perceived lack of administrative support, some teachers were unsure about participating in the program in the future.

In a Delphi study designed to determine strategies to help superintendents overcome implementation barriers of CLPs in K-12 schools, Anderson (2008) asked a national expert panel of 26 superintendents and technology leaders who had experience with laptop programs to identify five strategies that would help change facilitators overcome implementation barriers. She concluded that it was very difficult to attain full implementation without a leader who had (a) a clear vision and could inspire teachers to support the vision, (b) technical capacity to support teaching with laptops, (c) belief that student learning should be the focus of TPD, and (d) opportunity to change teachers’ instructional methods in the classroom. Without these supports by administrators in place, it may be difficult to implement a CLP.

Teachers who participated in the HOIT project, a non-laptop environment, cited several barriers that prevented them from implementing ICT into their curriculum and classroom activities (Shulha et al., 1998). These teachers stated that there was no forum available to share
and collaborate with other teachers, there were not enough workshops that increased technological knowledge, there was insufficient on-site technical support for troubleshooting issues, there were hardware and software limitations (e.g., computer crashes, complicated software), and there was a lack of funding for computer equipment. The most frequently cited barrier to implementation was a lack of time to plan curriculum and learn the technology. In a typical laptop program some of these issues (access to hardware and technological support) are eliminated. Laptop teachers did identify the need for collaboration and a lack of time to focus on integrating laptop technology into their teaching practices (e.g., Davis, Garas, Hopstock, Kellum, & Stephenson, 2005). The few studies focusing on laptop programs do indicate that technological support is adequate, whereas, there is a need for professional development that focuses on content issues (Davis, et al, 2005). The literature suggests that in laptop programs, administrators provide a mechanism for ample technological support, but this assumes teachers can make the connections to content integration in their teaching practices on their own. Studying teachers’ beliefs, and behaviours will provide an understanding of whether teachers actually do make the connection between technology, pedagogy, and content during the implementation process. Coppola (2004) sees administrators and leaders enabling teachers’ practices rather than controlling them. She states that powerful instruction emerges from a teachers’ understanding and ownership of teaching strategies, and it is leadership that enables teachers to acquire knowledge and understanding of embedding technology into teaching practice, rather than through top-down approaches that mandate specific pedagogical practices.

It becomes evident that the same factors that facilitate implementation of ICT are also those identified as first-order barriers when they are absent. PD and training appear to be a key barrier to adopting ICT innovations in the classroom. Indeed, if teachers’ concerns about the innovation
are identified and understood by those adopting a compulsory laptop program the level of success for implementing the planned change may increase.

Second-order Barriers

Second-order barriers to adopting and implementing an innovation are intrinsic and involve basic changes to teaching practices and teachers’ beliefs (Kerr, 1996; Richardson & Placier, 2001). They are viewed as less tangible, deeply rooted, and more personal than first-order barriers (Kerr, 1996). They are documented as having the potential to cause more problems than first-order barriers (Dede, 1998; Fisher, Dwyer, & Yocam, 1996). Hope (2002) suggests that these obstacles can include apathy about the policy and disagreement about how to achieve desired results—both relate to teachers’ beliefs and teaching practices.

In a study of 118 participants, Zhao, Pugh, Sheldon, and Byers (2002) found 11 factors to help explain conditions in which technology innovations were unsuccessfully integrated into the classroom by identifying each teacher or teaching team’s technology projects’ implementation efforts as being either successful, partially successful, or unsuccessful. Those pertaining to teachers include (a) a lack of knowledge about the specific technology used in teaching, (b) a lack of “compatibility between teacher pedagogical beliefs and the technology” (p. 491), (c) a lack of social awareness about the school culture and social dynamics of colleagues, (d) the distance the technology is from a teachers pedagogical beliefs and practices, (e) the amount of dependence that must be placed on either human or hardware resources, and (f) the context in which the innovation takes place (e.g., social supports, human and technical infrastructure). They also found that innovations low in distance and dependence are the simplest to implement and therefore have the greatest levels of success.
In a case study of Brewster Academy, a private school in New Hampshire, Bain (2000) found that laptop technology can complement educational goals only after the school has a clear vision of what is meant by successful teaching and learning. He notes that after a six-week pre-service training session, teachers still needed to see how their technological learning connected to classroom practices. This suggests that communicating an action plan as part of the policy dissemination process is important for teachers’ understanding of their role as implementer. As well, the literature indicates that teachers may need teacher professional development that not only focuses on the technical aspects of how to use the laptops and the software programs, but why and how laptop use connects to their own pedagogical beliefs and course content.

Hargreaves and Fullan (1992) agree that a necessary component of successful change is the “development of a common vision, commitment of shared goals, or developing clarity in and understanding of the goals being implemented by others” (p. 5). Complete implementation does not seem attainable for schools that are implementing a laptop program without a shared vision and goal-setting process in place.

A study by Ertmer, Addison, Lane, Ross and Wood (1999) examined the ways in which teachers were using technology in their classrooms with the goal of describing what teachers’ beliefs and values supported or hindered effective use and implementation. The six week data collection period involved teacher surveys, three semi-structured interviews, and observations in seven primary teachers’ classrooms all within the same school site. They found that the barriers mentioned most frequently included first-order barriers—time, equipment and support. The second-order barriers included relevance of the innovation and teacher confidence level. They concluded that first- and second-order barriers should be addressed simultaneously and involve the following supports:
1. Incorporate a dual focus on technological and pedagogical issues during training efforts.

2. Foster a broader vision of technology integration.

3. Provide instructional resources (models, mentors, peers) during the change process.

4. Provide opportunities for reflection, collaboration, and discussion with peers. (p. 70)

Another study was conducted as a part of the Apple Classrooms of Tomorrow (ACOT) program. The teachers involved in the program were volunteers and the ultimate implementation goal was to change teaching instruction and learning (Dwyer, Ringstaff, & Sandholtz, 1991).

The researchers found that part of the challenge in adopting ICT was a result of the centralized organizational structure and the traditional policy implementation methods; “district and state mandates and expectations actually discouraged teachers due to traditional instruction” (p. 50).

They concluded two conditions must be present in order to reform educational programs:

1. Teachers must be given an opportunity to reflect on their own beliefs about learning and instruction and to develop a sense of the consequences of alternative belief systems.

2. Administrators must be willing to implement structural or programmatic shifts in the environment, for teachers who are instructionally evolving. (p. 51)

This literature pertaining to ICT in the classroom suggests that the affective, emotional domain of teachers is an important, yet understudied, component of a successful planned change initiative. Bloom (1984), in his seminal work, identifies the affective domain and described the manner in which teachers deal with emotional events as evolving though five major categories: receiving phenomena, responding to phenomena, valuing, organizing, and internalizing values. This study attempts to understand attributes from the teachers’ affective domain—feelings,
values, and beliefs—through identifying their concerns about the CLP. Hargreaves (1998) studied 13 American high schools and found that emotional practices of teachers as well as their knowledge should be recognized during implementing educational change. For example, teachers become emotional if the change implies that their teaching methods of the past are ineffective. In the one study on laptop schools and teachers’ concerns, Donovan, Hartley and Studler (2007) state that, “it is critical that when asked to adopt an innovation teachers feel important and involved” (p. 279). The implications of this emotional consequence are said to be detrimental to school reform efforts (Gulek & Demirtas, 2005; Hargreaves, 1998; Lampert, 1990).

Giving teachers the necessary professional development opportunities for overcoming these barriers and enacting the policy vision and goals are strategies deemed essential for successful adoption and implementation of a planned change initiative involving an educational innovation (Gritter, 2005; Gulek & Demirtas, 2005; McLaughlin, 1991; Means & Olson, 1995). This study is an attempt to acknowledge and understand teachers’ emotional and behavioural responses to a compulsory laptop program in order to assist change facilitators in supporting teachers in the implementation process.

Teacher Professional Development Models

Adult Learning Theory

“Learning is understood as the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one’s experience in order to guide future action” (Mezirow, 1991, p. 162) and allows adults to adapt to our rapidly changing world. Respecting how adults learn is important when implementing a planned change initiative in schools—teachers must be supported when learning about and adopting the change. Knowles (1968)
believe andragogy (helping adults learn) involves a system of concepts or a model of assumptions that assist in understanding how adults learn. It consists of five assumptions about adult learners: (1) they are able to direct their own learning, (2) their experiences provide them with a rich resource for learning, (3) social roles are closely related to personal learning, (4) they are interested in applying immediate knowledge to solve problems, and (5) learning is motivated by intrinsic rather than extrinsic factors.

Mezirow (1991, 1997) and Taylor (2007) expanded on Knowles (1968) assumptions about adult learning through the transformational learning theory. This theory, grounded in communication, suggests there are five components necessary for adult learning to take place. These include, (1) self-reflecting, (2) establishing relationships with peers, (3) changing perspective, (4) developing a purpose for the new learning(s), and (5) identifying a personal and historical context for change. One of the premises of this theory is that the facilitators of change are able to recognize when teachers are ready for a transformative experience in order that meaning can occur (Taylor, 2007). This theory also suggests that the learning process will occur when there is a combination of support, trust, friendship and intimacy. By attending to the emotional well-being is an important part of the educational change process (Hargreaves, 1998), a second-order barrier to change is addressed. It appears adult learning theory, as described by Knowles, Mezirow, and Taylor, is connected to teachers’ intrinsic beliefs about teaching and learning and their attempts to connect the laptop program to these beliefs.

Shulman (1987) contends “teaching is, essentially, a learned profession” (p. 9). It follows then that learning to teach may be a lifelong developmental process (Harrington, 1994; McCarthy & Riley, 2000) that involves the continual deepening of both knowledge and skills (Cuban, 1990) as suggested in the adult learning theory literature. Teachers are learners on their
own professional journey (McCarthy & Riley, 2000) and professional development is an ongoing and continuous process that takes place throughout one’s teaching career (Erikson, 2007, Jones, 1995; Kegan, 2000; Loucks-Horsley, Stiles, & Hewson, 2000).

Teacher Knowledge

Shulman (1986) identifies three areas of knowledge that teachers need in order to be effective. First, teachers need a deep understanding of content knowledge (CK). Teachers who teach without this understanding need opportunities to learn that equip them with knowledge and skill that will enable them to teach effectively (Ball, 2003; Loucks-Horsley, Stiles, & Hewson, 2000). Second, teachers need pedagogical knowledge (PK)—an understanding of the methods and strategies of teaching that allow them to continually develop and refine their own practices. Third, teachers need pedagogical-content knowledge (PCK) for understanding specific methods, resources and strategies that are proven to work well when teaching a particular content area (Brown & Borko, 1992; Carter & Day, 2002; Loucks-Horsley, Stiles, & Hewson, 2000). Pierson (2001), and Mistra and Koehler (2006) added technological knowledge (TK) and technological-pedagogical-content knowledge (TPCK) to Shulman’s main categories as shown in Figure 3. Technological knowledge (TK) includes a range of knowledge from using basic software programs to integrating technology into subject content areas. TPCK concerns the teachers understanding and ability to use technology effectively in classroom contexts for teaching their subject matter. This intersection of all three knowledge areas will define effective technology integration—a teacher who is able to draw on extensive content and pedagogical knowledge to intersect with their technology knowledge (Lawless & Pellegrino, 2007). Surrounding the areas of knowledge and affecting all aspects of new knowledge acquired is the context within which the knowledge is acquired and learned (Mishra & Koehler, 2006).
Loucks-Horsley and Matsumoto (1999) maintain that effective professional development must address all areas of knowledge; therefore, professional development that transforms teaching and builds substantial knowledge of curriculum content cannot be a straightforward task of ‘plan and implement’ (Loucks-Horsley et al., 2003) accomplished by simply instituting ‘innovations’ or adding a few strategies to teachers’ repertoires (Acquarelli & Mumme, 1996; Smith, 2001).

Many times we act as if learning happens as a direct result of exposure to new information; as if at the moment of hearing new information, we ‘learn’ it. Learning is much more complex than that, especially when the goal of learning is to build the capacity of the individual or the system. (Wald & Castleberry, 2000, p. 8)

Due to the dramatic shift in curriculum content and increased focus on conceptual understanding, non-routine problem-solving, and ICT integration (Goldsmith, 2001), professional development specific to teachers’ needs is central to education reform (Cavanaugh & Ritzhaupt, 2006; Lee, 2001, Livingston, 2006). Fundamental change can only occur over time.
through active engagement with new ideas, understandings, and real-life experiences, and through experimentation with new behaviours and ways of doing. (Loucks-Horsley et al., 2003; National Staff Development Council, 2002). As Penuel (2006) states,

Most educational technology innovations combine social, pedagogical, and technological elements, and program designers must constantly adapt and reconfigure these elements as programs evolve. (p. 342)

Education reform leaders are acknowledging the central role that TPD must play in systemic reform efforts. In practice, however, even studies of exemplary TPD efforts report that it is difficult to maintain support for teachers after an institute or workshop, or to encourage sustained discourse among participating teachers (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson 1996; Romberg, 1997). Moreover, teachers have little time to develop and test new ideas, assess the effects, and adjust their strategies and approaches (Cook & Fine, 1996). Hence, TPD models are shifting from traditional to newer alternative approaches—a significant observation for educational researchers and administrators serious about providing effective support to teachers. Understanding and listening to teachers’ responses to their personal TPD needs and giving them a voice could assist in the implementation of compulsory laptop programs. “Too often, teachers who are going through the change process are not consulted on the usefulness of the innovation yet are expected to adopt it with open arms” (Donovan et al, 2007, p. 279).

*Traditional Teacher Professional Development*

Traditional forms of TPD, including workshops, train-the-trainer, and speaker series, have relied primarily on transmitting new ideas of teaching and learning through top-down, hierarchical structures (Ruopp & Haavind, 1993). In traditional TPD models, the learning occurs in “formal, highly structured activities outside the context of [teachers’] actual work” (Schlager,
Fusco, & Schank, 1998, p. 2), gives teachers little control over the content, focus and interactivity of sessions (Sykes, 1996), and are often scheduled at inappropriate times (Guskey, 1995). Research on such models suggest they are not sustainable, generative or collaborative; do little to bring about significant change to teaching practices and student achievement; and are isolated from enacted teaching practices (Dalgarno & Colgan, 2007; Guskey, 1995; Loucks-Horsley et al., 2003).

These traditional approaches to technology PD focus on teachers learning how to use the technology without connecting it to how to integrate it into curriculum and pedagogy (McCannon & Crews, 2000; Penuel, 2006). Traditional technology PD leaves teachers unprepared for rapidly changing technology (e.g., software, hardware, terminology) (Mishra & Koehler, 2003). In this tradition, there is an emphasis on a checklist of competencies which Mishra and Koehler (2006) suggest is inappropriate due to (a) the rapid rate of technology change, (b) the software which is designed primarily for business rather educational purposes, (c) the contextual nature of learning, and (d) the emphasis on what skills teachers need rather than how teachers will acquire these skills.

Traditional approaches to PD are often based on an outside expert’s opinion of what teachers needed, not what they wanted, provides neither the content nor the opportunities teachers view as essential for their professional growth (Loucks-Horsley et al., 2003). Research suggests that these approaches are far removed from the present day-to-day classroom practices (Lawless & Pellegrino, 2007). Alternative TPD models may be more effective for assisting educational researchers and administrators in supporting teachers’ needs as they address teacher identified shortcomings of more traditional approaches.
Alternative Teacher Professional Development Models

TPD models are shifting “from a transmission model of information transfer to a socially and culturally situated process of knowledge construction” (Jenlink & Kinnucan-Welsch, 1999, p. 377) because studies continuously show that traditional methods are not meeting the needs of teachers (Ball & Cohen, 1999; Silvernail & Lane, 2004). This shift suggests that teachers profit more from the knowledge and insights they develop in their own ways through activity, discourse, reflection, inquiry and application within their own particular context (Jenlink & Kinnucan-Welsch, 1999; Lawless & Pellegrino, 2007; Osterman & Kottkamp, 2004; Sparks, 2004) than from prescriptions that give them little practical leeway (Kennedy, 1999). When asked, teachers request TPD content that (a) is endorsed by research (b) addresses both content and pedagogical knowledge within the context of the teachers’ learning experiences, (c) provides opportunities in a variety of social groupings, both formally and informally, to access and discuss exemplary reform-based resources, and (d) allows them to create and publish resources for new teaching practices (Ball, 1996; Coburn, 2001; Cooney & Krainer, 1998; Dalgarno & Colgan, 2007; Guskey, 2003; Lieberman, 1995; Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003; Sparks, 2004; Sykes, 1996).

There is a movement at the grassroots level to design local, relevant solutions to meet the needs of groups who share common challenges. These smaller, local professional development initiatives can take a variety of forms but all include at their core a community of learners who have worked together over time and go beyond the mere sharing of information to include dialogue, reflection, and feedback to and from each other (Cooner & Tochterman, 2004; Lieberman, 2000; Shaughnessy, 1998). These alternative forms of TPD adopt a structure that is predominantly informal, occurs in context (Schlager, Fusco, & Schank, 2002), and involves
“consultation, problem-solving, and program development” (Little, 2001, p. 23). Book clubs are one example of this approach because they can provide opportunities for teachers to reflect with colleagues, expand their content and pedagogical knowledge, actively engage in the learning process, and reduce the isolation often experienced by teachers (Kerka, 1996).

The literature specific to the unique challenges of learning how best to teach does reveal that more collaborative and communicative forms of TPD are only effective if the opportunities (a) engage teachers in experiences similar to those they wish for their students, (b) provide teachers with leadership experiences, (c) include evaluation, critical reflection, and mechanisms for improvement and, (d) allow for collaboration with colleagues (Cooney, 1994; Darling-Hammond & McLaughlin, 1995; Loucks-Horsley et al., 2003; Osterman & Kottkamp, 2004).

Mentoring, coaching, and peer observations are examples of approaches that provide support through the formation of a personal relationship that is focused on individual needs. Lesson study is an example of a TPD strategy that encourages teachers to examine their own practices by collaboratively interacting with colleagues to plan, teach, observe, and critique lessons (Crockett, 2007; Fernandez, Cannon, & Chokshi, 2003; Ma, 1999). In the Third International Mathematics and Science Study (TIMSS), Hiebert and Stigler (2000) analyzed videotapes from hundreds of classrooms worldwide. They found that Japanese students are among the highest achievers, in part, because Japanese teachers are empowered to take charge of their own professional development by implementing the process of lesson study thereby enhancing their own learning as well as their students’ learning—through the formation of a community of teachers.

Learning technology by design is another alternative TPD model that promotes collaboration among colleagues. In three case studies conducted by Misha and Koehler (2003),
they found that teachers work collaboratively in small groups to develop technological solutions to “pedagogical problems” (p. 1032). Through this model, teachers are producers of the technology and learn in a way that connects the technology uses to their own TPCK (Misha & Koehler, 2006).

Alternative TPD models have evolved to theories of learning that are more cognitive and constructive in nature and can be applied to TPD practices. In summary, alternative TPD models not only address the weaknesses of traditional models but are also characterized by research-based activities, informal processes, and critical thinking and reflection (Hirsh, 2004; Sparks, 2004). They must also, however, take into account teachers’ concerns about and their uses of the educational innovation being adopted and implemented; voices at the grassroots level that are key to successful implementation efforts within CLPs.

To date, most empirical studies that have focused on teachers’ uses of laptop program innovations have been conducted in Australia and the United States, and lack a connection between teachers’ concerns, uses and professional development practices surrounding the innovation. Unlike these studies, this study is Canadian-based and focuses on bridging the gap in the literature that connects teachers’ concerns about the innovation, teachers’ uses of the innovation, and the TPD models and policies presently in place to support these uses and concerns. In fact, it is very rare that teachers’ concerns are sought out or acknowledged as an important voice in planned change initiatives. For example, early attempts to introduce “teaching machines and computer terminals into the classroom…show how behavioristic strategies, computer-aided instruction, and the primitive nature of the technology led to so-called computer laboratories” (Johnstone, 2003, p. 5), decided upon by school policy-makers rather than through strategic consensus that included all stakeholders affected by the decision. This
literature—policy implementation, implementation models, facilitators and inhibitors of planned change, teachers’ beliefs, teacher professional development models—combines to frame the structure for the methodology of this research. Online survey questions, the Stages of Concern questionnaire, interview and focus group questions, and classroom observations are structured from the review of literature.

Theoretical Framework

This research is primarily framed by three theories of educational innovation adoption and implementation: the Concerns-based Adoption Model, the Adopter Categorization model and by the barriers to educational change.

*The Concerns-Based Adoption Model*

The CBAM is used as the framework for identifying teachers’ concerns and uses within a CLP, rather than the ACOT model, as it appears to be more adaptive to individual teacher’s needs. ACOT is based on very prescriptive forms of TPD, depending on which of the 5 evolutionary phases teachers are placed. Little attention is paid to the individual in this model, whereas the CBAM appears focused on the individual when identifying stages of concerns and levels of use through the SoC questionnaire and the LoU interview protocol administered to each teacher in the face-to-face interviews. As well, unlike the ACOT model, CBAM is described by Hall and Hord (2006) as being adaptive to the implementation process as it recognizes that teacher concerns and uses of the innovation can change over time.

The two major components of the CBAM were used to gather data about high school teachers concerns and uses of the education innovation under study—the compulsory laptop program (CLP). Hall and Hord (2006) classify concerns about implementing an innovation through studying stakeholder’s perceptions and feelings—a key purpose of this study. The
techniques for assessing teachers’ SoC in this study were through an online survey, semi-structured interviews and administering the 35-item Stages of Concern Questionnaire (SoCQ) during the interview process (see Hall & Hord, 2006, p. 279). It is important to note that although CBAM identified attitudes as part of the SoC measures, teachers’ attitudes are typically measured using a positive and negative type scale. This study does not, however, use this type of measure; instead this research is based on the tradition that focuses on teachers’ beliefs and practice rather than their attitudes. The CBAM’s LoU framework addresses “behaviors and portrays how people are acting with respect to a specified change” (Hall & Hord, 2006, p. 159)—another key purpose in this study. LoU addressed questions relating to how teachers are using the innovation and what behaviours they exhibit as they try to implement a CLP in their teaching practice. Hall and Hord identify eight levels of use that describe the behaviours of the innovation users: nonuser, orientation, preparation, mechanical, routine, refinement, integration, and renewal (see Table 2). This linear framework allows participants to be categorized into one of the eight levels of use. A focused interview (see Hall & Hord, 2006, p. 168) employs “questions that are based on a set of seven categories or dimensions that compose each LoU: knowledge, acquiring information, sharing, assessing, planning, status reporting and performing” (Hall & Hord, 2006, p. 167). The SoC and LoU frameworks provide a model for identifying teachers’ concerns about and uses when implementing a CLP into their teaching practices.

**Adopter Categorization Model**

Roger’s (2003) adopter categorization model provides a frame to identify where teachers place themselves in terms of their level of experience with laptop use and the characteristics associated with that particular category (see Table 4). Roger’s model suggests that teachers in a
school system decide to use laptop technology at different times during their decision making process. In this case, teachers are classified according to the when they decide to use the innovation. For the purpose of this study innovators and early adopters are identified as experienced users of laptop technology; early majority are intermediate users; late majority adopters are termed novice users, and laggards are identified as non-users of the technology. Each category is characterized in Table 4.

First- and Second-order Barriers to Change

As discussed in the review of literature, the framework ‘barriers to change” was born from Fullan and Stiegelbauer’s (1991) concept of first- and second-order change. They described first-order changes as improvements to existing organizational structures. Second-order changes are altering “the fundamental ways in which organizations are put together” (Fullan & Stiegelbauer, p. 29) and challenge teachers beliefs about teaching and learning. They suggest that most educational changes are first-order reforms; most second-order reforms result in implementation failure.

Ertmer (1999) adapts the barriers of change theory to specifically address information and communication technology (ICT) implementation. She defines first-order barriers as extrinsic in nature and outside a teacher’s control. They include features such as lack of resources, ineffective technical and administrative support, and ineffective teacher professional development. Second-order barriers to ICT implementation are identified as intrinsic in nature and involve fundamental changes to teaching practices and beliefs. These types of barriers included traditional teaching beliefs and practices, lack of a clear vision, and lack of shared goals (see Table 6). Identifying teachers’ perceptions of first- and second-order barriers to change was
through both quantitative and qualitative methods—a survey, interviews, focus groups and classroom observations.

Summary of Chapter

The review of literature identifies policy-making and definitions, adoption and implementation models, facilitators and inhibitors (barriers) of change, and teacher professional development as important components of implementing an educational innovation. The models suggest that implementers (e.g., teachers) moved through linear progressions of policy-making, uses and concerns about laptops in an over-time sequence. The facilitators and barriers identified provide potential reasons why the implementation process succeeds, fails or has limited success. For example, the literature suggests that a lack of support and resources, traditional approaches to professional development initiatives, and disconnect between teachers’ beliefs and the nature of the innovation can become barriers to the change process. The theoretical framework incorporates many aspects of the literature reviewed.

The theoretical framework for this study initially provided a method for identifying participants’ levels of use, stages of concern, levels of experience, and strengths and barriers that affect implementing an educational innovation through a planned change initiative. By studying these features through a teacher’s lens, greater knowledge can be gained about the complex nature of effecting educational change by implementing an innovative program in schools. Teachers’ voices need to be heard and their actions studied if educational innovations are to be implemented effectively in the teaching and learning process. The limited literature that focuses on teachers’ responses to the compulsory laptop program is being addressed by this study.
CHAPTER 3: METHOD

Overview of Chapter

This study used a multiple-method approach. It involved a survey and a case study (Black, 1999; McMillan & Schumacher, 2006; Stake, 1995). This chapter describes the research methods used in the study and includes five sections: methodological framework, research setting and participants, role of the researcher, data collection methods, and data analysis methods.

Methodological Framework

A quantitative survey research design was also employed to provide an overview of teachers’ responses to implementing a CLP and to assist in developing an initial framework in which to organize the data about teachers’ beliefs, behaviours, and perceptions that emerged from the qualitative data. The qualitative research case study design was used to examine a “bounded system” (McMillan & Schumacher, 1999, p. 26) in order to understand how and why teachers in one school are using the laptop technology in their teaching practices, and what supports and challenges they face when implementing a CLP policy in the classroom. The framework begins with a description of the online survey methodology.

Quantitative Methodology: The Online Survey

The quantitative data from the online survey provided a framework to analyze, interpret, and understand the case study data. The survey helped to situate the main issues and emergent themes from the case study analysis. Stake (1995) states “the real business of case study is particularization, not generalizations” (p. 8). He suggests that a case study is not conducive to making wide-reaching generalizations. Stake refers to generalizations in case study as “petite generalizations” (p. 7) because specific identifiable problems or responses will surface during the
analysis of the case. Stake (1995) and Black (1999) believe that traditional co-relational or comparative studies involving representative samples allow for generalizations in research. Although we cannot generalize from a single case, in order to make the results of this study as ‘sharable’ as possible, the quantitative data obtained from an anonymous online survey provide a method of determining if any of the case findings were either generalizable to the schools surveyed or “idiosyncratic to the group contracted” (Black, 1999, p. 49)—that group being the case study school.

**Qualitative Methodology: The Case Study**

A case study attempts to “examine a contemporary phenomenon in its real-life” (Yin, 1981, p. 58). Both Stake (1995) and Patton (2002) suggest educational case study research involves people and programs. A case can involve teachers or innovative programs and is a “specific, complex, functioning thing” (p. 2). Stake further describes case studies as being comprised of a purpose, inner workings, and a system; this research involves the study of an innovative program (the compulsory laptop program), whose working parts (e.g., teachers, students, administrators) are an integrated part of a larger educational program—all components of a case study as described by Stake. Patton (2002) and Stark and Torrance (2005) state that interviews, and observations are effective methods for collecting qualitative data. Hence, in order to provide a comprehensive picture of the CLP, as perceived by teachers, four primary methods of data collection were employed: individual interviews with 15 teachers, two part time teacher/administrators, and one full-time administrator; two teacher focus groups; five classroom teacher observations; and follow-up e-mail interviews with 21 teachers from the original interviews and focus groups.
Individual Interviews

Patton (1990) suggests that the purpose of face-to-face interviewing is to “find out what is in and on someone else’s mind” (p. 278). This technique was used to discover the perspective of the teachers being interviewed. Interviewing assumes that the participants’ perspectives are knowledgeable and meaningful (Stake, 1995). In this study, 15 individual teacher interviews were conducted in order to “obtain the descriptions and observations” (Stake, 1995, p. 64), to identify “multiple realities” (p. 64) and to “understand behavior, issues, and contexts” (p. 78) from participants in the CLP.

Individual teacher e-mail interviews (EI) were also conducted three years after the original face-to-face interviews and focus groups in order to determine if there were any major changes to the original data collected. This method of interviewing allowed me to follow up on any changes in uses, concerns, or facilitators and barriers to teaching in a CLP by provided a venue to conduct an engaging conversation that was less intrusive than the face-to-face interviews and more synchronous for the teachers (Gay, Mills, & Airasian, 2008).

Focus Groups

Krueger and Casey (2000) state that the purpose of focus groups is to ‘promote self-disclosure among participants” (p. 7); participants in this study disclosed their beliefs, feelings and behaviours about implementing a CLP in their classroom practices. Focus groups can be conducted “during a program to identify strengths, weaknesses, and needed improvements” (Patton, 1990, p. 336) and to identify significant elements during an implementation process (Patton, 2002). It is a method of finding out what people, who have a commonality, think and feel (Morgan, 1988). Similar to the individual interviews, two focus groups were conducted in order to (a) find a range of feelings that teachers have about the innovation (b) understand the
differences in perspectives and uses between categories of people, and (c) to assist in reaching saturation—the point where no new information is being obtained (Krueger & Casey, 2000).

Classroom observations

Classroom observations were conducted in this study in order to “increase our understanding of the case” (Stake, 1995, p. 60). Collecting participant observational data allowed me to record teacher behaviours as they occurred in real life and assisted to corroborate the interview data obtained from the teachers being observed (McMillan & Schumacher, 2001; Patton, 1990). Viewing the teachers’ WebCT\(^5\) course pages also provided a method of corroborating that what was observed in the classroom and stated in the interviews was taking place. The interviews, focus groups, and classroom observations were conducted in order to identify and understand the teachers’ responses to the adoption and implementation of an educational innovation.

Research Setting and Participants

Nine independent schools in Canada participated in the survey, all of whom were members of the Canadian Association of Independent Schools (CAIS) and taught Grades 9 to 12. The nine schools selected were based on the willingness of the Headmaster/mistress to participate in this study. Purposeful sampling was used to find a case that supported the purpose of the research—to study teachers’ responses to the adoption and implementation of a compulsory laptop program. Two overall criteria were considered when selecting the case study school and the participating teachers: the school must be implementing a CLP in Grades 9 to 12, and the participants must teach Grades 9, 10, 11 or 12. Once the research site was selected, the

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\(^5\) WebCT is a learning management system (LMS) designed to deliver, manage, and track courses. In this study, it is used by teachers and students as course management software.
participants were selected based on their willingness to engage in interviews or focus groups, and classroom observations.

**Online Survey Setting**

The online survey involved nine Canadian secondary independent schools, all of which had compulsory laptop programs. All schools participating in the online survey were members of the Canadian Association of Independent Schools (CAIS).

**Case Study Setting**

The case study involved a focused study of one independent school in Ontario. It is also one of the nine schools that participated in the online survey. It is a co-educational boarding school that had a fully operational compulsory laptop program (CLP) in grades nine to 12 since September of 2001.

The school under study was established in the 1800s and is a rural co-educational, independent school that offered preparatory education for grades 5-12. It is primarily a boarding school in which students lived in on-site residences throughout the year but there was also a day school component as well. Day students, who live within bussing distance to the school, attended on a daily basis. The Senior School [Grades 9-12, also known as Foundation Year (FY) through Year Four (Y4)] comprise of approximately 500 students, 60% of whom were boarders. The Junior School included 100 day students from Grades 5 to 8.

In 1997, the administrative team brought together a group of parents, teachers, students, and administrators for a think-tank, charging them with the mission of determining whether it was in the best interest of all stakeholders to implement a compulsory laptop program. The outcome of this think tank was that the school should not implement such a program at that time,
but rather explore all components that would be necessary for the successful adoption and implementation of such a program given the environment and culture of the school.

Despite the results of the think-tank, the same administrative team decided that all Grade 9 teachers would receive laptops that summer (1997) and be given professional development throughout the next school year on how to use the technology and integrate it into classroom practices. This caused some resistance and resentment by teachers who did not agree with the top-down decision to adopt a laptop program, believing that the recommendation of the think-tank would be respected. The administrative teams underlying goal in providing all Grade 9 teachers with a laptop was to implement a Grade 9 Foundation Year (FY) compulsory laptop program the following year (1998) in which all Grade 9 students would have a school designated laptop in order to attend the school. Anyone who was teaching Grade 9 at the time, but did not want to be a part of the initial phase-in of the compulsory laptop program, was given the option of teaching different grades. All Grade 9 teachers opted to be a part of the initial CLP. The implementation of the CLP at this school corresponded to the elimination of the Ontario Academic Credit (OAC) in Ontario. The Grade 10 year two (Y2) teachers were then given laptops for the school year 1998 in order to prepare for the grade 10 CLP that was implemented in 1999. Grade 11 (Y3) implemented this program in 2000 and Grade 12 (Y4) became laptop in 2001.

The School's educational technology vision was "to enable students to harness technology in a constructive, responsible way in order to enhance their ability to learn and advance their ability to communicate" (School website, 2008). In order to meet this mission, all students are required to have a School-sanctioned laptop, which the Information Services department will load with all necessary applications at the outset of the year. Furthermore, students are taught how to use this toolbox wisely and effectively in an Introduction to Information Technology course. (School website, 2008)
The School had a local area network, operating on approximately 1,300 live Ethernet data jacks throughout the campus—with at least two in each of the student residence rooms. There were two T1 Internet lines coming into the School that provided all students, faculty and staff with their own e-mail accounts. The Internet was accessible from anywhere on campus and all students had their own voice mailboxes, as well as telephone jacks in their individual residence rooms.

The school also used up-to-date computer software and hardware accessories. SmartBoards, TeamBoards, and data projection units were to become standard resources in ‘almost all’ classrooms (School website, 2008). All course instructors were required to use WebCT as the electronic platform through which students and parents could access homework, assignments and the course syllabus. The school maintained a large Information Services team that supported the education technology needs of teachers and students. A help desk was open during regular school hours with an available staff member to troubleshoot any problems students and teachers encountered both with hardware and software (School website, 2008).

The Participants

The participants in the online survey were independent school teachers teaching Grades 9 to 12. They taught in compulsory laptop program (CLP) environments within the Canadian Association of Independent Schools (CAIS). The survey was distributed to approximately 270 teachers in nine schools. This represents nine out of 15 CAIS schools known at the time of data collection to have laptop programs. The nine schools were selected based on their willingness to participate in the research. The survey was distributed to approximately 60% of the overall teaching population in laptop schools and almost 20% of these teachers responded to the survey. Of the 270 participants invited to complete the survey, the response rate was 32%. The number
CAIS schools has since grown to approximately 87 schools but the number of laptop programs represented in this membership is unknown (personal communication, CAIS administrator, February 14, 2009).

The participants in the focused study included teachers and administrators at the independent school site described above. Table 7 describes the teachers and administrator participants. There were approximately 30 teachers and three administrators associated with the laptop program at this school.

Table 7

Participants in Face-to-Face Interviews, Focus Groups, and Classroom Observations

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Interview (I), observation (Ob) or focus group (FG)</th>
<th>Date I or FG was conducted (y/m/d)</th>
<th>Number of observations (OB1/2/3) and date Ob was conducted (y/m/d)</th>
<th>Teacher (T) and/or administrator (A)</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Andrew</td>
<td>FG</td>
<td>05/03/29</td>
<td></td>
<td>T</td>
<td>Science</td>
</tr>
<tr>
<td>2. Art</td>
<td>I</td>
<td>05/02/21</td>
<td></td>
<td>T</td>
<td>Music</td>
</tr>
<tr>
<td>3. Callum</td>
<td>I</td>
<td>05/02/23</td>
<td></td>
<td>T</td>
<td>SS, English</td>
</tr>
<tr>
<td>4. Cindy</td>
<td>I, Ob</td>
<td>05/02/23</td>
<td>Ob1/2: 05/04/27</td>
<td>T</td>
<td>English</td>
</tr>
<tr>
<td>5. Emi</td>
<td>I, Ob</td>
<td>05/03/29</td>
<td>Ob1/2: 05/04/20 Ob3: 05/04/21</td>
<td>T</td>
<td>Mathematics</td>
</tr>
<tr>
<td>6. Evan</td>
<td>I, Ob</td>
<td>05/03/29</td>
<td>Ob1/2/3: 05/04/25</td>
<td>T</td>
<td>Science</td>
</tr>
<tr>
<td>7. Fred</td>
<td>I</td>
<td>05/03/04</td>
<td></td>
<td>T</td>
<td>SS</td>
</tr>
<tr>
<td>8. George</td>
<td>I</td>
<td>05/03/04</td>
<td></td>
<td>T</td>
<td>Computer Studies</td>
</tr>
<tr>
<td>9. Henry</td>
<td>FG</td>
<td>05/03/29</td>
<td></td>
<td>T</td>
<td>Health/PE</td>
</tr>
<tr>
<td>10. Ian</td>
<td>FG</td>
<td>05/04/08</td>
<td></td>
<td>T</td>
<td>Science/Mathematics</td>
</tr>
<tr>
<td>11. Jack</td>
<td>I</td>
<td>05/03/03</td>
<td></td>
<td>T</td>
<td>French</td>
</tr>
<tr>
<td>12. Jeff</td>
<td>I</td>
<td>05/02/25</td>
<td></td>
<td>T, A</td>
<td>Science/Mathematics</td>
</tr>
<tr>
<td>13. Jenny</td>
<td>I</td>
<td>05/02/24</td>
<td></td>
<td>T</td>
<td>English</td>
</tr>
<tr>
<td>14. Joshua</td>
<td>I</td>
<td>05/03/02</td>
<td></td>
<td>A</td>
<td>n/a</td>
</tr>
<tr>
<td>15. Justin</td>
<td>I</td>
<td>05/03/03</td>
<td></td>
<td>T</td>
<td>SS, English</td>
</tr>
</tbody>
</table>
The follow-up e-mail interviews (EI) were sent November 6, 2008 to 21 teachers who participated in the individual interviews and the focus groups (excluding Vera and Henry as they were no longer teaching at the case study school).

Role of the Researcher

While collecting data from the survey, I was responsible for contacting the Headmaster/Headmistress and the Director of Information Technology (IT) at each school to organize the procedure for distributing the Universal Resource Locator (URL) for the online survey. The dissemination was completed by the Director of IT through an e-mail to faculty.

My role during the case study was that of an interviewer-observer (McMillan & Schumacher, 2006) and an interpreter (Stake 1995). As the interviewer and observer for the focused study, I made initial contact with the Headmaster, and the Dean of Faculty and Curriculum to request an appointment explaining all aspects of the research (e.g., timeframe, methodologies, and goals). My role as the researcher was to establish “social relationships, to move from role sets appropriate for one group (or person) to different role sets for other groups (or persons)…” to raise additional questions, check out hunches, and move deeper into the

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</thead>
<tbody>
<tr>
<td>16. Kim</td>
<td>I, Ob</td>
<td>05/03/04</td>
<td>Ob1/2: 05/05/17</td>
<td>T</td>
<td>Social Sciences (SS)</td>
</tr>
<tr>
<td>17. Kyle</td>
<td>FG</td>
<td>05/04/08</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>18. Linda</td>
<td>I, Ob</td>
<td>05/03/03</td>
<td>Ob1/2: 05/05/05</td>
<td>T</td>
<td>SS</td>
</tr>
<tr>
<td>19. Liz</td>
<td>FG</td>
<td>05/03/29</td>
<td>T</td>
<td>SS, English</td>
<td></td>
</tr>
<tr>
<td>20. Lucas</td>
<td>I</td>
<td>05/03/29</td>
<td>T, A</td>
<td>SS</td>
<td></td>
</tr>
<tr>
<td>21. Matt</td>
<td>I</td>
<td>05/02/21</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>22. Patrick</td>
<td>FG</td>
<td>05/04/08</td>
<td>T</td>
<td>Art</td>
<td></td>
</tr>
<tr>
<td>23. Stephen</td>
<td>I</td>
<td>05/02/24</td>
<td>T</td>
<td>Music</td>
<td></td>
</tr>
<tr>
<td>24. Susan</td>
<td>FG</td>
<td>05/03/29</td>
<td>T</td>
<td>Science/Mathematics</td>
<td></td>
</tr>
<tr>
<td>25. Vera</td>
<td>I</td>
<td>05/02/25</td>
<td>T</td>
<td>SS, English</td>
<td></td>
</tr>
<tr>
<td>26. William</td>
<td>FG</td>
<td>05/03/29</td>
<td>T</td>
<td>Guidance</td>
<td></td>
</tr>
</tbody>
</table>
analysis of the phenomenon” (McMillan & Schumacher, 2001, p. 437), to ensure the results were grounded in the data (Creswell, 2002), to determine the strengths, weaknesses, successes and failures of the CLP (Stake, 1995), and to ensure an exit strategy was in place that thanked all participants involved in the research.

I was previously employed for seven years (from 1992-1999) at the principal research site chosen and was involved in the first two years of the adoption and implementation of the CLP. This experience provided me with a good working knowledge of the physical and organizational environment and day-to-day routines, and assisted me in becoming immersed in the school. The familiarity I had with this school environment also contributed to data collection being minimally disruptive and obtrusive to teachers, students, and administrators.

Methods of Data Collection

This multiple-methods approach included an online teacher survey, 18 individual interviews, two focus groups, and classroom observations of five teachers. Table 7 above identifies the participants in the case study site who participated in each of the data collection methods.

Online Teacher Survey

The research, in part, involved an anonymous online teacher survey (see Appendix A) and included a letter of introduction and consent form (see Appendix B). The survey items and format were constructed based on the ‘tailored design method’ (Dillman, 2000). Using this method the wording, order and transition methods were carefully attended to. For example, double-negative and double-barreled questions were avoided, only relevant questions related directly to the research questions were included, and the contextual information was placed at the end of the survey. The survey construction was also informed by (a) the literature that identified
the issues involved in web-based surveys (Mertler, 2002; Mertens, 2005) (b) common patterns identified in the review of literature, and (c) past validated surveys. The survey items in Part A (Facilitators and Barriers) (items #1-5) and Part B (Teacher Professional Development) (Items #6-15) were designed from past validated surveys (e.g., OISE/Trent Valley Centre, 2001; Van Melle, 2004). Part A and B of the survey address enabling questions 2 and 3. The survey items in Part C (Uses of the laptops) (Items #16-19) were adapted from the CBAM’s Levels of Use categories and address enabling question 4 and 5. The survey items in Part D (Items #20-40) relating to teachers’ concerns about the CLP were also adapted from the CBAM’s Stages of Concern Questionnaire so that the wording of each item related specifically to the CLP. Part D of the survey addresses enabling question one. The last section of the survey (Items #55-66) collected background and contextual information about each participant. It also adapted Rogers (2003) adopter categorization model to provide a mechanism for respondents to determine whether they considered themselves to be experienced, intermediate, novice, or non-users of technology.

As the researcher, I was aware of the range of respondents’ levels of computer literacy, experience and comfort with Internet tools (Dillman, Tortara, & Bowker, 1999)—no pull-down menus or ambiguous navigational tools were used in the survey (Dillman, 2000). As well, I used a reliable server to host the survey (Mertler, 2002) and understood the format in which the data would be downloaded (Colgan & Dalgarno, 2009b; Shannon, Johnson, Searcy, & Lott, 2002). One of the complexities with web-based surveys is the difficulty researchers have in defining the population—they are unable to construct a population list and this causes concerns about “coverage bias or bias due to sampled people not having or choosing not to access the Internet” (Solomon, 2001, p. 2). Population sample and representation, however, was not an issue in this
survey since I knew the survey was being sent through faculty distribution lists to teachers who possessed their own laptop computer and had access to the Internet and an up-to-date browser.

The first draft of the survey was divided into five thematic sections and was informed by the literature and the research questions (See Table 8). The survey sections included: (1) concerns about the innovation, (2) uses of the innovation, (3) facilitators and barriers to adopting and implementing the innovation, (4) TPD models both presently used and desired in the future, and (5) background information.

A usability analysis (think-alouds) to test for validity was then conducted with two laptop teachers and two professors of education (Colgan & Dalgarno, 2009b; Mertler, 2002). This analysis resulted in the rewording of questions that were ambiguous or confusing, and reordering of the sequence of questions. For example, the more difficult questions and the ones requiring more thought were moved from the first section to the second last section of the survey. To ensure the online survey was functioning properly it was first sent to one CAIS school where it was pilot tested.

Table 8

*Enabling Questions Addressed by the Survey*

<table>
<thead>
<tr>
<th>Enabling questions</th>
<th>Survey section</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQ1</td>
<td>Part D</td>
</tr>
<tr>
<td>EQ2</td>
<td>Part A, Part B</td>
</tr>
<tr>
<td>EQ3</td>
<td>Part A, Part B</td>
</tr>
<tr>
<td>EQ4</td>
<td>Part C</td>
</tr>
<tr>
<td>EQ5</td>
<td>Part C</td>
</tr>
</tbody>
</table>

The survey was then distributed to nine CAIS schools with CLPs. I contacted the Headmaster and Director of IT at each school site both by e-mail (see Appendix C) and by phone to discuss the purpose of the research, to have a personalized e-mail sent to their faculty inviting
them to participate in the survey, and to ensure that they receive the results of the research. The IT Director then distributed an e-mail that included the URL for the survey to each teacher at that school site. Hard copies of the survey were also available although none were requested. Follow-ups on the progression of this process at each site were completed by e-mail and telephone correspondence. A follow-up e-mail was distributed to the faculty which thanked them for completing the survey and invited teachers who had not completed it to please do so.

Individual Interviews and Focus Groups

The process of data collection at the principal site occurred in several stages. First, an e-mail (see Appendix D) was sent to the Headmaster and Assistant Headmaster of Academics at the case study school inviting them to participate in the study (Stake, 1995). Once permission was obtained to collect data at the school, an e-mail was written and forwarded to all Grades 9 to 12 teachers inviting them to participate in either a face-to-face interview or a focus group. Participants (teachers and administrators) were selected based on their responses to the invitation to participate in the interview—all teachers accepting the invitation participated in the data collection. Once all participants had been selected, an interview schedule was arranged to accommodate each teacher. Prior to the interview, each participant received a letter of information and signed a letter of consent form (see Appendix E).

Interviews

Prior to beginning the semi-structured open-ended questions, each interview participant was asked to complete the Teacher Stages of Concern Questionnaire (TSoCQ) (see Hall & Hord, 2006, pp. 279-282), and the Headmaster, Assistant Headmaster, and IT Director were asked to complete the Facilitators Stages of Concern Questionnaire (see Hall et al, 1991, p. 48). The 35-item teacher’s SoC Questionnaire (TSoCQ) revealed the stage of concern for participants using
the manual for measuring SoC (Hall, George, & Rutherford, 1998). The SoCQ had a strong internal consistency (α) ranging from 0.65 to 0.86. The two part-time teachers and administrators, as well as the Headmaster, were directly responsible for implementing the CLP into teaching practice and curriculum. These participants, therefore, were not included in the teachers’ SoC Questionnaire, rather they were given the change facilitators questionnaire (CFSoCQ). The CFSoCQ also contained 35 items and the five questions associated with each stage of concern had an internal consistency of between 0.63-0.86.

The second part of the teacher interviews was based on the Levels of Use (LoU) interview protocol (see Hall & Hord, 2006, p. 168). It focused on understanding the teachers’ levels of use of the innovation and measured the behaviours of the users (Hall & Hord, 2006; Loucks, Newlove, & Hall, 1998). The interview questions incorporated decision points, as developed by Loucks, Newlove, and Hall, (1998, p. 22) to assist in determining participants’ levels of use. The final part of the interviews involved open-ended questions in order to elicit beliefs, feelings, and perceptions about the laptop program, professional development practices, and existing school policies. The questions asked of teachers and their relationships to the enabling questions are identified in Table 9. The open-ended questions posed to the administrators and their relationships to the enabling questions are shown in Table 10.

During the interviews, brief notes were taken in order to ask probing follow-up questions and to record key words that might assist in the analysis of the data. Each interview was recorded (using both a tape recorder and an electronic MP3 recorder), field notes were written, and confidentiality was assured to the extent possible. The interviews were, on average, approximately 60 minutes long and were transcribed verbatim.
Table 9

**Enabling Questions Addressed by the Teacher Interview Questions**

<table>
<thead>
<tr>
<th>Teacher Interview questions</th>
<th>Related enabling questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoCQ</td>
<td>EQ1</td>
</tr>
<tr>
<td>LoU Protocol</td>
<td>EQ4</td>
</tr>
<tr>
<td>Describe the laptop program as you see it?</td>
<td>EQ1, EQ2, EQ3</td>
</tr>
<tr>
<td>When you think about the laptop computer program, what are you concerned about? (Do not say what you think others are concerned about, but only what concerns you now.)</td>
<td>EQ1</td>
</tr>
<tr>
<td>In what ways do you use the laptops? (both in and out of the classroom)</td>
<td>EQ4, EQ5</td>
</tr>
<tr>
<td>What types of PD have you been involved in that relates to the laptop program?</td>
<td>EQ2, EQ3</td>
</tr>
<tr>
<td>What types of professional development practices that you’ve been involved in have been the most effective? Why do you think that is? (Probe: Are these administration-driven or teacher-driven?)</td>
<td>EQ3</td>
</tr>
<tr>
<td>What types of professional development practices that you’ve been involved in have been the least effective? Why do you think that is?</td>
<td>EQ1, EQ2</td>
</tr>
<tr>
<td>If you could be involved in any type of PD in the future how would it be structured? What would be the content?</td>
<td>EQ1, EQ2</td>
</tr>
<tr>
<td>What type of policies do you have on the laptop program? On TPD practices?</td>
<td>EQ2, EQ3</td>
</tr>
<tr>
<td>How are the laptop and TPD policies created? How are they useful, if at all? (Probes: Have you ever seen them? Were you involved in making them? When are these revised? Why are they revised?)</td>
<td>EQ2, EQ3</td>
</tr>
<tr>
<td>Should the laptop program be continued? If no, what should replace it?</td>
<td>EQ1</td>
</tr>
</tbody>
</table>

Table 10

**Enabling Questions Addressed by the Administrator Interview Questions**

<table>
<thead>
<tr>
<th>Administrator interview questions</th>
<th>Related enabling questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFSoCQ</td>
<td>EQ1</td>
</tr>
<tr>
<td>Describe the laptop program as you see it?</td>
<td>EQ1, EQ2, EQ3</td>
</tr>
<tr>
<td>What do you see as your role in the laptop program?</td>
<td>EQ1, EQ3</td>
</tr>
<tr>
<td>When you think about the laptop computer program, what are you concerned about? (Do not say what you think others are concerned about)</td>
<td>EQ1</td>
</tr>
</tbody>
</table>
Focus Groups

A focus group of $n = 3$ was conducted with teachers on the Grade 9 Foundation Year (FY) teaching team. A second focus group of $n = 5$ was conducted with teachers on the Grade 10 Year Two (Y2) teaching team. Prior to the interview, each participant received a letter of information and signed a letter of consent form (see Appendix F). The focus group questions and their relationships to the enabling questions of this research are shown in Table 11.

Each focus group was recorded (using both a tape recorder and an electronic MP3 recorder), field notes were written, and confidentiality was assumed to the extent possible. They were approximately 90 minutes long and were transcribed verbatim.

Near the completion of the analysis of data, a decision was made to give the participating teachers from the interviews and focus groups an opportunity to discuss major changes to the CLP from their perspective. Appendix G includes the follow-up e-mail questions. The responses to the follow-up e-mail interviews were printed and confidentiality was assured.
Table 11

*Enabling Questions Addressed by the FY and Y2 Focus Groups’ Questions*

<table>
<thead>
<tr>
<th>Focus group interview questions</th>
<th>Related enabling question</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you see as the strengths of the laptop program in your situation?</td>
<td>EQ3</td>
</tr>
<tr>
<td>What do you see as the weaknesses of the laptop program in your situation?</td>
<td>EQ2</td>
</tr>
<tr>
<td>When you think about the laptop computer program, what are you concerned about? (Do not say what you think others are concerned about, but only what concerns you now.)</td>
<td>EQ1</td>
</tr>
<tr>
<td>How has being a part of a teaching team assisted you in teaching in the laptop program?</td>
<td>EQ3, EQ5</td>
</tr>
<tr>
<td>What types of professional development practices that you’ve been involved in have been the most effective? Why do you think that is? (Probe: Are these administration-driven or teacher-driven?)</td>
<td>EQ3</td>
</tr>
<tr>
<td>What types of professional development practices that you’ve been involved in have been the least effective? Why do you think that is?</td>
<td>EQ1, EQ2</td>
</tr>
<tr>
<td>How does being a part of the FY/Y2 team assist in your PD?</td>
<td>EQ1, EQ3</td>
</tr>
<tr>
<td>If you could be involved in any type of PD in the future, what would it look like (Probes: structure, content)?</td>
<td>EQ1, EQ2, EQ3</td>
</tr>
<tr>
<td>What type of policies do you have on the laptop program? On TPD practices?</td>
<td>EQ1, EQ2, EQ3</td>
</tr>
<tr>
<td>How are the laptop and TPD policies created? How are they useful, if at all? (Probes: Have you ever seen them? Were you involved in making them? When are these revised? Why are they revised?)</td>
<td>EQ1, EQ2, EQ3</td>
</tr>
<tr>
<td>In what ways do you use the laptops? (both in and out of the classroom)</td>
<td>EQ5</td>
</tr>
<tr>
<td>Do you think the laptop program should be continued?</td>
<td>EQ1</td>
</tr>
<tr>
<td>Can you describe the laptop program as you see it?</td>
<td>EQ1, EQ2, EQ3</td>
</tr>
</tbody>
</table>

*Classroom Observations*

Five teachers who participated in the individual interviews were observed in the classroom; they were selected on the basis of their willingness to participate. I observed two, and in two cases three, 75 minute classes for each of the five participating teachers. Prior to the first
observation each participant received a letter of information and signed a consent form (see Appendix H).

The data recorded during observations included how often the innovation was used by teacher and/or students, when it was used, and in what contexts it was used. Observations were recorded using duration recording to determine how often the innovation was used (the length of time the innovation was used was measured). Continuous observation was also used to observe the teacher with her/his classes. This involved a chronological written description of the observed behaviour exhibited by the teacher and students over a period of teaching either two or three classes (McMillan & Schumacher, 2006) in order to provide a “relatively incontestable description for further analysis” (Stake, 1995, p. 62).

Methods of Data Analyses

Both quantitative and qualitative data analysis techniques were used to analyze the data collected from this research. In the qualitative data analysis, triangulation of data that occurred from the interviews, focus groups, and the classroom observations assisted in identifying consistency of findings. For example, consistencies across the data sources emerged in terms of teachers’ concerns, barriers teachers faced, and type and levels of laptop use.

Analysis of the Online Survey

The survey results were analyzed using SPSS 16.0. Cronbach’s alpha (α) was used to determine the internal consistency of items grouped in Parts A, B, and D of the survey (see Table 12) based on the average inter-item correlation (Black, 1999). A value of .60 or higher is considered acceptable reliability for the analyses completed in this study (Hall & Hord, 2007). Descriptive statistics in the form of percentages, frequencies, and cross tabulations, as well as frequency profile graphs identify the (a) facilitators and barriers teachers face when teaching in a
CLP (addressing EQ2 and EQ3), (b) the TPD activities that enhance and/or inhibit teaching in a CLP (addressing EQ2 and EQ3), (c) the types of uses and levels of use of laptops by responding teachers in a CLP (addressing EQ3 and EQ4), and (d) concerns responding teachers have about CLPs (addressing EQ1). Descriptive statistics were also used to report the demographics of the responding population (Part E of the survey).

Table 12

*Internal Consistency of Specific Survey Items*

<table>
<thead>
<tr>
<th>Survey section</th>
<th>Survey items</th>
<th>Internal consistency (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A: Hardware issues</td>
<td>1i, 1k, 1l</td>
<td>.670</td>
</tr>
<tr>
<td>Part A: CLP awareness</td>
<td>1o, 1p, 1q</td>
<td>.601</td>
</tr>
<tr>
<td>Part A: Administration</td>
<td>2a, 2c, 2d, 2e, 2f, 3l, 6a, 6b</td>
<td>.631</td>
</tr>
<tr>
<td>Part A: Decision-making structures</td>
<td>2b, 2q, 3f</td>
<td>.665</td>
</tr>
<tr>
<td>Part A: Review and revision of policies</td>
<td>3c, 3d, 3e, 3h, 3j, 3k</td>
<td>.745</td>
</tr>
<tr>
<td>Part A: Implementation of policies</td>
<td>3i, 3m</td>
<td>.668</td>
</tr>
<tr>
<td>Part B: Isolation</td>
<td>6h, 6i</td>
<td>.627</td>
</tr>
<tr>
<td>Part B: TPD</td>
<td>1e, 1f</td>
<td>.652</td>
</tr>
<tr>
<td>Part D: Stage 4 Concerns</td>
<td>20, 31, 34</td>
<td>.673</td>
</tr>
<tr>
<td>Part D: Stage 5 Concerns</td>
<td>22, 25, 30, 38</td>
<td>.913</td>
</tr>
<tr>
<td>Part D: Stage 6 Concerns</td>
<td>33, 40</td>
<td>.630</td>
</tr>
</tbody>
</table>

One-way analysis of variance (ANOVA) was used to determine whether scores from survey items were significantly different between groups of users, gender, years of teaching experience, years of teaching experience in a CLP, age, concerns, types of use, and barriers and facilitators of implementing a CLP (Gay, Mills, & Airasian, 2009). For example, an ANOVA was conducted to determine if there was a significant difference between intermediate laptop users, experienced laptop users, gender, and the number of days spent on their own learning of laptop use for teaching. It was also used to determine significant differences between male and female respondents’ levels of use and their type of use. These statistical comparisons were made with
alpha set to 0.05. The Bonferroni adjustment procedure was not conducted in order to reduce type I errors, thereby reducing the probability of Type II errors. When significant differences were found for comparisons of 3 or more groups, post-hoc comparisons were made with Tukey’s test in order to identify the significant between group differences.

*Analysis of Interviews and Focus Groups*

Preliminary data analysis began while collecting data from the interviews and focus groups, using the constant comparative method of analysis (CCM) in order to identify and refine categories until saturation of the categories was reached. Following each interview and focus group, field notes were written that identified potential commonalities. The process of analysis consisted of organizing data, coding, developing categories, and finding patterns.

The information gathered was transcribed verbatim. The researcher verified each transcript by listening to the recorded interviews while following the transcript to ensure there were no discrepancies between the transcripts and the audio-taped interviews. Member checking for reliability was then completed; each participant was sent their transcript for verification to ensure the statements represented their feelings, thinking, views, opinions and behaviours. Pseudonyms replaced the participants’ names to ensure confidentiality. The number of pages transcribed for each interview and focus group were as follows:

- Kim, 9 pages
- Cindy, 15 pages
- Stephen, 13 pages
- Evan, 14 pages
- FY FG, 11 pages
- Jeff, 19 pages
- Emi, 9 pages
- Jenny, 15 pages
- Vera, 14 pages
- Y2 FG, 16 pages
- George, 18 pages
- Matt, 18 pages
- Linda, 13 pages
- Callum, 13 pages
- Lucas, 9 pages
- Jack, 14 pages
- Justin, 9 pages
- Art, 14 pages
- Fred, 15 pages
- Josh, 11 pages

The field notes from the interviews and focus groups totalled 41 pages.

The interview and focus group (FG) data were organized and identified by the pseudonym of each participant and the paragraph (P) number within each document. For
example, an individual interview by Kim that referred to a quote located in paragraph 47 would be coded as (Interview, Kim, P47) and data from each focus group would be coded, for example, as (FY FG, Dan, P120). Follow-up e-mail interviews (EI) were labeled as (EI, Kim).

The four phases in the inductive data analysis process were used as described by McMillan and Schumacher (2006). This qualitative framework was implemented because it allowed topics, categories, and patterns to emerge from the data. Accordingly, patterns of meaning were built using segments, topics, and categories (see Figure 4). Segments identified the supporting data (quotations) from the transcripts, topics identified the subject of the quotations (segments), categories represented the meaning attached to connected topics, and patterns identified relationships that emerged from the repetition among the categories (Stake, 1995, p.76).

![Figure 4](image-url)

**Figure 4.** Building patterns of meaning from qualitative data. (adapted from McMillan and Schumacher, 2001, p. 373)

Using Atlas TI, each transcript was coded into topics. Using the constant comparative method of analysis (CCM), nine transcripts were coded by the researcher until no new codes
were needed. One individual teacher interview transcript and one focus group transcript was then given to an expert in qualitative research for coding verification and inter-rater reliability (Loucks et al., 1998). Upon comparing the coding from both researchers it was determined that 95% of the transcripts were identically coded. The remaining five percent were due to an overlap in meaning for some of the codes. Initially, there were 103 topics coded. Once the codes were verified and further discussed, the topic codes were reduced to 71. For example, CLASS MAN (classroom management) and MGE (management); 1-ON-1 (1-on-1 support) and FACE (face-to-face support); and INF COM (informal communication) and COLL-INF (informal collaboration) were combined into one code. Next, the topics were collapsed into 29 categories, which were then used to generate six patterns (themes) (see Table 13).

Table 13

Emergent Topics, Categories, and Patterns

<table>
<thead>
<tr>
<th>Topic (subject identification)</th>
<th>Category (meaning of connected topics)</th>
<th>Pattern (relationship among themes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial tasks</td>
<td>Mechanical uses (LoU III)</td>
<td>Levels of Use (LoU)</td>
</tr>
<tr>
<td>Demonstrations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Established patterns of use</td>
<td>Routine uses (LoU IVA)</td>
<td></td>
</tr>
<tr>
<td>Revise uses</td>
<td>Refinement uses (LoU IVB)</td>
<td></td>
</tr>
<tr>
<td>Reflect on uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td>Integration uses (LoU V)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Awareness concerns (SoC 0)</td>
<td>Stages of Concern (SoC)</td>
</tr>
<tr>
<td>Managing laptops in curriculum</td>
<td>Management (SoC III)</td>
<td></td>
</tr>
<tr>
<td>Time required to integrate laptop into teaching</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moving from ideas to reality</td>
<td>Refocusing concerns (SoCVI)</td>
<td></td>
</tr>
<tr>
<td>Time for mandated requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of time</td>
<td>Awareness and Management concerns (SoC 0, III)</td>
<td></td>
</tr>
<tr>
<td>Lack of peripheral hardware support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conflict between professional and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>personal interests</td>
<td>Communication</td>
<td>Uses of Laptops</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Attendance program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reports program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course management software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Databases</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td>Websites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PowerPoint</td>
<td>Presentations</td>
<td></td>
</tr>
<tr>
<td>Movie making software</td>
<td>Simulations</td>
<td></td>
</tr>
<tr>
<td>Course-specific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course management software feature</td>
<td>Tests</td>
<td></td>
</tr>
<tr>
<td>Word processor</td>
<td>Student writing</td>
<td></td>
</tr>
<tr>
<td>Hardware (laptops)</td>
<td>Administrative support</td>
<td>Strengths of CLP</td>
</tr>
<tr>
<td>Software programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information technology department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivated students</td>
<td>Teaching practice</td>
<td></td>
</tr>
<tr>
<td>Varied lesson delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email to students, parents, colleagues</td>
<td>Communication tool</td>
<td></td>
</tr>
<tr>
<td>Students submit assignments via Email</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WebCT/ANGEL(^6)</td>
<td>Course Management</td>
<td></td>
</tr>
<tr>
<td>Reporting system (MarkBook(^7))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back-up system for documents</td>
<td>Access to resources</td>
<td></td>
</tr>
<tr>
<td>Online</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course-specific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unlimited access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top-down decision making</td>
<td>Mandated requirements</td>
<td>First-order Barriers</td>
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<tr>
<td>Relevance</td>
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<td>Enactment</td>
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<tr>
<td>Managing mandates</td>
<td>Time</td>
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<td>Integrating laptops</td>
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<td>Learning new software programs</td>
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<tr>
<td>Distractions</td>
<td>Classroom management</td>
<td></td>
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<tr>
<td>Student excuses</td>
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\(^6\) Angel is a LMS geared toward Kindergarten to Grade 12. It is a course management system used by teachers, students, and possibly parents in the case study school.

\(^7\) MarkBook was a software tool used by the case study school to record student marks, analyze student achievement, writing report cards, and importing and exporting student data.
<table>
<thead>
<tr>
<th>Management techniques</th>
<th>Description</th>
<th>Understanding the CLP</th>
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<tr>
<td>Goals</td>
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<td>Policies</td>
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<td>Evaluation</td>
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<td>Older laptop models</td>
<td>Hardware</td>
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<td>Peripheral technology</td>
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<td>Replacement technology</td>
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<td>Network compatible</td>
<td>Software</td>
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<td>User-friendly</td>
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<td>Ineffective TPD</td>
<td>Teacher professional development</td>
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<td>experiences</td>
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<td>Personalized IT and curricular support</td>
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<tr>
<td>Course-specific content</td>
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<td>External activities</td>
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<td>Independent learning</td>
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<td>Hands-on activities</td>
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<td>Collaboration</td>
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<td>Administration</td>
<td>Pressure</td>
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<td>Self-imposed</td>
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<td>Second-order barriers</td>
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<td>Varied</td>
<td>Level of faculty buy-in</td>
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<td>Course-specific</td>
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<tr>
<td>Personal beliefs about teaching and learning</td>
<td>Teachers’ philosophies</td>
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<td>Meaningful implementation</td>
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<tr>
<td>Meet specific needs</td>
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Patton (2002) suggests that qualitative research begins with an inductive approach—an approach that allows categories, themes and patterns to emerge directly from the data. Patton also, however, states that a deductive analysis is required in order to relate the analysis to a theoretical framework. Deductive analysis provided a method of confirming some of the developed themes.

Determining each interview participant’s level of use involved using the LoU rating sheet (see Loucks, Newlove, & Hord, 1998, p. 42) and the LoU Interview Protocol (p. 24-27). A protocol sheet was used for each participant in the interviews on which abridged responses to the questions were recorded. Following each interview, the LoU of the participant was determined.
using the answers to both the decision point questions and the questions that probed within each of the LoU categories. The LoU rating sheet provided in the rating manual (p. 42) was used to record each participants LoU. The field notes recorded on the protocol sheets totaled 54 pages.

The teachers’ Stages of Concern Questionnaire (TSoCQ) completed by each participant in the interviews was analyzed directly following each interview, using the scoring device developed by Hall, George and Rutherford (1998). The 35 questionnaire items represented seven areas of concern. The raw score for each of the seven concerns were the sum of responses to five statements represented by each of the seven concerns. Using the scoring device provided for the teacher questionnaire, the raw scores were then converted to percentiles in order to better compare and contrast the results. The follow-up e-mail interviews were coded by hand using the same codes identified using Atlas TI.

Analysis of Classroom Observations

Various techniques were used to analyze and interpret the classroom observations. Activities were categorized as either (1) student-centred (e.g., individual student work, group work) (2) teacher-centred (lecture), (3) student-teacher interaction (full class discussions or activities), or (4) transition (Rennie, 1990). Each part of the lesson was divided into one of the four categories. For each section of the lesson, the time was calculated that the teacher and/or students used the innovation. This provided an opportunity to determine the mean time of innovation use by the teacher and students, and the proportion of the class that the innovation was used. Field notes were used to identify the types of uses of the innovation and the contexts in which the teacher and/or students use the innovation. There were 37 pages of classroom observation field notes in total. The teachers’ WebCT course pages were also viewed in order to verify that what they stated in their online course management pages was actually there.
Summary of Chapter

The method for this study involved a multiple-method approach. It included a quantitative online survey of nine independent schools and a qualitative case study of one independent school; all schools were members of the Canadian Association of Independent Schools. The participants in the study were teachers who taught Grades 9 to 12. As well, the case study involved two part-time teachers/administrators and one full-time administrator.

Methods of data collection included an anonymous online teacher survey that was distributed to approximately 270 teachers and had a response rate of 32%. The case study involved 15 teacher interviews, two part-time teacher/administrator interviews, one full-time administrator interview, two focus groups, and classroom observations of five teachers. The individual interviews also included a 35-item Stages of Concern questionnaire and a Levels of Use interview protocol from the Concerns Based Adoption Model (Hall & Hord, 2006). Follow-up e-mail interviews were also conducted with the interview and focus group participants. Field notes were taken during all phases of data collection.

Methods of data analysis for the online survey involved descriptive statistics (percentages, frequencies, and cross tabulations). The qualitative data used an inductive approach in which patterns emerged from the data. Data from classroom observations were analyzed by recording durations of student-centred, teacher-centred, student-teacher interaction and transition periods.
CHAPTER 4: PRESENTATION OF FINDINGS

Overview of Chapter

This chapter is divided into two main sections: online survey results and case study results. The survey results describe the response rate, demographics of the respondents, types and levels of laptop use within a CLP, stages of concerns these teachers have with the CLP, and facilitators and barriers encountered with teaching in a CLP. The survey findings were used to provide an overview of implementing a CLP into teaching practice within nine independent schools in Canada and inform the case study analysis.

The case study results describe the demographics of the participants, the relationship between teachers’ levels of use and stages of concern of the innovation, the types of use by the participants, the strengths of the CLP, and the barriers faced within a CLP. The presentation of data begins with the results of the online survey.

Online Survey Results

Response Rate

The online survey was distributed to approximately 270 potential participants in nine Canadian Association of Independent Schools (CAIS) across Canada. There were approximately 30 high school teachers at each of the participating schools. In total, 85 responses were received giving an overall response rate of 32%. This is slightly higher than the 25% average rate of return for online surveys (Mertler, 2002).

Demographics

Of the 85 responses received, 80 were from full-time teachers and five from part-time teachers. Of the 84 who identified their gender, half were men and half were women. Sixty-two respondents were between the ages of 30 - 49, while only 22 respondents were between the ages
of 20-29 or over 50 (one respondent did not respond to this question). In terms of teaching experience, of the 55 teachers with 11 or more years of teaching experience, 52 taught in a laptop program between 2 - 10 years. These observations suggest that the majority of respondents were experienced, mid-career teachers who had been teaching in a laptop program since the early stages of its adoption and implementation into Canadian schools. As well, 79 of the respondents considered themselves either intermediate or experienced users of technology.

Forty-five Mathematics and Science teachers, 24 English and Social Science teachers represent the majority of respondents, and only eight Health, Music, Physical Education, and Art teachers responded to the survey. Finally, the respondents identified that the most frequently taught grade using laptop technology was Grade 9 (f = 23). In Grades 10 to 12, respondents used laptops with similar frequency (f = 16 to 19).

*Types of Use of Laptop Technology for Teaching*

In trying to understand how teachers responded in a compulsory laptop program, the ways laptops were used in teaching practice was studied. Figure 5 illustrates the types of use and the frequency of use of various applications used within a CLP. E-mail and word processing were the most frequently used application, while chats, discussion groups and video conferencing were the least used applications. It appeared that the most recent forms of social networking applications were not commonly used for teaching in a CLP, while the more traditional, known, and understood applications (e.g., e-mail and word processing) were more frequently integrated into teaching practice.

Experienced users were significantly more likely to use the Internet for course software use, $F(1,83) = 3.33$, ($p = .028$) than intermediate users. This could mean that the more
experienced users become, the more confidence they have using the laptops in different ways and the more willing they are to implement the uses in the classroom.

**Figure 5.** Types and frequency of use of laptops for teaching.

*Levels of Use for Laptop Technology in Teaching*

The purpose of this research, in part, is to identify how teachers in a compulsory laptop program (CLP) respond to this educational change in their teaching practice in order to better understand their needs. Hence, respondents answered questions that allowed me to determine their level of use according to the Concerns Based Adoption Model (CBAM). The Level of Use (LoU) framework provided a method for identifying how teachers were using laptops in their practice, as the LoU measures “the behaviors and portrays how people are acting with respect to a specific change” (Hall & Hord, 2006, p. 159). CBAM’s levels of use identifies eight classifications of how people behave in response to a change: the first three levels are described as ‘non-users’ and next five levels are referred to as ‘users’.
Figure 6 depicts the survey respondents overall LoU. Given that the laptop program was compulsory in each of the nine schools that participated in the survey, it is understandable that very few teachers identified themselves as ‘non-users’ since, in order to teach at a CLP school, teachers were required to use the laptops if only for administrative purposes (e.g., e-mail communication and marks). The most common LoU identified by respondents was categorized as ‘refinement’—teachers were refining their use of the laptops to maximize the effects on student learning. It should also be noted that ‘renewal’ was another common level of use identified by respondents. *Renewal* is defined as a teacher re-evaluating the quality of laptop use, making major modifications in its use, and keeping up-to-date on “new developments in the field” (p. 160). Hall and Hord (2006) suggest that teachers who have reached the ‘renewal’ level have done so due to their own “creative abilities and energy” (p. 173). This result contradicts CBAM’s database which suggests that only 2.5% of teachers involved in a change process reach this level of use. The high proportion of teachers who identified themselves as either refining or renewing their laptop use suggest that the majority of teachers in their CLP are continually searching for ways to better implement laptops into their teaching practice.
Figure 6. Levels of use of laptops in compulsory laptop programs.

Other important aspects for understanding teachers’ behaviours were to determine if there were significant differences between groups of users, gender, years of teaching experience, years of teaching experience in a CLP, age, concerns, types of use, and barriers and facilitators of implementing a CLP. Based on Figure 7, it appeared that teachers with more than two years experience teaching in a CLP implemented the laptop into their practices in more sophisticated ways. Only those teachers with less than one year experience in these CLPs considered themselves ‘non-users’. The majority of respondents considered themselves to be experienced users of laptops in their teaching practice. Only three respondents identified themselves as novice users. This suggests that teachers with between 2-5 years of experience in a CLP have the most advanced levels of use of the laptops in their teaching practice. Those with five or more years experience also use the laptops in their teaching practice, although not to the levels of those with 2-5 years experience.
There was no significant difference between male and female respondents’ levels of use in the laptop program or with their types of use. It appears both males and females were equally likely to represent similar levels and types of use within the CBAM. This may be a result of the mandated aspect to the laptop program; all teachers were required to use the laptops at some level in order to survive in the laptop environment.

![Levels of Use According to Years of CLP Teaching Experience](image)

*Figure 7. Level of use and number of years experience teaching in a CLP.*

*Stages of Concern about the CLP*

This research, in part, is an attempt to understand teachers’ feelings and perceptions of teaching in a compulsory laptop program (CLP). Given this purpose, teachers’ concerns about implementing changes to their teaching practice were determined by answering the question, What concerns do teachers have about the CLP? The original scale used in the survey was condensed from a seven point scale (see Appendix A) to a three point scale of ‘not true of me now’, ‘somewhat true of me now’ and ‘very true of me now’. The term ‘irrelevant’ was also an option for respondents. This combined the two points categorized as ‘not true of me’, the two
points categorized as ‘somewhat true of me’ and the three points categorized as ‘very true of me now’ in order to provide a more transparent analysis of the responses.

Stages of concerns about implementing a CLP into teaching were measured using survey items 27, 23, 37, 35, 26, 36 and 40 which represented the Concerns Based Adoption Model’s (CBAM) seven specific categories of concerns, and were adapted from Hall and Hord’s (2006) SoC items. The survey items identified in Table 14 were used in order to categorize each respondent’s stage of concern which provided a method for creating an aggregated profile of the respondents. The frequency of responses from the scale “somewhat true of me now” and “very true of me now” were combined in order to determine a SoC profile of the teacher responses.

Table 14

<table>
<thead>
<tr>
<th>Stage of concern</th>
<th>Survey item #</th>
<th>Survey statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0: Awareness</td>
<td>27</td>
<td>I am not concerned about the laptop program.</td>
</tr>
<tr>
<td>Stage 1: Informational</td>
<td>23</td>
<td>I have a very limited knowledge about the laptop program.</td>
</tr>
<tr>
<td>Stage 2: Personal</td>
<td>37</td>
<td>I would like to have more information on time and energy commitments required by this laptop program.</td>
</tr>
<tr>
<td>Stage 3: Management</td>
<td>35</td>
<td>I am concerned about the time I spend working with nonacademic problems related to the laptop program.</td>
</tr>
<tr>
<td>Stage 4: Consequences</td>
<td>26</td>
<td>I am concerned about how the laptop program affects students.</td>
</tr>
<tr>
<td>Stage 5: Collaboration</td>
<td>36</td>
<td>I would like to coordinate my efforts with others to maximize the effects of the laptop program.</td>
</tr>
<tr>
<td>Stage 6: Refocusing</td>
<td>40</td>
<td>I would like to determine how to supplement, enhance, or replace the laptop program.</td>
</tr>
</tbody>
</table>

Figure 8 shows that very few respondents were concerned about becoming aware of the CLP, acquiring more information about the CLP, affecting them personally, or managing the tasks required in a CLP. According to CBAM, and in an attempt to better understand teachers’
beliefs and perceptions about the CLP, this indicated respondents were not as concerned about themselves as they were about their students in the implementation process.

When testing for levels of significance between variables, it was determined that intermediate users believed they had more limited knowledge about the CLP than experienced users, $F(1,83) = 9.16, p = .015$. The Tukey post-hoc comparison test indicated there was a significant difference in that teachers who were categorized as refinement users were more likely than routine users to have concerns about managing time between academic and non-academic problems than those who was themselves as experienced users of technology, $F(2,82) = 3.24, p = .047$. Table 15 shows the result of this test (the difference in means), with means of 2.43, 1.71, and 2.05 for routine, refinement and renewal user groups, and the significant difference between the routine and refinement users.

Table 15

<table>
<thead>
<tr>
<th>User group</th>
<th>Routine</th>
<th>Refinement</th>
<th>Renewal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine</td>
<td>—</td>
<td>.714*</td>
<td>.379</td>
</tr>
<tr>
<td>Refinement</td>
<td></td>
<td>—</td>
<td>.336</td>
</tr>
<tr>
<td>Renewal</td>
<td></td>
<td></td>
<td>—</td>
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</table>

*p < .05.

In trying to understand the feelings and perceptions of teachers in a CLP, this finding showed that as teachers became more active in developing ways to integrate the laptop program into their teaching practice, spending time on non-pedagogical issues became more of a concern.

The profile in Figure 8 revealed intense concerns about the consequences of the laptop program and engaging in collaborative initiatives with colleagues as shown by the peak in the graph. This indicates respondents had high impact concerns about the effects of the CLP on their teaching practice and on student learning. According to Hall and Hord (2006), the profile
depicted in Figure 8 indicates an ideal goal for schools implementing change. They suggest that “the essence of good schooling is teachers with high impact concerns about the effects of use of the innovation in their classroom (Stage 4 Consequences) and about linking with other teachers in the use of the innovation (Stage 5 Collaboration)” (p. 149). They further state that this type of a profile is rare and indicates that the innovation is aligned directly with a school’s vision.

![Stages of Concerns Profile](image)

**Figure 8.** Stages of concerns profile of survey respondents.

The high impact *consequences* concerns (Stage 4), revealed that many of the respondents were most concerned about evaluating how their use of laptops impact students and about exciting their students about their part in the CLP (refer to items 20, 31, and 34 on the survey). The high impact *collaboration* concerns (Stage 5), according to items 22, 25, 30 and 38 on the survey, revealed that the majority of respondents would like to collaborate with their peers in order to (a) maximize the effect of the laptop program by helping other faculty, (b) coordinate
their efforts with others in order to make the CLP more effective, and (c) learn what other faculty, within course-specific departments, are doing with the laptops. Intermediate users, however, were less likely than experienced users to be concerned about collaborating with other departments or faculty members with the progress of the CLP, $F(1,83) = 6.48, p = .047$. High impact Refocusing concerns (Stage 6) were also prevalent among responses, although slightly less than Stage 4 and 5 concerns. Teachers indicated they were not interested in replacing the CLP with another innovation (76% of respondents stated that the laptop program should be continued). They were, however, concerned about modifying their present use of laptops based on the experiences of their students. The teachers in this stage were looking for more universal benefits from the innovation and they had definite ideas about revising their teaching in the CLP.

By identifying concerns that respondents had to the compulsory laptop program some of their feelings and perceptions about the mandated change were revealed. The findings suggested that most respondents felt they put student interests ahead of their own, which may mean that they would integrate laptop technology into teaching practice only when they believed it would benefit student learning; rather than make their teaching easier. The data also indicated that the more active a teacher became in integrating laptops into pedagogy, the more frustrated they were in having to spend time managing non-academic issues. Finally, the responses suggested that teachers who wanted to involve themselves in collaborative initiatives with colleagues had a better understanding of their schools’ mission, vision, and goals. This group tended to be teachers who consider themselves experienced laptop users, possibly due to increased confidence in their teaching abilities with laptops.
Teachers’ Personal and Professional Responses to a Compulsory Laptop Program

The essential components and challenges of requisite participation in a laptop program, as perceived by teachers, assisted in understanding teachers’ changing roles that resulted from the adoption and implementation process. For analysis purposes, the original five-point scale used in the survey (see Appendix A) was combined into a three-point scale due to the lack of variability in the distribution of responses. It combined ‘strongly agree’ and ‘agree’ to become ‘yes’, combined ‘disagree’ and ‘strongly disagree’ to become ‘no’ and ‘don’t know’ remained the same. This allowed the analysis to become more relevant to the statements on the survey while not changing the meaning of the responses. To calculate levels of significance the scale was reduced to two points, from three, by omitting the responses to ‘don’t know’. Respondents identified five issues that affected implementing a laptop program into their teaching practice: teacher professional development, administration, policies, pressure, and hardware and software.

Teacher Professional Development

Almost 75% of respondents spent five days or less in formal training sessions; over 80% engaged in informal conversations ranging from a few times a year to weekly. When asked how many days’ respondents had spent on their own learning to use laptops for teaching, 38% suggested they spent 11 or more days on this form of TPD, while 32% suggested they spent 2-5 days/year on independent learning. These data show that informal and independent teacher professional development (TPD) is more prevalent and frequent in teachers’ professional lives than formal initiatives. Informal types of professional development may not, however, be recognized as meaningful forms of TPD in compulsory laptop programs as it is difficult to monitor and define—it usually occurs on a just-in-time basis when teachers have a specific problem or need.
Figure 9 illustrates that respondents wanted more time for TPD opportunities. Almost 75% hoped to gain the knowledge they felt was required to integrate laptops into their teaching practice through future TPD initiatives. Respondents stated they wanted TPD through more, (a) exposure to discuss with colleagues about the use of laptops in teaching, (b) exposure to examples where faculty have successfully integrated laptops into teaching, (c) time to change the curriculum to better incorporate laptops into teaching, and (d) effective mentors in order to increase success when teaching in a CLP. Respondents’ desire to gain knowledge through effective TPD suggests that either a lack of one or more types of knowledge (content, technological, and pedagogical) is preventing these teachers from feeling more success when teaching within a CLP.

![Teacher Professional Development Requests](image)

*Figure 9. More teacher professional development opportunities desired.*

Over 75% of respondents reported that their most effective TPD activities were, (1) curriculum-based and subject-specific, (2) collaborative (sharing), (3) hands-on, (4) small-group, individualized and/or 1-on-1, and (5) ongoing. It is important to note that over 75% of respondents also stated that the above five activities were identical to any future TPD initiatives they desired. The least effective TPD activities cited by respondents involved (1) lectures, (2)
non-curricular or course specific, (3) short-term conferences/workshops, and (4) software training.

Teachers' responses to their personal teacher professional development experiences suggested that they know what types of TPD are effective for their needs and can identify the structures that would encourage the learning they desire (e.g., curriculum-based, hands-on, ongoing, small-group). The findings also suggest that there is a need to connect content, pedagogical, and technological knowledge in a way that is meaningful and applicable to the respondents' teaching practice and curriculum integration initiatives.

Administration

Figure 10 illustrates that respondents felt they had administrations support developmentally, financially, and morally when teaching in the laptop program. Users considering themselves to be experienced were significantly more likely to believe that administration encouraged the development of action plans for professional growth than those who considered themselves intermediate users, $F(1,83) = 6.11, p = .016$. This shows that teachers involved in the survey were satisfied with their administrative support and indicates that teachers perceived administrative support as essential to success teaching in a laptop program. Experienced users of laptop technology may be more advanced, satisfied and independently motivated in their professional learning process, as there were more action plans developed with this group. The existence of individual teacher action plans also suggests that administration at these schools understands the value of supporting teacher’s professional growth.
Figure 10. Types of administrative supports.

**Compulsory Laptop Program Policies**

*Purpose of CLP.* Figure 11 presents three areas that respondents believed would facilitate the use of laptops in their teaching: (a) a clear description of the range of choices for laptop integration, (b) more compelling reasons to incorporate laptops into teaching, and (c) a clearly conceived strategy that links the use of laptops for teaching to student achievement and outcomes. Experienced users were significantly more likely to desire a range of choices for integrating laptops into their teaching, $F(1,83) = 6.08, p = .016$. These observations suggest that although teachers believed they had the support of administration in the CLP, they may not actually be using laptops as effectively as they would like to be in their teaching practice, especially given that they were unclear about the possibilities of laptop use and wanted evidence that a CLP positively affects student learning.
Figure 11. Information desired by teachers about the purpose of CLPs.

Awareness, review and revision of policies. Seventy-one percent of respondents knew what their school’s CLP policy was, although it was more likely that experienced users were more aware of these policies than those considered to be intermediate users, $F(1,83) = 5.60, p = .02$. The majority of responding teachers believed that their school policies were reviewed frequently and revised to meet the changing needs of their students and community. Whereas, only one half of respondents believed that their CLP policy was revised if necessary, as illustrated in Figure 12. This shows that although most respondents were aware of existing policy and policy revision, fewer believed there is a regular mechanism for review. This suggests that, although the technology is continually changing and new challenges for teachers are surfacing (e.g., social networking), some teachers feel that CLP policies are not revised regularly to reflect these changes.
Figure 12. Teacher knowledge about CLP policy reviews and revisions.

*Shared decision-making structures.* Approximately 60% of respondents stated that leadership in the school was shared among faculty. One-half of participants believed decision-making regarding the use of laptops in teaching was shared among faculty, while 34% did not think it was a shared process. One-half of respondents perceived that consensus-building did not occur in determining which initiatives should be implemented; only 35% believed consensus-building did occur.

The findings suggest that leadership and decision-making processes were shared among faculty, but working toward consensus was not a part of the process. This appears to be a contradiction in that one would think consensus would be an integral part of a shared decision-making process. It could be that consensus occurred with those teachers who had been at the school for an extended period of time (ages 40-49) and were also experienced in the CLP, while excluding less experienced teachers.
Implementation of policy. Figure 13 illustrates that the majority of respondents believed their school was not able to find a balance between too much and too little change. As well, approximately one-half of participants believed their school introduced and adopted a change in program without a clear implementation plan. Teachers in this study felt that their professional life was not balanced due to the lack of planning and a school’s desire to undergo too much change without a clear implementation plan in place. This may mean that teachers find it challenging to understand how to implement a CLP into their teaching practice without clearly communicated implementation expectations, although they stated there was a policy and they know about it.

![Implementation of Goals](image)

**Figure 13.** Implementation of goals.

Pressure

Fifty-seven percent of respondents stated they felt pressure to use the laptops in their teaching practice. As shown in Figure 14, the source of most pressure came from administration. This was not surprising, given that the literature suggests administrative pressure is common during an educational change process (Fullan, 2006). What was surprising, however, was that
40% of the pressure felt was self-imposed pressure respondents placed on themselves. Pressures from students, other teachers, and parents accounted for other less cited pressures. This suggests that by imposing a mandated change that has such direct effects on teaching practice and beliefs, teachers put pressure on themselves. The self-imposed pressure could manifest itself in any number of ways, from developing strategies to resist the change process to developing strategies to implement the change as expected in the school’s vision, goals, and policies.

![Pressure in CLP's](chart.png)

**Figure 14.** Sources of pressure to use laptops in teaching practice.

**Hardware and Software**

Sixty percent of respondents would prefer better physical classroom structures that support the use of teaching with laptops, as well as more reliable technology to support their teaching with laptops. Participants stated that funding did not limit the hardware desired and/or provided to teachers and students. An equal number of respondents stated that access to additional hardware would facilitate their use of laptops in their teaching practice.

Approximately one-half of respondents wanted greater variety in the software provided, whereas, 33% stated that they were satisfied with the software they presently possessed. As with
hardware, funding for software did not appear to be a major barrier to teaching in a CLP because only 10% more respondents stated that additional funding for laptop related projects would facilitate their integration of laptops into teaching practice.

These findings suggest that funding is available to teachers who would like to purchase additional hardware and software for the CLP. Respondents also indicated that perhaps the laptops were not powerful enough for the types of uses teachers required of them. As well, it appeared that the actual classroom configuration (e.g., student groupings, teacher location, and physical structures and technology) was a barrier that prevented teachers from using the laptops in ways they desired.

Analysis of teachers’ responses to the adoption and implementation of a compulsory laptop program (CLP) provided insight into their perceptions of how it affects their teaching practice. This knowledge, in turn, offers a better understanding in how to support teachers through the change process. The online survey data suggest that recent developments in technology, such as social networking applications (e.g., Facebook, MySpace®, MSN, wikis) are rarely integrated by teachers into teaching practice possibly due to a lack of experience with the technology or the non-academic uses presently associated with social networking. The key differences in variability of levels of use were not related to gender or years of experience teaching in a CLP, this may be a result of the mandatory nature of the change, since all teachers must implement the technology at some level regardless of gender, years of experience, or personal beliefs. As well, informal and independent professional development initiatives were more popular among respondents than formal activities, but the literature suggests that administrators focus more frequently on providing formalized forms of TPD. It is possible that they do not recognize the effect or importance of informal dialogue and collaboration that occurs
among non-regulated TPD. In terms of policies, the data indicated that, although administration was supportive of teachers’ efforts to implement a CLP into practices and curriculum, these participants would like more clearly defined ways to integrate the technology, as well as evidence that the change improves student achievement. Finally, the findings indicated that there was self-imposed pressure by teachers to implement laptop technology into teaching practice. Again, this could be due to the mandated nature of the change and personal beliefs about teaching and learning—participants were more concerned about the effect on their students than on themselves. These findings that emerged were used to inform the case study analysis in order to provide a deeper understanding of what teachers experience and feel, and how they behave when implementing a mandated laptop program.

The Case Study

The case study findings are organized into four emergent themes: teachers’ levels of use and stages of concerns, types of uses, strengths, and barriers experienced when implementing a compulsory laptop program into teaching practice. The section begins with a description of the demographics of the case study participants.

Demographics

There were 26 total participants in the case study, of these 18 were males and eight were females. Twenty-three teachers were involved in the face-to-face interviews and focus groups. Of these same teachers, 76% responded to the follow-up e-mail interview. (Two teachers no longer worked at the school.) Of the 15 teachers and two part-time teachers/administrators interviewed the majority were between 30-49 years of age. Most participants had more than 11 years teaching experience and had taught from one to eight years in a CLP. At the time of data collection, no teachers had taught in a CLP for more than eight years since this educational
innovation had not been in existence in Canada for that long. (For a more detailed description of the demographics of the case study please refer to Table 7 in the Methods chapter.)

*Teachers’ Stages of Concern and Levels of Use during Implementation*

This section is organized into two distinct parts. First, it identified the overall profile of concerns for participants in the interviews and compared them to the combined administrative profiles. Second, the data were organized around participants’ levels of use of the innovation. Participants were grouped into specific levels of use based on their responses to the LoU protocol questions. Within each grouping, individual participants’ stages of concerns were described in an attempt to understand how teachers’ behaviors, beliefs, and feelings affected the implementation process.

In order to obtain an overall profile of the participants’ stages of concerns, the average of each Teachers Stages of Concern Questionnaire percentiles and each Change Facilitators Stages of Concern Questionnaire percentiles was tabulated. As illustrated in Figure 15, the peaks of the teachers profiled indicated *awareness* (Stage 0), *management* (Stage 3), and *refocusing* (Stage 6) concerns were the most intense. Obtaining initial information about the innovation, the consequences of the innovation, and collaborating about the innovations’ uses were less of a concern. This profile was significant due to the ‘tailing up’ of Stage 6 *refocusing*; it indicated that, overall, these teachers had strong ideas about what should be done differently with the CLP (Hall & Hord, 2006).

The administrators’ profiles indicated intense concerns about an initial awareness of the innovation and managing the innovation, also shown in Figure 15. How the innovation would affect them or their teachers, and the consequences of the innovation were of little concern to these administrators. The tailing-down in the final stage of concern (*refocusing*) suggested
administrators were unsure about what should be done or what needed to be done differently with the CLP (Hall & Hord, 2006). This is in contrast to the teachers, who had strong opinions and views on what needed to be done differently during the implementation process. These findings suggest that teachers and administrators may not be communicating as effectively as they could about the needs, views and opinions of the teachers—those responsible for making the mandated change a reality in the classroom. As well, it is difficult to believe that administrators had such strong awareness concerns given that the CLP adoption process began eight years before this data were collected. In contrast to what the model suggests, there may be a new type of awareness they were concerned about (e.g., advancements in technology or concerns about teachers awareness).

Figure 15. Average stage of concern for participants.
The findings revealed that none of the 15 teachers interviewed were classified as non-users of the innovation (based on levels 1 to 3 of the Concerns Based Adoption Model). Table 16 shows that most participants were routine users in the compulsory laptop program (Level IVA), whereas only two teachers were identified as integrating their use of technology (Level V). What follows is a description of the teachers identified within each of the four levels of use identified: Mechanical, Routine, Refinement, and Integration.

Table 16

*Levels of Use (LoU) Groupings Based on Individual Interviews*

<table>
<thead>
<tr>
<th>Levels of use</th>
<th>Number of teachers (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>III: Mechanical Use</td>
<td>1</td>
</tr>
<tr>
<td>IVA: Routine</td>
<td>7</td>
</tr>
<tr>
<td>IVB: Refinement</td>
<td>5</td>
</tr>
<tr>
<td>V: Integration</td>
<td>2</td>
</tr>
</tbody>
</table>

_Mechanical Uses of the Laptops_

One teacher, Evan, was identified as a mechanical user within the compulsory laptop program (CLP). Evan was an experienced physics teacher who had been at the school for 25 years and had taught in the CLP for three years. He was observed teaching a Grade 10 Physics class, an Advanced Placement Physics class, and a Grade 11 Physics class in one day during the final semester of the year.

This level of use suggested that Evan used the laptops in his work for short-term and day-to-day purposes (Hall & Hord, 2006). Involvement in the CLP in mechanical ways indicated that Evan was using his own laptop primarily for managerial and administrative tasks that were required by all teachers at this school (e.g., attendance, marks, e-mail communication, and posting solutions on WebCT), and for two or three demonstrations per year.
During all three classroom observations, students did not use their laptops and Evan used his only for attendance purposes—there was no evidence of laptop use for teaching purposes. Prior to the beginning of each class observed, he read and answered his e-mail (Ob1, Ob2, Ob3). He was observed leaving his classroom within the first five minutes and entering his office in order to submit an attendance report electronically using the laptop in his office (Ob1, Ob2). (This use was not observed in Ob3 because he forgot to take attendance for that class). Evan also stated that he used his laptop for recording marks using the mandated marks program: “We all have to keep our marks on our [laptop] computers and update our marks about every two weeks or so” (P297). Evan also stated he used his laptop to manage e-mail communication: “I came in [to school] yesterday, the last day of March Break, I had about 70 e-mails. I didn’t have to respond to all of them, but it took more than an hour to go through them…everybody has to do that” (Interview, Evan, P305).

During the interview, when asked if Evan used WebCT, he stated, “Shhh…I don’t use WebCT” (Interview, Evan, P307). Evan also admitted that although his assignments and solutions were posted on WebCT, he did not post them himself because he did not have the technological knowledge to do so, as demonstrated in the following statement:

[What I] had been doing in the past was writing out solutions for every homework question I assigned, and then photocopying them. When we got a disk with our textbook, it wasn’t necessary to do that anymore, but it did mean that somebody, who had more computer expertise than I have, had to do that. [My Head of Department] said, ‘I’ll do it, it’ll take me half an hour’. So he did it.... He knows I don’t use WebCT nearly as much as I should or I’m supposed to, but I don’t think my kids are really at a disadvantage. (Interview, Evan, P333)

This was also reinforced by looking at Evan’s WebCT course management site; as he stated his assignments and solutions were posted, but no other WebCT feature was in use (e.g., calendar, course outline, or discussion groups).
Evan stated he used his own laptop infrequently during class and his students rarely used them in the classroom for related work. Students in his class assumed they would not be using their laptops, so very few of them even brought them to Evan’s class. (Ob1, Ob2, Ob3). In terms of using laptop technology in his curriculum with his students, Evan stated that he had students use laptops “a very small amount” (Interview, Evan, P233). Those times when students were required to use their laptops, he used a specific Astronomy website and the Starry Night® Backyard CD-ROM\(^8\) that came with the textbook, both of which demonstrated specific scientific concepts. With the web-based program, his students used their laptops for accessing a website called Asteroid Impact\(^9\). He had students enter a situation about a meteor in order to determine the specific amount of damage done to Earth. For example, students could determine the amount of damage from a meteor “100 metres wide…going at 30 km a second, and hit[ing] Earth at an angle of 45 degrees” (Interview, Evan, P119). He stated that he and one of his colleagues had their students use the Starry Night Backyard CD-ROM by,

Walk[ing] them through it, show[ing] them what it would do, and [giving students] a test using the program. We might say, “Put yourself in Rome, Italy in the year 465. How many degrees above the horizon was Cappala at 10:32 p.m.?” or “What phase will the moon be on January 18, 2014?” (Interview, Evan, P233)

Usually when Evan used laptop technology it was as a demonstration tool. According to his interview, he used it as a demonstration tool two or three times per year. For example, he projected visuals, from his laptop to the data projector, using various websites for his class to see. He stated, “There’s some really good websites with amazing pictures on it. It’s just nice to show the kids some of the really good shots that the Hubble telescope has taken” (Interview,

\(^8\) Starry-Night Backyard CD-ROM is astronomy software. The two main features are a sky map that can be viewed from anywhere in the world and the ability to view the universe at any point between 4700 BC and 9999 AD.

\(^9\) Asteroid Impact is an interactive website for estimating environmental consequences of a asteroid impact on Earth. The features it is able to tabulate include ground shaking, atmospheric blast waves, thermal effects, and the size of craters produced from a specific region.
Evan also used scientific probes connected to his laptop and projected onto a screen, for the first time, just before the interview. He demonstrated measuring the speed of sound using the echo method and the sound probes and it worked out really well. I did it as a demonstration in front of the class and it was projected from the ray gun right onto the screen, so the kids could see exactly what was happening as it happened.  (Interview, Evan, P131)

He did not, however, use the graphing software when collecting the probe data due to his philosophical belief that students needed to complete the graphs by hand in order to really understand the meaning of the graphs. He stated,

I think there’s a real benefit for most kids doing it [graphing] by hand because they can actually see where it [the data] comes from. But the software [will] do it for them immediately. Like here’s the distance-time [graphs]—it [computer software program] will calculate the acceleration time for them right away, but they don’t see where it comes from. I think going back to first principles is a good way to do a lot of things in Physics anyway.  (Interview, Evan, P281)

The CBAM criteria suggest that anyone in this LoU considers change only when it will make their teaching easier for themselves, rather than for improving student learning. Although Evan was concerned about making his own life easier with the implementation of the CLP, he was more concerned about providing a good education for his students. When talking about an in-class assignment he wanted his students to do, he stated that he didn’t think the CLP “made things any better for the kids. All I really wanted to do was [have them] fill in some blanks on a handout and the overhead did it just as well and [was] a whole lot easier for me” (Interview, Evan, P409). He did mention that he had “never heard any kid complain and kids are going to be the first to complain if they think they’re being hard done by or don’t have access to all the resources they think they need” (Interview, Evan, P333). If he decided to further integrate other software programs or electronic probes into his curriculum and teaching practice it would be due to the benefits he saw for his student learning:
We had a PD session right before Christmas on how to use some of the other probes. We had [a demonstration on the] force probes and pressure probes. I haven’t used them yet, but I think I could use them if I needed to. (Interview, Evan, P269)

Evan also believed that,

I use it [laptop technology] so seldom compared to other members of the department. I use it when I need it, and if someone…. who’s an absolute whiz on the computer shows me a lot of stuff, I just think I think I can do it better using chalk and talk rather than [using laptops]….I’ve been doing this [teaching physics] a long time, and I think I’ve developed some better methods of getting an idea across rather than showing them on a laptop. (Interview, Evan, P147)

Stages of Concern for the Mechanical User

Evan had very few concerns “about or involvement with” (Hall & Hord, 2006, p. 140) the CLP. According to the CBAM, his concerns were unrelated to himself, his tasks, or the impact of the CLP on others. Figure 16 illustrates that Evan was most concerned about awareness issues (Stage 0). According to Evan’s concerns profile and level of use findings, he was certainly aware of the innovation due to the mandated nature of the CLP and he was interested in gaining more knowledge about it from a student learning perspective. Although Evan used the laptops primarily for demonstrations and administrative purposes, he did not appear to have any concerns about the management of the innovation or the effects it had on student learning since he rarely integrated the laptops into his teaching practice. He stated that he saw some strengths in the laptop program but not any weaknesses in his situation (Interview, Evan). He did not believe his students were being disadvantaged by his decisions to avoid laptop technology in the majority of his teaching practice. He was doing things the way he had for the last twenty years. As he said during a conversation following Ob3, “I could use more technology but why? This [what I am doing now] is effective”.

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In conclusion, Evan limited his use of laptops to three primary functions: a managerial tool, a communications tool, and a demonstration tool. He was not concerned about the laptop program because he believed most of the changes were based on teachers’ needs and his perception was that there was no need to change his teaching practice. Classroom management related to laptop technology was not a concern since his teaching practice did not permit students to use them in class (Ob1, Ob2, Ob3, Interview).

Routine Uses of the Laptops

Based on the responses to the levels of use interview protocol, seven participants were identified as routine users within the CLP—four females and three males. CBAM defines this group of users as possessing an established pattern of laptop use for both themselves and their students (Hall & Hord, 2006). The members of this group had between one and eight years

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**Figure 16.** Stages of concern for the mechanical user.
teaching experience in a laptop CLP. Five teachers identified themselves as experienced users of the laptops, while two females believed they were intermediate users. All taught in the English, Language, and/or Social Science Department. Two of these teachers were observed while teaching. Linda was observed teaching a Grade 11 Ancient Civilizations course and a Grade 11 World History course over a period of one day. Cindy was observed teaching a Grade 10 English class and a Grade 12 Writer’s Craft class over a period of one day.

The CBAM described the LoU for teachers in this group as (a) having mastered the laptops use for their own needs and the needs of their students, and (b) routinized their ongoing use of the laptops—few, if any changes, were made on an ongoing basis (Hall & Hord, 2006).

In general, this group felt comfortable using laptop technology and they made few changes to the overall way they taught with the laptops. They used the laptops for specific lessons to meet particular instructional goals, and they felt comfortable with technology and how to use it. For example, Linda stated that,

Every year I slowly integrate it [laptops] more and more. I try to diversify it; I might use a few PowerPoint [presentations] a year, a half a dozen times we go to the World History Database, a few times we use websites, a few times we use video clips. I try to make it so that I’m not always using PowerPoints as notes…so that they don’t get bored. (Interview, Linda, P262)

As another example, Callum stated that he used laptop technology in his teaching practice “for delivery [of lessons] using PowerPoint, DVD’s, Word files that I might want to show to the students or anything on the Internet. It [the CLP] is useful in terms of helping with the course” (Interview, Callum, P279).

These teachers made few, if any, changes or improvements in the laptop’s use due to the comfort they had in the routine use of the laptops. These teachers were waiting to see if their present patterns of use had effects on student learning before revising their uses. For example,
when Jack was asked if he made any changes recently in how he used the laptops in his classes, he replied,

not really in terms of the amount of use. I’ve changed the style sometimes where I’ve asked the students to submit me things or done communication activities using e-mail or other communication media that they like…but in general, no it’s the same. (Interview, Jack, P203)

When asked if he was planning on making any changes he stated he hadn’t,

really given [it] a great deal of thought. For me changes with respect to technology just tend to happen… It hasn’t been something I’ve sat back and reflected on and say; “next month I’m going to try this.” I wish I had more time to do that. (Interview, Jack, P207)

Jack also stated that his plans for laptop use later this year included routine use: “Using WebCT for discussions related to the things we see or the things we read, e-mail communication, WebCT quizzes, and the course calendar, basic stuff” (Interview, Jack, P215). During Cindy’s first classroom observation, she allowed her students to use the laptops 60% of class time in order to compose and edit stories because it was believed to be more efficient, faster, and easier for students to edit and share the work with their peers.

Stages of Concern for Routine Users

There was a great deal of variability in each of the seven routine users’ stages of concern (SoC). Intense concerns for this group of users ranged from obtaining enough information about the CLP, to being able to implement it into their teaching, to managing its use, to refocusing on major changes in the way the laptops are used.

According to the CBAM (Hall & Hord, 2006), Cindy, Jack Jenny, and Stephen’s profiles indicated intense concerns about managing the laptops. However, the fairly high refocusing concerns indicated that these users knew what to do about their management issues and had them under control (Hall et al., 1998). The interviews did reveal that these users were most concerned about managing (a) the laptops within their curriculum, (b) the time it takes to integrate laptops
into their teaching practice, (c) the mandated requirements, (d) the number of malfunctions with student laptops, and (e) the changing dynamics of classroom management. The model also indicated that individuals with this profile were intermediate users of the innovation. The questionnaire revealed, however, that three of the four individuals with this profile considered themselves to be experienced users.

The CBAM described Linda’s concerns as indicative of a non-user who is “somewhat aware of and concerned about the innovation and is interested in learning more about the innovation from a positive proactive perspective” (Hall et al., 1998, p. 36). Linda, however, considered herself an intermediate user of the technology. The model assumed that Linda had not yet begun to implement the innovation; whereas; this was not the case especially given that it was a mandated change. Linda was implementing the innovation in routine ways. Unlike the descriptor for Linda’s SoC profile, which indicated she had few management concerns, her interview responses revealed some concerns about management. For example, Linda stated that there were times she told “students not to bring them to class, albeit rarely, on days they were not needed” (Interview, Linda, P252). Given Linda’s management concerns, the CBAM’s concerns profile does not appear to take into account a mandated change such as a compulsory laptop program, in which the technology is frequently changing and teachers in these programs are required to continually adjust with the rate of change.

Vera’s concerns profile indicated that she could be classified as a non-user. Hall, George and Rutherford (1998) state that Vera’s,

personal concerns override concerns about learning more about the innovation. The individual is much more concerned about her/his personal position and well-being in relation to the change than she/he is interested in learning more of a substantive nature about innovation. (p. 36)
Vera’s interview responses contradicted this profile analysis. Vera considered herself to be an experienced user of the laptops and stated that, “the laptop has been phenomenal to teach with…. Using it as a teaching aid has been huge. I actually don’t know how I would teacher this course sans [without] a laptop. I like it” (Interview, Vera, P343). The model suggests with a profile such as Vera’s, the less information communicated to the implementers of an innovation, the greater personal concerns become (Hall & Hord, 2006). Vera, however, believed that administrative support for her use of technology was effective (Interview).

Callum’s profile, according to CBAM, indicated that he was most concerned about “the impact of the innovation upon [his] students” (Hall et al., 1998, p. 40). The interview data suggested this analysis was accurate as Callum stated that his only concern was student-centred:

I’m concerned that they’re [students] using them to support learning and not replace it…. I sometimes get the sense that the laptop program was introduced just for the sake of having laptops introduced at an independent school and that really concerns me. I think they’re a very expensive tool and a very valuable tool, but I think teachers have to put some thought into how students are going to best benefit from their use, and I’m not sure that happens all the time. (Interview, Callum, P259-263)

The low awareness and informational concerns also indicated that Callum had no desire to learn more about the innovation as he felt he knew all there was to know or perceived he needed (Interview); this finding also supports the CBAM’s analysis for this profile type.

There was high variability in the Stages of Concern for routine uses, ranging from informational, personal, management, consequence and refocusing. Although some members of this group were classified as non-users (according to CBAM), all members were in fact users with the CLP. All users identified themselves as either intermediate or experienced users of the technology, whereas some SoC profiles indicated that these members were either non-users or inexperienced users. As well, the questionnaire identified specific concerns about each user. The interviews, however, revealed that in some cases what were considered non-concerns were
in fact prominent concerns (e.g., Linda). These findings suggest that the CBAM may not be an appropriate measure for understanding the implementation of a school-wide mandated technology innovation, since once it is adopted, all implementers become users if they are to survive in that environmental context. The data also showed that due to the constant developments in laptop and software technology, teachers’ concerns ranged from ‘unrelated’ and ‘high impact’ concerns.

Refinement Uses of Laptops

As in the previous group, the five teachers identified in this level used the laptops in similar ways; they reflected and revised their uses for the benefit of their students (Hall & Hord, 2006). They had been teaching in a CLP for between five and eight years. All users in this group were males and four considered themselves to be experienced users, while one identified himself as an intermediate user. They taught within the English, Music, Computer Studies or Social Science departments. One teacher was cross appointed between the English and Social Science departments.

The CBAM suggested that teachers in the refinement LoU were taking initial steps to observe and reflect on how the CLP was benefiting their students. Based on these assessments, teachers revised their use to improve student learning (Hall & Hord, 2006). The CBAM also stated that teachers such as these were concerned about the CLP itself and were searching for alternative uses within the existing innovation (Hall & Hord, 2006). The interview data supported CBAM’s description of teachers in this level of use, as they used laptop technology for (a) understanding the short- and long-term consequences for students based on informal assessment strategies, (b) making changes to improve student learning, and (c) finding new ways to integrate CLP’s into curriculum.
They had knowledge of both short- and long-term consequences for students through informal evaluations that included dialoguing with students (e.g., Interview, Justin, P123) and observing student work. Matt reinforced this by suggesting that,

Students have become increasingly computer literate and computer comfortable… from a computer mechanical point of view and someone who teaches writing I’m getting better quality writing than I used to get and more extensive writing than I used to get. It also opens up their [students] options more in terms of what they can learn from. When I first came here research was confined to what you could find in the library with an occasional research trip to Toronto. If you wanted to do lessons involving research there was very little you could actually research on. Now with the Internet, there [are] lots of things that they have access to…so it opens the horizons for students confined to this relatively small area. It also improves communication a great deal, and in many ways it helps to meet the school's fundamental mandate of preparing students for university and beyond in that I don't think anybody short of a blue-collared mechanical job is going to be doing things that don't involve computers in the world and beyond. (Interview, Matt, P429)

Reflections on past lessons were the primary form of assessing what worked when teaching in a CLP and what could be improved upon for future lessons. Fred, with support from George, revised a Geography project. According to George, Fred and his colleagues did a national park project and [used the] old display board way of doing it. They liked to keep the display boards for parent-teacher interviews or various things. Then at the end of the year, they had all these display boards and you just can’t keep keeping them. That’s when he thought [about] doing this [project] web-based. [Fred] and the geography teachers were looking for a way to do this electronically so that they could keep them all without having to take up all this room in their office or classrooms. So we came up with doing it as webpages [using FrontPage], and we [had] taught them [the students] similar skills already… We showed them how to do the national park project with all the linking, pictures and using tables to keep things organized, how to do the internal links down the page, and ways to find the right type of pictures and the right size and the right quality and everything to put on it. We did that and the geography teachers loved it. And now, at the end of the year when they collected them all I said, ‘you can burn those on a CD and use them as exemplars the next year’. (Interview, George, P333-341)

All five teachers in this LoU did not perform any formal evaluations of the laptop program on teaching and learning (e.g., Interview, Art, P197; Interview, Fred, P211-213). The
motivations for changes made by these teachers were purely self-directed and student-oriented. For example, Fred explained that in his Grade 11 Geography course he would,

normally do student presentations on tornadoes [using laptops]. One group does one on how to prepare for tornadoes, one does a safety guide. Instead of doing student presentations again in this unit, what I’m going to get them all to do is to make a thirty second public service announcement on tornado safety. (Interview, Fred, P257)

This group of teachers believed they knew all they needed to know about the laptops and had many ideas about how to use them in their lessons. For example, Art stated he was “not actively seeking” new information (Interview, Art, P97) and although Matt was also not actively looking for information about integrating laptop technology into teaching, he would, “like to find more effective ways to actually use it in the classroom in ways in which the students could do things that would be more constructive” (Interview, Matt, P113). The CBAM appeared to describe this group of users accurately.

Stages of Concern for Refinement Users

There was also a great deal of variability in each of the five refinement users’ Stages of Concern (SoC), as intense concerns ranged from obtaining enough information about the CLP, to managing its use, to collaborating with colleagues, to refocusing on major changes in the way the laptops were used.

All teachers in this category were concerned at a fairly intense level about refocusing their ideas about the use of laptops into classroom realities—they wanted to try out their ideas in the classroom with their students. Unlike the CBAM, however, these teachers were not interested in replacing the CLP with an alternative as all five teachers believed the laptop program should continue. Their main concern was about the mandated requirements preventing them from integrating laptops more fully into their teaching practice.
According to CBAM, Fred and George were most concerned about “working with her/his colleagues or others in coordinating use of the innovation” (Hall et al., 1998, p. 40) and were typically team leaders. The interviews supported these descriptions as both George and Fred were team leaders. They were also proactive in working with colleagues to enhance the implementation of laptop technology into the curriculum. In fact, Fred approached George just before the interviews were conducted for support in creating electronic versions of student projects, as described above (Interview).

Matt and Justin were most concerned about the consequences of the CLP—how it would affect their students’ learning and achievement. Similar to Callum’s concerns (a routine user), these two teachers were not looking for additional information on expanding their knowledge as they believed they knew all there was to know about the program.

Art was the only one in this user group to be most concerned about managing the laptops. Unlike the routine users’ management concerns, Art was concerned about the time managing the mandated requirements took from focusing on the teaching and learning process. For example, Art stated that the mandate to use the laptops was getting in the way of creative potential:

You have to do some [mandated] things on laptops [because] there has to be some evidence that the laptops are being used [by administration], so whatever time you would have for technology you kind of have to do there. I’ve found software [for the laptops] that is not very imaginative in a way because there’s a limited amount of applications in music theory. We’ve got some of those that we’re using now and it’s working, but I would love to be able to use software that is more creatively based where the kids are composing and using multimedia kinds of experiences but that takes a lot of time and we don't have that time. So the [mandated] laptop [use] impinges on that. (Interview, Art, P93)

As in the routine users group, there was a great deal of variability in this groups’ stages of concern. They appeared to be more suited to the CBAM’s levels and stages, as no members of this group were classified as non-users and those who considered themselves experienced users had concerns that directly impacted their students, rather than themselves.
Integration Uses of Laptops

The levels of use interview protocol identified two teachers, both females, as users who were most concerned about integrating laptop technology into their practices. That is to say, according to CBAM, they planned and implemented laptop integration based on collaboration with their colleagues, for the students’ benefit rather than for their own (Hall & Hord, 2006). Kim and Emi had four and six years experience teaching in a CLP respectively. One taught in the Mathematics Department, the other in the Science department, and both were course leaders. Both of these teachers were observed in the classroom. Kim was observed twice and Emi three times. For Emi, there were no instructional days between the first two observations and one instructional day between the first two and third observation. These users “systematically initiate and execute plans to integrate [their] use of the innovation with others to increase impact of the innovation on their mutual clients” (Loucks et. al, 1998, p. 191). Both teachers were observed integrating laptop technology into their teaching practice and having students interact with their laptops an average of 75% of the time in class (Ob1, Ob2, Emi; Ob1, Kim).

Both Emi and Kim collaborated and shared their experiences informally with their colleagues in order to benefit the students. Emi stated that,

I talk to other members of the department primarily…. We talk about what would be good software to demonstrate certain things. We discuss [whether or not we] should we use Fathom, [whether we] should we use Excel. We have so many different programs that we use in the math department and all have strengths and weaknesses so sometimes it’s just a matter of choice. It's not really done on a formal basis. (Interview, Emi, P119)

Emi also described a formalized structure within the CLP, for colleagues to collaborate with each other:

We also have a course leader for each grade and they are in charge of designing the lessons for the course. I am in charge of the Grade 9 program, so I talk to the other grade nine [math] teachers and tell them ‘this is good software to use for this to show...here are some good examples’…. One of the teachers teaching the Grade nine course this year is a rookie
teacher so we'll sit down together and I'll go over the programs and show her how to do things…. There's other things I don't know how to do and I'll go into their [my colleagues] office and they'll show me how to do something on Geometers Sketchpad because I can't figure it out. We have a pretty good department; they're generally helpful and it's generally different people that know how to work different programs better than other people. In Grade 11, my department head is the course leader, so he does the same thing. He'll give me some ideas of things to use [in the classroom]. I change things based on this coordination because we discuss which is the best program [to use]. (Interview, Emi, P159-171)

These teachers also preferred that any changes made in the use of the laptops in the classroom be done as a collective group rather than individually. For example Kim, one of three grade 10 teachers in the History department stated that all three of them collaborated on a research project about alumni who served in World War I. They decided to turn student essays into websites:

We work together to kind of create the standards, like what do we want the background of the website to be, the font, the size, etc. and what are the minimum requirements for that website. We also work with [two members of the IT department]. They actually come in and do workshops with the students, so they'll be coming in right after March Break. They will be presenting how to use FrontPage, how to create the website, what to do with pictures, [how to] map the network drive so that their websites are saved on the school's server... They come in and do the introduction, and the next time they come in is usually during a work period and they just float around to trouble shoot. The last time they come in is finalizing—doing all the fancy transitions and stuff, and [explaining to the students] how to post it. (Interview, Kim, P119)

These findings appeared to align with the Concerns Based Adoption Model (CBAM).

*Stages of Concern for Integration Users*

There was a high level of variability among the two integration users. According to the CBAM and illustrated in Figure 17, the major concerns with members of this group were *awareness, management and collaboration* issues.
According to the CBAM analysis of Emi’s profile, she was most concerned about awareness issues; she was interested in finding out about the CLP and its potential use in teaching. This was not the reality of Emi’s situation. The interview and observational data indicated that she was an avid, thoughtful, and frequent user of laptops in her teaching practice. Emi was looking for a new type of awareness that would allow her to further implement the CLP into her curriculum. For example, she stated that unless she has access to the peripherals that support laptop integration into teaching, Emi would not spend the time developing the lessons:

I’ve asked to have my own classroom with a SmartBoard in it for next year just because I find it beneficial. And I know if I did [have it] I would use it a lot more. I would design my lessons around it and have kids interacting more with it. But it takes so long to prepare a lesson using the SmartBoard, especially an interactive one where they come up and actually do things on it. I’m not going to do that if I’m not going to have a SmartBoard for that particular grade next year. It’s just too much work. (Interview, Emi, P147)
In the follow-up email, Emi stated that she was eventually given a SmartBoard in her classroom as requested and thus she is using the laptops “almost 100% of the time [with the] SmartBoard to teach most lessons, post all work/handouts/solutions on the schools LMS\textsuperscript{10} (EI, Emi). As well, Emi’s concerns focused on ensuring there was new awareness about emerging possibilities of uses for the technology that aligned with her teaching practice. She stated that her department, “only try to use it where it’s actually beneficial. We don’t use it because we’re supposed to use it. We don’t do [mandated] discussion postings on WebCT because that’s just not applicable to math” (Interview, Emi, P175).

Kim’s scores on the questionnaire, as shown in Figure 17, indicated that her concerns were quite different than Emi’s focusing instead on managing the technology and collaborating with colleagues in the implementation process. Kim’s interview data revealed conflicts between managing her personal and professional interests. For example, Kim had put a great deal of time and effort into integrating laptops into her senior grades (Grades 11 and 12). Administration was trying to determine if the CLP at these grades should continue:

I’ve created lessons and units around the laptops and so for us [to take] those away from our classrooms would be frustrating…. You sit there and you think the effort you’ve put in to try and integrate it and the threat’s there to take it away now or to revise how it would be used in the upper senior grades…. It’s frustrating. (Interview, Kim, P83)

The findings from this group of users show that there was variability in their stages of concerns. In Emi’s case, the CBAM model was not indicative of her true concerns. Yes, she has awareness concerns but not initial awareness concerns that progress linearly to promote the use of the innovation. Rather, she was searching for a new awareness given the rapidly changing

\textsuperscript{10} LMS stands for a Learning Management System. In this study, the LMS used is WebCT (and later Angel)—web-based software used for managing and delivering a high school course.
advances in the technology; she wanted to stay relevant with the potential uses of the laptops for implementation in her teaching practice. This appears to be a continuous process.

In summary, the findings show that the Concerns Based Adoption Model was limited in its use when trying to understand teachers’ behaviours, perceptions, feelings, and beliefs about the compulsory laptop program. The model identified some of the participants as non-users when, in fact, they were all users of the laptops to some extent. It also suggested that some participants, who were implementing the technology in highly impactive ways, were most concerned about being aware of the program’s existence. This was not the case. There was, however, the suggestion that a ‘new awareness’ was sought by some teachers who were trying to keep abreast of the rapidly changing developments associated with laptop integration into teaching practice. The model as it stands is linear; whereas, some of these participants were moving through the levels and stages in a continuous motion depending on how they were interacting with the laptops at any given time. Finally, the model may not be applicable to mandated laptop programs. This model assumed teachers had an option of adopting and implementing the innovation, whereas that is not the case in a CLP. All teachers became a user, at some level, once the decision to adopt the CLP occurred.

*Uses of the Laptops within the Compulsory Laptop Program*

It was important to identify the types of uses by teachers in a compulsory laptop program, if their behaviours during the implementation process were to be examined. Consistent with the findings from the online survey, the most common uses of laptop technology by participants were for communicating, word processing, researching, and presenting curricular material. Very few participants integrated emerging forms of technology, such as social networking
applications, into their teaching practice. All participants, to varying degrees, integrated some technology into their teaching practice.

Communication

The most common use of laptops by participants in this study was to communicate with students, fellow colleagues, and parents. The attendance program, the reporting program, e-mail, and WebCT, were the primary tools used for communication.

The attendance and reporting program were used by all participants in this study since these two uses were mandated by the administration. Online attendance was to be taken, using the teacher’s laptop, within the first five minutes of every class. All marks and report card comments were recorded in a specific reporting software program called MarkBook.

Kim stated that e-mailing the various stakeholders was, “…just a part of my job…. I don’t even think about that anymore” (Interview, Kim, P171-175). Other comments about the importance of e-mail communication in this educational environment included: “I do a lot of e-mail communication with students” (Interview, Matt, P273); “a lot of students e-mail me their late work” (Interview, Cindy, P321), and “e-mail, of course, at this school is almost like an epidemic” (Interview, Justin, P191).

WebCT was the other tool used most frequently by the majority of participants in this study to communicate with students and parents. Most teachers used the calendar to communicate important dates: “I use the calendar so kids can go in and check when things are due” (Interview, Art, P125). Many participants also used it to distribute notes and class handouts. For example, Callum stated, “I use it to post things to WebCT” (Interview, Callum, P279). One part-time teacher, Jeff, used “the laptop all the time; that’s how I deliver the [course] material to the kids” (Interview, Jeff, P265). Fred also described his communication method
using WebCT: “I have the whole year planned out on the [WebCT] calendar…. All my materials are already on [WebCT]” (Interview, Fred, P309).

Word Processing

One of the primary uses of laptop technology that emerged from the data was the word processing software. Word processing was used by all participants but one to write assignments and tests for students. It was also used by all course leaders to write curriculum documents for each of the courses for which they were responsible. Only Evan, the one mechanical user, did not use a word processor for designing assignments, worksheets and tests. He continued to design his handouts by hand.

Research

Research was also cited as a frequent use by teachers in the interviews and focus groups (almost 70%). Most teachers used the laptops to research material and information in their lesson planning (e.g., Fred, P173) and to have their students research information for projects and assignments. In History, Art, English, Science, Guidance, and Music courses the teachers in this study subscribed to a variety of databases (e.g., World History database) (e.g., Interview, Linda, P70), and used Websites (e.g., CBC, Archives of Canada, Ontario Government) (e.g., FY FG, Ian, P41; Y2 FG, William, P549; Interview, Vera, P191), for both teacher and student research purposes.

Presentations

Just over 50% of participants used the CLP to give presentations to students and for student presentations in class. For example, Callum described the teacher-centred use of presentations: “I use them [presentation software and the laptop] mainly for delivery of the program…the laptops come in handy for PowerPoint” (Interview, Callum, P51). Of the teachers
in this study who used presentations, most used student presentations as a teaching method. An English teacher, Matt, stated that,

One of the assignments they’re required to do are presentations. Pretty much every presentation is laptop based. Of the 35 students taking the course [Classic Civilization], I think there’ve only been two presentations that were not laptop based. [Students] made either a movie or a PowerPoint. (Interview, Matt, P189)

Cindy, another English teacher had her students make a public service announcement. They’ll use their laptops and record messages… I set them up with Outfront. We looked at a bunch of Outfront samples then they made their own Outfront. We sent them in to CBC. There were some great things; one girl did ‘What are your dreams?’ She interviewed all of her peers of ‘What are your dreams? Where will you be in five years?’ Another girl did her documentary on living with attention deficit disorder; she took us into the classroom and she interviewed professionals. (Interview, Cindy, P285).

One of the Music teachers, Art, used a software program that allows students to make a digital Music history timeline. Students chose “an image from the Internet, put the images in order in a timeline, add titles, add transitions between the images, and then finish with a movie.

[Students] go through the steps of making a movie” (Interview, Art, P201). Kim, a Social Science teacher, required student pairs to cover the art movement for each unit in her History course. She stated students,

have to create a PowerPoint presentation…. I actually tell them [her students] that the only print that should be there [in the presentation] is the overview of the movement, and how the movement’s related to the time period. The rest should just be pictures and sound files. The analysis [of the paintings] should be done orally without print. (Interview, Kim, P111-115)

**Simulations**

Most of the Geography, Music, Science and Mathematics teachers in this study stated they used simulations in their teaching practice. For example, the Music teachers used a

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11 Outfront is a Canadian Broadcasting Corporation (CBC) radio show that encourages Canadian citizens to create a radio documentary that describes stories about real Canadian experiences. Selected documentaries are published by CBC.
software program called ‘Band in a Box’\(^\text{12}\), that allowed students to “program background parts. If they’re practicing a jazz solo, they can put in the chord symbols and it will play it for them” (Interview, Art, P145). In Geography, one teacher integrated an online flood prediction simulation “before we go out into the field to do river field measurement. The online simulation mimics what we are going to do in the field” (Interview, Fred, P53). The part-time Science teacher used probes that interfaced directly with the laptops:

It’s amazing because you can gather the data far more accurately than you could otherwise and certainly you can analyze it so much better. You get away from the idea of saying ‘Draw this graph…if you get a straight line, you’ll get the right answer.’ Now you can say, ‘Here’s your data, now you figure out what the relationship is. Here are the tools to do it, you analyze it and you tell me what the relationship is’. (Interview, Jeff, P457)

**Social Networking**

Very few respondents stated they used discussion groups or online chats in their teaching practice. Teachers that used discussion groups, did so solely because it was one of the WebCT features mandated by administration. Only one French teacher implemented MSN into his teaching practice:

We’ve even done an activity using MSN, which is theoretically forbidden in the school. But, if we have a conversation exercise where we’re talking about, ‘What are you wearing today?’, and we’re dealing with names of clothing [in French] then [I’ll] have them converse on MSN—they’re really attracted to that. (Interview, Jack, P203)

The findings show that participants most frequently integrated technology that had been available and used prior to the adoption of the compulsory laptop program; those being e-mail, word processing, and presentation software. New emergent uses of technology, such as social networking applications, had yet to become commonplace for many users. One teacher even stated that MSN was banned for student use (Interview, Jack). This may illustrate that once teachers and administrators have acquired a ‘new awareness’ about social networking technology

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\(^{12}\) Band in a Box is music composition software that allows users to create, play, and record music. It also provides background music for music the user writes.
(e.g., Facebook, MySpace, Twitter) and its advantages and pitfalls, it will become more
frequently and thoughtfully implemented into teaching behaviours and curriculum initiatives;
just as e-mail and PowerPoint have become common uses for both teachers and students alike.

Strengths of the Compulsory Laptop Program

Identifying strengths of a CLP assisted in understanding the feelings, beliefs, and
behaviours of teachers in the implementation process. Five strengths of the CLP for teachers
emerged from the data: technical support, administrative support, communication, access to
resources, and teaching practice.

Technical Support

The majority of technical support described by the interview participants related directly
to the Information Technology (IT) Department. Over fifty percent of participants interviewed
believed that the IT Department was supportive of their needs when it came to troubleshooting
technical difficulties they had with their laptops—either with hardware or software. As Art
described, “if you have problems with the technology we have an IT Department and you call
them and they come; they’re great. They come pretty well right away and help us fix things”
(Interview, Art, P325). Evan also stated that,

if you’re just a guy with a computer…and something breaks, it’s got to be a pain in the
neck to get it fixed or to make a program work. That’s never a problem here because
there’s always eight or ten people across the hall [in the IT Department] that can help you
in a minute or two. (Interview, Evan, P457)

All three administrators interviewed also agreed that the IT Department was a major support for
teachers (e.g., Interview, Jeff, P143; Interview, Josh, P61).

Administrative Support

In contrast to the findings from the online survey in which the majority of respondents
believed their administration provided developmental, financial and moral support in terms of
teaching in a CLP, the findings from the case study suggested administration were most supportive financially. An overwhelming majority of interviewees were pleased that the school provided them with laptops and the software programs they needed for their teaching practice. For example, Stephen stated, “We don’t have to purchase our own [laptop]. It goes with the job…it means the school has made an enormous investment in its faculty and I do appreciate that” (Interview, Stephen, P279). Art was also the only teacher who suggested that Administration was becoming flexible in their mandated uses. As the Head of his department he stated that,

I’ve talked to our Admin[istration] about the laptop use. Basically, they’re willing to overlook us [their department] and let us get away with not using them as fully as other departments. It’s really just within the last month or so they’ve started to say, ‘Well, maybe we should revisit the whole issue of the software we’re using and the laptop program’. It’s the first I’ve heard since I’ve been here that they’re willing to take one step backwards because it’s always been push, push, push, push. (Interview, Art, P101)

Communication

A majority of participants in the interviews and focus groups cited e-mail and WebCT communication as strengths of the CLP. All faculty were in e-mail contact with students, parents, and colleagues. Teachers sent homework and reminders via e-mail and WebCT. Stephen stated, “If I want the kids to listen to the pieces we’re studying, I don’t have to burn CD’s anymore or make copies of tapes like I used to. I can send them an audio file and then they can listen to it themselves” (Interview, Stephen, P53). Kyle suggested that the most effective way he uses the laptops was “for communication with the students—constant communication, whether it be by e-mail [or] checking the WebCT calendar…just keeping students aware of what to bring to class, what’s due, that sort of thing” (FY FG, Kyle, P43). WebCT was also cited frequently as a strength for communicating with students. Linda stated she used WebCT as her daily planner:
There’s a calendar function on it, so every day I’ll write down what we’re doing in class, and homework, when tests are coming up, when assignments are due. It’s all mapped out for the kids… I just go unit by unit so that kids can figure out when the next test is and stuff like that. I have all my course materials on WebCT. (Interview, Linda, P62)

Emi posted “handouts, solutions, and tests” on her WebCT account because she found it benefited the students (Interview, Emi, P291). This use was confirmed by looking at Emi’s WebCT course pages. Susan further explained that “WebCT is a nice feature for students who are absent or who are going to be away for an extended period of time. They can get access to the course material” (Y2 FG, Susan, P21).

The majority of teachers also cited a student’s ability to easily contact teachers and classmates as a strength of the CLP. For example, Susan believed that students could be in “constant communication with the teacher and with their peers through e-mail” (Y2 FG, Susan, P21). A few teachers suggested that students submitted assignments by e-mail and believed this to be a strength of the program. As Henry commented, “Communication is a big factor too. A student’s ability to send assignments via e-mail instead of having to track [them] down—that’s a big thing” (Y2 FG, Henry, P37).

Access to Resources

According to the qualitative data, one of the main strengths of the CLP was perceived to be access to online and course-specific resources, and access to technology whenever needed. All teachers interviewed agreed that adopting and implementing the CLP allowed access to a wide range of online resources. Matt supported this finding when he stated,

In a small community like ours where library resources are very limited, the computer opens a great field of available research to them, especially now that there is Internet access wirelessly in all the classrooms. As a result, you can say in class ‘bring your laptops and we’re going to look for information about x’, and everybody can [access the information] easily and efficiently. (Interview, Matt, P61)

Jack believed that the CLP provided greater online access for students:
You can travel online so it’s a huge advantage having laptop access in the classroom…. I can take them to France and say, ‘find me a restaurant in France that serves vegetarian dishes and I’m giving you a budget of this much money.’ Or we’re going to visit a city and find out information about it.  (Interview, Jack, P61-63)

Even Evan, who was the one teacher identified as a mechanical user according to CBAM, believed that access to online resources for demonstration purposes was a definite strength of the CLP:

One of the sites that I go to is a German site. It’s just a whole bunch of neat little demonstrations, like how the Doppler Effect works. It’s a little cartoon demonstration that shows how the wave fronts are compressed in front of a moving object and stretched out behind it.  (Interview, Evan, P127)

All teachers also believed a major strength of the CLP lay in the greater access to course-specific software. The Science and Language teachers commented on the increased value of students having access to the CD-ROM that accompanied their textbook (e.g., Interview, Jack, P55). The four Mathematics teachers interviewed believed that, due to the CLP, they were able to use the virtual graphic calculator, Excel, and Geometer’s Sketchpad more frequently and effectively in their teaching practice. For example, one of the Mathematics teachers stated:

Right now my Grade 11’s are using the virtual [graphic] calculator…. They’re using their computers quite a bit for other programs as well. They’re using Excel and Geometers Sketchpad. In my Grade 9 class, we will be using it in intersection of lines. We will be using the [virtual] calculator and drawing different lines by using their computer and their calculator drawing lines and finding points of intersection.  (Interview, Emi, P151-155)

The two music teachers interviewed stated that the software for theory and ear training was beneficial because it was loaded on each student’s laptop and was easily accessible. Stephen identified Alfred Music Theory as a “multi-level music theory program…it is essentially an open-ended program where we can determine which level students are at and then they are self-guided” (Interview, Stephen, P155). In Computer Studies, computer language software programs were installed on each student laptop so that they could access them from home
The one Geography teacher in the Social Science Department was able to provide students with access to the Geographic Information System (GIS) software (Interview, Fred, P57-61). The Guidance teacher used a software program that allows students to search various careers (Y2 FG, William, P27).

The majority of teachers identified the increased access to resources as a strength for students doing research. Cindy stated that her students were “finding more information on the issue they’ve chosen from around the world through the Internet [than in the library and reading newspapers], which is good for the senior students” (Interview, Cindy, P69). Kim believed that the CLP allowed her students to “access materials [they] wouldn’t normally have” (Interview, Kim, P75). And Justin stated,

In the classroom, I’ll say, ‘You need to look up what’s the salary of a Canadian senator?’ If somebody asks me I say I don’t know and I say, ‘Can somebody look it up?’ They can access information immediately, which is pretty neat. (Interview, Justin, P51)

Another strength identified by an overwhelming majority of participants was the availability of technology 24 hours a day. Most identified a strength of the CLP was having access to information outside of the classroom (e.g., Y2 FG, Susan, P21). Those teachers who were at the school prior to the adoption and implementation of the CLP remember the difficulties in trying to book their class into computer labs. Now, with the CLP, “everybody has access at the same time. There is no lining up to use the computers” (Interview, Jenny, P47). As well, George remembered,

In days prior to the laptop program we had to keep the labs open for student demands—nightly, after school, [at] lunch, etc. With the students being pulled in so many different directions that was always tough for them to have to come in during study or trying to get that little bit of extra stuff done before their bus came and [before] sports practice. So now that the technology and the applications are with them it just makes our course so much easier that you don’t have to build in all that delay of when assignments are due because you know they’ve got to get access to the school desktops and the network drives, etc. If they went home and didn’t have it because it was on the school drive [they
couldn’t do their homework]. (Interview, George, P77)

Teachers also cited not having to wait for office computers to become available in order to complete their work. Fred stated, for example,

From my student teaching [experience], the teachers all fought in the math department for this one computer to get their marks on…and do their report card comments. Our mark book and report card system are now Internet based and we each have [our own laptop]. (Interview, Fred, P177)

According to a few of the participants, the reporting program teachers were required to use was evolving into a strength of the CLP due to its accessibility from home. Art summed up this view when he stated,

The reporting system is actually quite good now. For the first time this year, we can do it from home, so the hours and hours it used to take can now be spent at home because it is web-based. Our reports here are very time consuming….Thank god we can do them from home now. (Interview, Art, P285)

Teaching practice

Ninety-five percent of teachers believed that the CLP should continue, a view also supported in the survey results. The majority of teachers interviewed believed the CLP strengthened teaching practice by increasing the motivation of some students, and providing more interesting, varied lessons. Andrew believed a CLP,

adds motivation if used properly….Technology, like anything else is a good thing, but too much of a good thing is a bad thing. So moderation for the right purposes is an excellent learning tool. It definitely enhances the program through variability and access to information. (Y2 FG, Andrew, P19)

Callum reinforced this view:

It makes my course much more interesting. I can provide a good variety of materials. I can take the kids further than what I could with chalk or a whiteboard each and every day, and present a variety of curriculum materials that otherwise wouldn’t be available at most public schools. (Interview, Callum, P171)
When asked if the program should be eliminated, Jenny summed up the perception of many teachers:

I think that probably would be burying our heads in the sand… I think that is going too far because they’re going to live in a world of technology and the alternative would be to go back to computer labs and then the whole business of trying to find a free time to take them [students] to the computer lab. (Interview, Jenny, P647)

Teachers did acknowledge caveats to the continuation of the CLP. One teacher, representative of those interviewed, wanted to improve his teaching with the CLP.

I would like to find more effective ways to actually use it in the classroom; ways in which the students could do things that would be more constructive…. It would be nice to get beyond the usual routine of essays written in Word and PowerPoint presentations, and get to something more adventurous. The difficulty is neither subject that I teach really loan themselves by nature to flashy adventurous things that you could add [to the curriculum]. (Interview, Matt, P113)

Only one teacher, who used the laptops in routine ways, did not want the CLP to continue due to her frustration in the quality of some of her students’ work: “I think it [laptops] complicates the whole learning process. Let’s just get back to the basics.” (Interview, Cindy, P529).

The major strengths in a CLP for teachers in this case study included technical and administrative support, the availability of communication to all stakeholders, access to resources and improved teaching practice. The support strengths were primarily technological—administration provided the hardware and software, while the IT Department provided all the necessary support for learning how to use the technology. These strengths appeared to be mainly administrative tasks that involved communicating and organizing. Access to online resources appeared to be the only essential component related to pedagogy and curriculum content. It appears that pedagogy and curriculum development were not considered strengths of the laptop program—two important components for teaching students effectively. This may mean that the focus of support was on providing technological knowledge, rather than connecting it to content
and pedagogical knowledge. If an essential component was learning how to integrate laptops into curriculum and teaching practice was provided through a transparently communicated educative rationale, greater implementation efforts might be made in the classroom by teachers. Not only did the data suggest there were strengths within a CLP, but barriers emerged that challenged teachers attempts to implement a CLP into teaching practice.

First-order Barriers of the Compulsory Laptop Program

Identifying barriers that prevented teachers from fully implementing a compulsory laptop program provided a method of exploring teachers’ beliefs, behaviours, and perceptions when trying to implement a compulsory laptop program into their teaching practice. First-order barriers were defined as extrinsic to teachers and were outside of their control. The themes that emerged were those related to (a) mandated requirements, (b) time, (c) classroom management, (d) understanding the CLP, (e) hardware, (f) software, and (g) teacher professional development and were first-order barriers thought to prevent complete implementation of the CLP into their teaching practice.

Mandated Requirements

From the teachers’ perspectives the required mandates were the use of WebCT, reporting software, attendance, and e-mail. The majority of teachers interviewed believed that the mandated requirements were top-down decisions that prevented them from more fully implementing the CLP into their teaching practice in meaningful ways. They cited top-down approaches to policy making, relevance of the mandated tasks to specific courses, and procedures to ensure policies were enacted as barriers to teaching in the CLP.

Top-down decision making. All teachers believed that the mandated requirements in the CLP were decided by administration in a top-down fashion. For example, Matt stated that the
requirements were “commands from on high saying you must do this” (Interview, Matt, P265).

Another participant thought the mandates to be “very rigid and [there is] no dialogue…it’s like, ‘do it’” (Interview, Cindy, P453). Cindy gave an example of the reporting program, MarkBook, and dividing the marks into four separate categories\(^\text{13}\): “We were told again just do the four categories and tough if it doesn’t work in Math or Physics…just do it” (Interview, Cindy, P475).

Jack described MarkBook being mandated had added “an element of mechanical burden” (Interview, Jack, P167). The barrier did not appear to be with the provincial mandate to institute the four categories into reporting student achievement, rather it was with the restriction of having to use a specific reporting program mandated by administration. In support of this theme Matt stated he was,

> concerned about the ‘ram down the throat syndrome’ where we get this mandate that’s saying every department must add the use of one WebCT feature every year whether we need the feature or not. I watched one of my colleagues, for example, spend the better part of an hour and a half trying to prepare a multiple choice test on WebCT. I thought, ‘Well, what’s the point of that?’ We’ve had edicts, for example, at one time or another saying you must always require your students to bring your laptops to class. (Interview, Matt, P261)

From the teachers’ perspectives, there was little or no consultation or opportunities for them to provide input into decisions made about software use. It emerged that one full-time and one part-time administrator believed, however, that there was a good decision-making structure in place and there was flexibility in the implementation of the mandates. For example, one administrator, Lucas, when asked about the mandated requirements stated that,

> We have dealt with it [the mandates] at the Course of Study committee, working with the academic department heads to establish standards that make sense for each of the departments. We’ve been pretty flexible. Initially, we had five standards [for WebCT] that everybody had to adopt. We then brought it back to three standards that everybody

\(^\text{13}\) Categories are based on the Ontario Ministry of Education’s mandate that teachers report on the levels of student achievement in each of four specific categories. The categories include, (1) knowledge/understanding, (2) thinking/inquiry, (3) communication, and (4) application/making connections.
had to adopt, with the opportunity for each department to establish what the other two would be. (Interview, Lucas, P75)

The full-time administrator, Josh, believed that,

[The case study school] has got good structures in terms of who’s responsible. From there, they make the call in terms of is this something that we bring together as a whole faculty to discuss or is it something that’s brought forward, depending on the issue, to the senior leadership group, the course of study group and then from there do we go back to the wider group or not. (Interview, Josh, P253)

There appeared to be a contradiction in beliefs about the decision-making structures at this school between the teachers and administrators. Frequent, ongoing communication between these two groups may bridge this gap in perception.

Not only were teachers frustrated with the top-down approach to mandating software programs, the majority were also resentful of the perception that they were required to use laptops in every class. Vera believed that the “Grade 10 (Y2) curriculum says that [students] need to bring their laptops [to] every class” (Interview, Vera, P99). Art also believed that “there’s been a huge resentment amongst the staff with the imposition of the laptops [by administration] saying you have to use them. That was told to us, ‘you must [italics added] use them in your classes’” (Interview, Art, P73).

The follow-up e-mail responses revealed that no changes to decision-making approaches had occurred since the original data collection occurred. All teachers said they were not involved in decision-making concerning the CLP program with the exception of two teachers who were members of the information technology (IT) committee. These teachers stated that they were involved in the decision to change to the LMS ANGEL from WebCT (EI, Matt; EI, Kim). Involving two teachers in the IT committee suggested that more stakeholders are becoming involved in decision-making processes, as the switch from WebCT to ANGEL was seen as a positive revision to the mandated requirements. Although the change in decision-
making was a slow process (it took eight years for the dissatisfaction teachers had with WebCT to be addressed), once the decision-making is viewed by teachers as more of a shared process, the changes appeared to be more generally accepted.

Relevance of mandated requirements. Although the participants in this case study appeared to resent forceful implementation of specific requirements in the CLP, the majority did conform, but only to the extent of using resources that they themselves deemed to be relevant to their subject areas. Cindy stated that she told her students not to bring their laptops to certain classes but was nervous: “If they [administration] found out that I said, ‘don’t bring your laptops to class’—that goes against what we’re trying to do” (Interview, Cindy, P185). When asked about using the WebCT mandates Stephen stated,

I don’t use [WebCT] because it’s completely peripheral to what I do in terms of music…. I just simply don’t find it relevant to what I do. I don’t post lecture notes. I suppose I could post sound files on WebCT but I’ve gone another route. If I need kids to access sound files, I put them in a separate sub-directory and they get access over the network and that’s that. (Interview, Stephen, P225, P319)

Emi also admitted that she did not adhere to the WebCT mandated requirements. She expanded, “I do my own thing…. I think as a department we decided that some of the things [mandates] weren’t applicable to our department, so we just do what’s applicable to us” (Interview, Emi, P274-279). One of the teachers was meeting the expectations only because she was required to do so, not because she believed it would improve her teaching or her student’s learning. She questioned, “Why should I be using five [the required WebCT mandates] if I’m only using five to fill the quota? I’m not actually using the five really well, so isn’t it better if I just do three really well?” (Interview, Linda, P182). In another example, one participant stated his concern about the mandates:

I don’t really want to be dictated [on] how to use this tool. When that has happened then you’re sort of running around trying to figure out what I can do with this and it’s
certainly besides the point of what I’m actually trying to accomplish in the class. I’ll use it but it’s only useful, it’s only real when you find something strong and essential to do with it, otherwise it’s donkey work. (FY FG, Patrick, P77)

The adherence to the mandated requirements was not related to years of experience, rather it appeared to be related to their beliefs about effective teaching practice. The significance of this finding is that most teachers would like to teach within the CLP without the set standards of use. This was especially true for the WebCT mandates. For example, one teacher suggested that, “I think there needs to be not so much a mandate, but an understanding from the powers that be that these are tools and that they are not always needed in every single class, every single day, of every single course” (Y2 FG, Andrew, P371). Another teacher believed that,

Not every single course needs to use these five aspects [of WebCT]…. Each department should maybe have a little bit more autonomy in terms of deciding what they’re going to do with each course…. Like all those people teaching Grade 10 Science should be able to decide the most applicable tools for use. If we feel that we should only be using three or seven or two [WebCT features], then that’s what we do. (Y2 FG, Susan, P427-433)

WebCT, however, was not the only mandate that teachers were frustrated with; the marks program (MarkBook) was also a mandated requirement for the faculty. Also mentioned as a top-down decision, the relevance of MarkBook was an issue with many teachers:

I mean, it’s [the mandates] even MarkBook now. This year they’ve [administration] instituted MarkBook as the organizer for our marks. Whereas, other people especially in the Math Department were using Excel. So that’s been a big shift…the reason behind it we can all understand because it’s trying to get all the systems to match and be able to upload our marks…. But that’s taking a big adjustment and we’re still discussing whether this is the right tool and how we’re going to use it best. (Y2 FG, Susan, P465)

The follow-up e-mail revealed that the only change in the mandated requirements was changing the LMS to ANGEL from WebCT. Most respondents suggested that although it was more user-friendly, the mandated requirements remained the same. For example, Kim stated that the mandatory requirements for ANGEL included “everyone should have their course outline posted; contents posted; and [they] should be using the calendar” (EI, Kim).
These findings indicated that most teachers engaged in only those mandated requirements they perceived as relevant to their teaching practice. This observation suggests that teachers’ beliefs about teaching and learning play a significant role in the level of involvement a teacher has in the implementation of mandated requirements. The beliefs of these teachers was not limited to teachers with similar years of teaching experienced, age, and gender.

enactment of mandates. The majority of teachers were not meeting all the required mandates of use within the CLP, in part, because there were no accountability procedures ensuring they were meeting the requirements. This was noted in comments similar to George’s:

They [Administration, Department Heads] say what the minimum requirements are for WebCT—your outlines, course material, the calendar, discussion groups once each term. But nobody follows up. You have no idea who’s suppose to look. We all seem too busy to make sure that we’re doing what we say we’re supposed to do and there’s probably not the support there to help…. I’m not trying to make it like a police state, but there’s just nobody there to help. (Interview, George, P285).

Understanding that there were no accountability measures to ensure mandates were being met was common among all teachers who did not adhere to every requirement. This understanding was demonstrated in Stephen’s belief that there was no problem in not following all the standards and he was not worried about it (Interview, Stephen). He commented, “Have I been called to the carpet for it? No” (Interview, Stephen, P335). Even one part-time administrator stated that, “a good teacher’s going to use the laptop whenever he/she feels it’s going to enhance the classroom [learning environment]” (Interview, Jeff, P729), not because they were mandated to do so. One part-time administrator acknowledged that some teachers were not meeting the required mandates when he suggested that, “There are a number of teachers who don’t use the calendar regularly, there are a number of teachers who probably haven’t uploaded materials to the extent that they should” (Interview, Lucas, P253).
From the teachers’ perspectives, it appeared top-down decisions about mandated requirements were barriers for teachers trying to implement the CLP into their teaching practice. Teachers were frustrated about the mandates they deemed inconsequential to their teaching goals and lesson outcomes and many would only enact those requirements in the classroom when they believed it would enhance their teaching practice and student learning. These findings suggest that teachers’ beliefs and intrinsic motivations about the teaching and learning process are key indicators for the level of buy-in a teacher has for the CLP. However, if the mandates were not in place would teachers still use the technology as much as they do now?

_Time_

Most of the participants in this study cited lack of time as a barrier to more fully adopting and implementing laptops into their teaching practice. These teachers believed that the barriers included the time it took to (a) manage the mandated requirements, (b) integrate laptops into curriculum, and (c) learn software programs.

_Managing the mandated requirements._ A common perception shared by the participants was that the managerial requirements took too much time, forcing them to place less pedagogical emphasis on integrating the CLP into their curriculum. The time it took to manage WebCT (and later ANGEL) was the most frequently cited barrier. Matt summarizes this sentiment with the following statement:

I could easily spend two hours every day making sure that WebCT was absolutely perfect. What tends to happen instead in my use of WebCT is a brief note about, ‘Read to page 37 for homework; test tomorrow on vocabulary’, that kind of thing. Whereas it would be a lot better if I were making more sophisticated usage of it, uploading pages. I do some of that but certainly not as much as I would like to or could simply because of time. (Interview, Matt, P405)
Cindy stated that, “Everyone has to [use WebCT] and I’m thinking, ‘Okay, fine. You want us to do WebCT then we should all have one less course.’ It’s really time consuming” (Interview, Cindy, P453). Even one of the part-time administrators acknowledged this finding:

The big complaint with WebCT, which is one that I have, [is] it’s too cumbersome. It’s too difficult to do some basic things. There’s too much effort required to get my handout from my laptop onto my WebCT course. It takes too much time, more time than it should and that’s probably the fact that you have this pretty complicated system. (Interview, Jeff, P529)

Jenny questioned whether completing attendance on the laptops was more efficient than having one student submit an attendance form completed by hand (Interview, Jenny, P299). Art’s statement also represents the majority of participants’ descriptions of the time it takes to address the mandated requirements within the CLP:

The amount of time that the technology takes out of my day leaves me so much less time for the students, for thinking about the kids or [for] planning interesting activities for the kids. I spend so much time on my laptop answering e-mails, because everyone expects an instant response…and we have to do our attendance [at the beginning of] every period on the laptop. (Interview, Art, P265)

In contrast to the teachers’ perspectives, one part-time administrator believed that allowing teachers to complete more administrative tasks on their laptops had simplified their lives.

You couldn’t exist around here [without using the laptop]…so many of our services now have to [be done] by computer. I think we’ve done a good job over the last two years, from the administrative side of things, using technology to make teachers’ lives simpler…. Over the last two or three years that’s been a really strong focus. (Interview, Jeff, P701)

There appears to be a discrepancy between teachers and administrators in the perception that technology-oriented administrative tasks would allow more time to be spent on pedagogy. The follow-up e-mail revealed that it was still time consuming to complete all mandated requirements using the new course management software program (ANGEL). For example, Emi stated that
“the ANGEL (replaced WebCT) expectations take about an hour a day to update—every teacher needs to update every class daily” (EI, Emi). These findings suggest that frequent, ongoing communication is needed about how both teachers and administrators feel about the mandated requirements.

Integration of laptops. Most teachers believed that time prevented them from more fully integrating the laptops into the curriculum. Emi, an experienced CLP teacher, stated she did not use the discussion posting or the self-testing features of WebCT because, “That might be useful but to set it up just takes so much time” (Interview, Emi, P283). One teacher who used the laptops routinely stated, in terms of further integrating laptops into her curriculum, “I don’t have the time. There’s so many things I want to do that I don’t put that high on the priority list” (Interview, Cindy, P141).

Learning new software programs. The majority of teachers also found that it took too much time to learn the various software programs that would enable them to more fully implement the CLP into their teaching practice. Evan, the one teacher who was classified as a mechanical user, had a SmartBoard installed in his classroom and the software program installed on his laptop. He stated that,

I started using it at the beginning of the year and just hated it. I wasn’t very good with it. I really didn’t give it enough time. I only spent about two or three classes with it and I didn’t like the fact that I could project my handout up on the board, write something down and [there would] be a second and a half delay before what I’d written appeared. Then I wanted to scroll down [and] everything [I’d written] disappeared. I thought this was ridiculous so now I just go back to the overhead projector. (Interview, Evan, P401)

This observation demonstrated that the difficulty Evan had in using the SmartBoard was a lack of understanding in the SmartBoard software. Art believed that,

Part of the problem is we tend to look at a software application and think, ‘It can do this, and it can do this.’ So you plug it in and hope the students will learn it and we’ll learn it, and we’ll do these great things. Then it crashes and burns because we haven’t really
come to know the intimacy level of the program…. It takes a couple of years to learn how to use a piece of software properly in order to teach it. (Interview, Art, P193, P337)

This observation may explain Evan’s frustration with SmartBoard technology. Emi described her frustration in integrating SmartBaord technology using her laptop as a matter of not having daily access to a SmartBoard in the classroom where she teaches one of her courses.

It takes so long to prepare a lesson using the SmartBoard, especially an interactive one where [students] come up and actually do things on it. I’m not going to do that if I’m not going to have a SmartBoard for that particular grade next year. It’s just too much work. (Interview, Emi, P147)

Callum suggested that one of the reasons the CLP was not more fully implemented by teachers was because they,

are so overwhelmed with the day-to-day requirements of teaching that often they’re working in a more sink or swim type of environment than an environment where they can actually look ahead and find better uses for the laptop in their programs. There’s no doubt in my mind that [this] happens a lot. (Interview, Callum, P263)

These findings suggest that time is a barrier to managing the mandated requirements, preparing lessons that integrate laptops into curriculum, and learning software programs. In contrast to the findings of Kanaya, Light and Culp (2005), this study indicates teachers require a long time to really learn and understand how to implement a software application effectively into teaching practice. Participants found they spent so much time focusing on the mandated requirements that they had little to no time to focus on ways of integrating the technology into their teaching practice. As revealed in the strengths of the CLP, greater focus on pedagogical and content, rather than technological, knowledge may provide teachers with the time they need to diversify their use of laptops in the classroom. What they are really saying is that they do not want to be told how, when, or why to implement the CLP—a belief that would certainly inhibit the implementation of the CLP.
Student Distractions

According to almost all of the teachers in this study, a barrier of the laptops was their ability to distract students from academic learning. Student distractions in class included using social networking programs such as Multiple Subscriber Number (MSN) and Facebook (e.g., EI, Jack), e-mailing (e.g., Interview, Matt, P65), surfing the Internet (e.g., Interview, George, P89), and listening to music (e.g., Y2 FG, Susan, P41). For example, one of the computer teachers stated that the laptops were “a huge distraction. [The students] can be surfing, looking at videos, playing games” (Interview, George, P89). One of the English teachers gave an example using her Grade 10 students: “I mean they love it [laptop]; it’s like a toy. It’s like having a big Gameboy” (Interview, Cindy, P141). Another English teacher, Matt, found it difficult to, judge whether students [are] actually paying attention. It’s easy for them to be doing things that are not class assignments—like their e-mail[ing] and chatting with people. I caught a student the other day watching a hockey game that he’d taped. (Interview, Matt, P65)

Yet another teacher, Art, described dialogue among faculty members that described the distractibility of the CLP for students.

Rarely do you hear, “Man, these laptops are a great idea. The stuff we’re able to do is so cool”. You usually hear management issues from teachers, like, “I was teaching a class and [name of student] wouldn’t get off his games” or “I had to give [name of student] a detention because they were on MSN during my class”. It’s the management issues [you hear about]. (Interview, Art, P173)

The responses to the follow-up e-mail supported this finding. All respondents, when asked what new concerns they had about the CLP, stated that students continued to be distracted by the laptops. For example, Kim stated that,

I don’t think the concerns are new [but] students being distracted by their laptops in class remain an issue. There seem to be a number of games that are in Word, Excel, etc. (like Tetris) so it is easier for the student to toggle through documents on their laptops and if a teacher looks at the list of programs open, they look benign. You really have to move about the room more when they are working on their laptops. (EI, Kim)
Jack also described this barrier:

Students are (1) so adept, and (2) so knowledgeable with their machines that they are easily able to get off-task/distracted. With e-mail, a game, MSN, and Facebook all open at the same time while they are ‘doing their homework’, how much quality focus does my material get? How does this affect the pace and/or quality of their learning? (EI, Jack)

Kyle summed up the view of many participants when he stated,

In English it [the laptops] can be an absolutely huge distraction. That is the greatest weakness and limitation of the laptop system. As a teacher I cannot make the switch to teach in the back of the class. I’m stuck in the front. I’m just comfortable there as the director and leader of the course to be looking at eyes instead of the backs of heads. Unless you are behind the laptops you really have no idea what the students are doing. I’m the first to admit that the majority of the time when the laptops are open and on in class the kids are distracted or off task and out of focus. They are doing e-mail, playing games, MSN, whatever it may be. At least three times a class I have to stop the flow of the lesson and say I will not continue until I hear the click of all the laptops [closing]. (FY FG, Kyle, P51)

Susan also supported this finding:

If I’m not using the laptop that day they’re [still] expected to bring their laptop [to] every single class in Grade 10. Mine [students] automatically walk in, set up their laptop and they’re not ready for my lesson because they are reading e-mail, they’re listening to music, [or] they are playing. (Y2 FG, Susan, P41)

This data suggested that laptops were a major cause of student distraction in the classroom and prevented students from focusing on the curriculum being taught. It was the distractions that most teachers found frustrating; many of which were unexpected problems that could not have been predicted during the adoption process. As with the survey data, teachers appeared to be resistant to the current emerging uses of technology (e.g., social networking), rather than understanding their educational uses and ways they could be implemented into classroom practices. Teachers tended to rely on traditional forms of technology; ones they were most familiar with. The distractions did, however, force teachers to revisit traditional classroom management styles and techniques.
Classroom Management

By identifying the changes in classroom management behaviours a better understanding of why and how teachers responded to the CLP was provided. The teachers’ responses suggested that the implementation of the CLP has necessitated a change in classroom management techniques for the majority of teachers who integrate laptops into their teaching practice. The changes in management style were primarily due to the distraction it created for students.

Teachers used several techniques to prevent students from being distracted by their computers. Some teachers had students close their laptops when they were not being used (e.g., FY FG, Kyle, P55; Interview, Linda, P250; Interview, Vera, P91). Others would actually take individual laptops away during class (e.g., Interview, Cindy, P57; Interview, Emi, P103). There were teachers who required students to keep laptops in their case during classes they were not being used (e.g., Interview, Jenny, P135; FY FG, Patrick, P57). Finally, a few teachers told students not to bring their laptops for specific classes; although they admitted to feeling nervous about this management technique as they believed it was in conflict with the CLPs goal—students using laptops in every class (e.g., Interview, Linda, P254). Four teachers, who were routine, refinement, or integration users, were exploring a software program that would allow students to open only those applications required during any given lesson. One teacher in this group, Kim, who was also a member of the Technology Curriculum Committee, had been looking at a new software program created for Harvard University called Secureware. When students are using the laptops they’ll have to sign in and it basically allows the teacher to see what they’re doing on their laptops at all given times. It can lock them out [of specific programs]. For example, if I was doing one of my website activities where I wanted them to go to the World History Database, I could lock their computer so that they only have access to that one website at that point…Kids were MSNing and doing everything. It’s frustrating so they wanted to try and create a system where students still have access but are monitored at the same time. (Interview, Kim, P59)
This data suggested teachers who integrated technology into their teaching practice understood the distractions laptops caused in class and implemented alternative classroom management techniques that those traditionally required in order to keep students focused on the curriculum being taught. The findings suggest that if teachers are to experience successful implementation of a CLP into their teaching practice, they need to alter their classroom management styles. Those that found the laptops most frustrating were those that resisted changing the way they managed their classroom.

*Understanding of the Compulsory Laptop Program*

The review of literature revealed the implementation of an educational innovation involves an understanding of the innovation by all stakeholders as well as the cyclical phases of policy-making: from an intended policy, to an actual policy, to a policy-in-use. The findings that emerged from the case study data suggested that the teachers had an unclear understanding of the CLP’s description, goals, policies and evaluation processes.

*Description of the CLP.* When asked to describe the CLP all participants had difficulty articulating the vision. An overwhelming majority of these teachers, from all levels of use, stated that the CLP only involved students being required to purchase a laptop through the school and bring it to class. Approximately one half of participants described the CLP as teachers using the required mandates; an observation demonstrated in the response one teacher gave when asked to describe the CLP: “I am using at least three main components of WebCT and choose two others [from the mandated requirements]” (Interview, Fred, P531). Only three teachers identified integrating the laptops into academic life as a purpose of the CLP. However, these teachers who believed that CLP policy was to integrate the CLP into academic teaching, were not sure it was being enacted. As Matt explained:
I am not convinced (at least at the senior level) that we really have a laptop program. A program to me would imply clear objectives, clearly communicated. These need to be more than “students should bring laptops to class” or “one test should be written on the laptop”. There is no such program at [the case study school]. I am in real doubt of the existence of a program, as opposed to a group of students/teachers using laptops in particular circumstances. (Interview, Matt, P448)

Even the administrators had difficulty describing the CLP in full detail. One administrator, Jeff, suggested that “the laptop program is all about access to the technology…really the resources you can get to through the technology” (Interview, Jeff, P257).

A second part-time administrator gave the most specific description when he described the CLP as,

All students in senior school [Grades 9 to 12] are expected to have a laptop…. All of our courses offer WebCT as a course platform. We have come to realize that we need to teach kids how to use the laptops and so they’re all required to take the course in the Foundation Year to help get the programs off to a good start and that’s integrated through that course in the other disciplines so that applications are pertaining to assignments in the various subjects. (Interview, Lucas, P111)

The full-time administrator, Josh, provided a broader description of the laptop program:

I see the laptop program as being part of every student’s life in some capacity. It is almost a companion—we use the term tool. As faculty, we look at it as a tool to enhance learning although I’m not sure that has wide acceptance, so I would describe our laptops as companions now. It think that we’re dealing with young people who carry their laptops around and treat their laptops like small children did their teddy bears. They almost feel that they cannot go anywhere without their laptop. They can’t do anything without their laptop. (Interview, Josh, P49)

Teachers and administrators had an unclear vision of the CLP policy. These findings suggest that greater focus on defining the CLP and communicating it to implementers would assist in providing a clear understanding of the teacher’s changing role in meeting the goals of the CLP. It appears the purpose, goals and vision of the CLP were not clearly defined.

*Goals of the CLP*. Most participants stated that the goal of implementing the CLP was as a marketing tool and the goal of mandating its use was to justify the expense to parents. The
majority of these teachers believed that “laptops are sexy and they are very marketable to our audience—parents and potential parents. It’s very attractive for them to know that their kids are going to be completely literate in computer applications when they leave” (Interview, Art, P101). Callum expressed the views of the majority of teachers when he stated that “I sometimes get the sense that the laptop program was introduced just for the sake of having laptops introduced at an independent school and that really concerns me” (Interview, Callum, P263). Only three teachers stated that a goal of the CLP was to improve student’s skill level with technology in order to meet the school’s mission.

Most of the teachers also believed the goal of administration for mandating certain requirements of use is to justify the expense of the CLP to parents. A common belief was summarized by Matt when he stated,

The fact that we’re requiring the parents to spend all this money, there is a tendency to say, “Well, we have to use it in order to justify the expense to parents”, which is [in] my mind a non-educational reason for using laptops. (Interview, Matt, P241)

Another teacher commented that, “We were pretty much told that we had to [use the laptops] in order to justify parents spending that sort of money” (Interview, Jenny, P99).

Teachers’ perceptions of why the CLP exists focused on economic issues. The findings indicated teachers were more likely to buy-in to the CLP concept if they understood the reasons to be pedagogical in nature and student-focused, rather than for marketing purposes.

*Policies of the CLP.* Most participants were not (a) aware of specific CLP policies except the mandated requirements, (b) aware of the location of policies, or (c) involved in formal policy-making and policy revision procedures.

Most participants in this case study were only aware of CLP policies related to the mandated requirements of use (e.g., five WebCT features, Markbook, and attendance). For
example, most responses to the question *What types of policies are there on the laptops?* were similar to Andrew’s: “Every single course needs to have the course material, the syllabus, and the calendar, and then you have [to use] two other options” (FY FG, Andrew, P411). The policy most commonly identified, although not specific to the CLP, was the policy that stated each faculty member was allotted $500 per year for professional development (e.g., Interview, Josh, P137; Interview, Stephen, P391). One part-time administrator, Lucas, believed there were only two CLP policies in place: “We have the laptop use policy…. There’s one for teachers and there’s also another one for students” (Interview, Lucas, P241-247).

The majority of participants could not identify the location of CLP policies. When asked where the policies were located, responses suggested they might be on WebCT (e.g., Interview, Justin, P315), in a policy binder (e.g., Interview, Art, P369), or communicated verbally (e.g., Interview, Callum, P411). Only one teacher, Linda, thought that policies were in the faculty handbook located on WebCT, although she had never visited the site: “You go to WebCT. We each have a faculty handbook on WebCT, so I’m assuming it’s there” (Interview, Linda, P460). The full-time administrator also had difficulty explaining where CLP policies were located: “My understanding is that [it] is in writing and if it’s not it’s certainly been verbalized” (Interview, Josh, P161). As Josh concluded, “in terms of our written policies in general, there’s considerable room for improvement” (Interview, Josh, P185).

When asked how the laptop policies were created, most participants could not explain the process (e.g., Interview, Cindy, P335-337; Interview, Linda, P412-414). Of the 23 teachers in either the interviews or focus groups, over 80% stated they were not involved in any of the policies about the CLP or about professional development. Matt stated that when the CLP was first implemented in Grade 9,
I was a member of the Information Technology Committee, which is now defunct….I was involved in the decision to go with WebCT for example, so certainly in the early stages I was involved. In later stages I don’t really think there has been any kind of general involvement beyond the higher powers consulting with each other. (Interview, Matt, P409)

Even one of the part-time administrators suggested that,

The fact that you don’t have many teachers involved in the decision-making I guess is a bit of a weakness…. In some ways we lost something when we went away from the old Information Technology [IT] committee…. It was an IT decision-making group. (Interview, Jeff, P661-673)

This IT Committee was composed of administrators, teachers, and students (Interview, Jeff, P668-670). In contrast, the other part-time administrator believed that policy initiatives were “a real team effort. We’ve got the technology experts involved with the academic experts in order to make sure that the policies make a lot of sense” (Interview, Lucas, P259).

As well, more than 50% of participants were unable to articulate if and how policies were revised. Many stated they had “no idea” (Interview, Emi, P253) or “I don’t know” (Interview, Stephen, P419) if they were revised. Others assumed they were revised because of changes that had been made periodically. For example, when asked if policies were revised, one teacher stated, “I don’t know. I assume so because we’ve gone wireless” (Interview, Evan, P521). One teacher, Vera, suggested that, “I’m sure they are. I haven’t seen that in writing, but I know just from department meetings that they’re constantly thinking about how to spend PD money, how to allocate it and that sort of thing” (Interview, Vera, P539). The follow-up e-mails also revealed that this observation remained the same; the majority of respondents stated they were not involved in policy revisions.

Emerging from these findings was the discovery that there was no clearly articulated policy, either intended, actual or in use, in existence which stated the vision, goals, or action plan for implementing the CLP into teaching practice. Given this finding, it would be difficult to
determine whether a teacher had initially, partially, or completely implemented the innovation without a clear understanding of what the CLP was or how it was to be enacted by the teachers. There appears to be a need for ongoing communication between administrators and teachers, if teachers’ beliefs, perceptions and behaviours are to reflect an understanding of their role in the CLP implementation process.

*Evaluation of the CLP.* At the time these data were collected, no formal evaluation of the overall effectiveness of the CLP had been completed (e.g., Interview, Emi, P135). The Director of IT reinforced this view, stating that, “No we haven’t [completed a formal evaluation of the CLP] and we need to” (Interview, Jeff, P329). There have, however, been a very few sporadic formal assessments initiated by teachers, who were refining or integrating laptop uses, within their courses and departments. For example, a student-centred assessment was completed in Grade 9 and Ian described the process:

> I’ve sat in on and helped evaluate the tech[nology] department Grade 9 course. They [the students] had to do a project at the end of the year whereby they take a look at how they’ve used the laptop in all their courses, and to me that was probably the most enlightening. (FY FG, Ian, P329)

Kim, in a survey, asked students how useful WebCT was and how effective they perceived their laptop use was in her course (Interview, Kim, P95).

> Many of the participants believed they completed informal assessments of the CLP through student feedback and observations in order to gain insight into their own use of the laptops in their teaching practice. This feedback was through informal conversations with students. For example, Emi explained that she knew her students were using WebCT because, some will thank me for putting stuff on WebCT or ask me to put things on WebCT—answers to homework questions. They want me to do full solutions, scan it and post it to WebCT. So the good students appreciate that kind of stuff. (Interview, Emi, P135)
Teachers observing their students in class was another informal assessment technique used to obtain feedback about the CLP (e.g., Interview, Linda, P230).

A small percentage (less than 20%) of teachers stated that they had not done any formal or informal evaluation of the CLP to date (e.g., Interview, Jenny, P259; Interview, Matt, P173). However, one teacher did state that this would change as his department integrated new course-specific software into their curriculum. Art explained that he was not yet doing any evaluating in his use of the laptops,

because we haven’t really used it extensively in class up until this year. We’ve found new pieces of software this year that can be put on the laptops and we’re starting to use them a little bit. So, we’ll do some evaluation at the end of this year. (Interview, Art, P193)

The data also suggested that the administrators believed no formal evaluations had been completed for the CLP. For example, one part-time administrator suggested that he had highlighted the need to review the laptop program and WebCT: “We need to review the laptop program to make sure that we are getting value for the large amount of money being invested in the program” (Interview, Jeff, P201). The second part-time administrator concurred with Jeff:

It’s important for us to take a very good audit of the whole program now that we’re eight years in. I think when we got into it [the CLP] we did take a good deal of time to think through it clearly and carefully and the rationale made sense. But we’re now eight years down the road and I think we need to determine whether laptop programs are still as much benefit as it was when we made the decision to go laptop eight years ago. There are other technologies out there now. We need to determine where to go from here. (Interview, Lucas, P103)

Josh, the full-time administrator also agreed that an evaluation would be beneficial in order to

Review the value of the role of technology in the school. I would be open to the concept of alternatives depending on how we position ourselves as a school, depending upon the changing needs of students and depending upon the changes in the information technology. I think that we have to be open to a significant change…. I do think that we have to review it [the CLP]…given the amount of money that we spend in this school, there’s an obligation that it’s reviewed. (Interview, Josh, P221)
The follow-up e-mails revealed that no evaluation of teachers CLP implementation had been conducted (e.g., EI, Patrick; EI, Susan).

It appeared from these findings that communicating what the CLP policies were, how they were created, where they were published, and how they were revised, as well as the absence of a formalized evaluation process, were barriers for teachers implementing a CLP into their teaching practice. These findings revealed the importance of creating, through shared-decision making structures, clearly defined policies that are continually reviewed, revised and disseminated to all stakeholders, especially given the rapidly changing uses of technology in our world today. The findings indicate that the policy-making process is not effective unless there is ongoing communication for ensuring teachers clearly understand their changing role in the implementation of the laptop program.

**Hardware**

Hardware issues appeared to be a barrier to implementing the CLP into teaching practice cited by the majority of participants. The issues included older laptops that were not powerful enough to complete the tasks some teachers desired, peripheral technology that supported laptop integration was either not working or unavailable, and no replacement laptops were available when problems occurred with student laptops.

*Older laptop models.* Of the 14 teachers interviewed who used the laptops for routine, refinement and integration purposes over 60% believed students who possessed older laptops were disadvantaged in the classroom. As Kim explained: “A student who gets one [a laptop] in Grade 9, by fourth year the laptop is old; they’re slow and they don’t have the capacity that the newer ones have. That’s always a problem” (Interview, Kim, P159). Cindy reinforced this view when she described the older computers as “obsolete and [they] break down” (Interview, Cindy,
The teachers in this study also believed that the laptops were not powerful enough to handle the sophisticated student uses required. This view was expressed when Matt stated,

In my English class this term I do my course on book and film where their final assignment is that they have to produce their own video. That always involves a lot of computer time at the end of the course. Usually [it’s at] a level beyond the laptop because they need larger hard drives; they need lots of capacity. So, we’ll probably be moving beyond the laptops at that point in the course simply because they need more processor and more storage. (Interview, Matt, P209)

Other teachers suggested that older laptops, “can’t run the newer applications and operating system” (Interview, George, P89) and “are not powerful enough or equipped to handle a particular piece of software” (Interview, Stephen, P215) that students need to learn.

**Peripheral technology.** The majority of teachers also believed that peripherals breaking down or lack of access to them inhibited their ability to implement the CLP more fully into their teaching practice. These participants cited not enough printers (e.g., Interview, Linda, P102), no access to a SmartBoard (e.g., Y2 FG, Henry, P575), and broken projection units (e.g., FY FG, Patrick, P59) as barriers to integrating laptops into their curriculum.

**Replacement laptops.** The case study school offered support for malfunctioning student laptops—the IT Department loaned students laptops, called ‘loaners’, while they fixed or replaced the problematic ones. Most teachers involved in the case study suggested students’ laptops not working properly was cause for concern. For example, Stephen suggested that there were “recurring technical issues with the laptop program, which in the case of honest students, are immensely frustrating. In the case of students who are perhaps less than honest [it] provides them with an easy and plausible technical out” (Interview, Stephen, P87). In terms of student laptops malfunctioning, Matt explained,

The difficulty from my point of view is that every student’s laptop has to be working at the time the class starts. You can’t afford to spend ten minutes of a class trying to sort out why a student’s computer won’t boot up if you’re planning to do a test based on the
computer. We also have the problem that while the school has some loaners available, there aren’t really enough loaners to cover the need. You often have students who will say, “Well, my laptop broke for whatever reason and it’s in being repaired, and therefore, I don’t have this assignment ready”. (Interview, Matt, P93)

Callum concurred that when a spare laptop was not available for students, the classroom learning environment was affected (Interview, Callum, P71).

A common belief among a few participants was that student laptops malfunctioned primarily because of the number of non-academic programs downloaded onto individual laptops. An example of this belief was demonstrated in Stephen’s explanation:

Because we are using so many different applications nobody can really track down all the possible interactions. The complexity is also compounded when you have students who are loading their own applications onto the laptops. They’re [the programs] not necessarily supported by IT, so they have unpredictable interactions with what we want to use curricularly. Sometimes the kids will just say ‘Such and such an application, doesn’t work on my computer’ and IT will scratch its head wondering what the heck is going on. Then they finally discover that the student has loaded some piece of non-approved software on their machine which is completely screwing it up. So we have a situation here with a huge number of variables, which is very difficult to scientifically track down and isolate, and it takes an inordinate amount of time and effort. (Interview, Stephen, P99)

Laptops that were old, malfunctioned, did not have the peripheral support, and were less powerful than required hindered the implementation of the CLP by teachers. As well, too few replacement laptops for students whose laptops malfunction also appeared to be a barrier in the implementation process. These findings suggested that teachers were trying to implement laptop technology into their teaching practice in ways that would support the curriculum but, rather than frustrations with lack of hardware, these teachers were finding that the available hardware was not powerful enough to support their uses.
Providing software that was reliable, compatible with the schools network system and user friendly were barriers to the majority of participants wishing to integrate the laptops into their teaching practice in specific ways.

Network compatible software. The most commonly cited barrier for software was ensuring it was accessible for teachers and students on the network. A specific example of this problem was explained by one of the Social Science teachers, Fred, who had difficulty getting GIS to work on the network:

I’m the only one that does GIS in the whole department at the FY level because everyone else knows the frustrations I have [trying to get GIS working on student laptops] and they’re not willing to do it. Yet in our curriculum it says that we should be teaching and using GIS. (Interview, Fred, P93)

Fred had become so frustrated with this barrier that he suggested, “at one time the school had an actual desktop lab for GIS and they took it away…I’m almost thinking that’s what we need again” (Interview, Fred, P93). Stephen also supported this finding when he stated that a weakness in the CLP was,

Getting networked applications to work consistently over all the laptops….With the large number of applications we use, particularly in music theory or music history, many of these applications purport to be network compatible but turn out not to be. [This] generates a great deal of work for the IT staff and a great deal of frustration for the students. I have to say, I’m moving away from using some of those networked applications for that very reason. You pop them [the network applications] up in class, you ask the kids to go ahead and work on them, and then nothing works and it’s frustrating. (Interview, Stephen, P95)

User-friendly software. A common perception shared by many of the teachers was that software which was difficult to learn and navigate was considered an inhibitor to fully implementing a CLP into teaching practice. WebCT was the most frequently cited software seen
as a challenge to laptop integration. The most common belief among these teachers was described in the following quote:

WebCT is not user friendly, not by a long shot. The only thing on there that really is user friendly is the calendar entries…If you have to be converting and storing, you have to go to two or three places to transfer a file; it’s too confusing. I use the simplest part of it and I’m able to get the information on there that I want, but I’m not using it the way it’s designed to be used. The design is preventing me from using it for other things. (FY FG, Patrick, P211)

Another teacher, Stephen, also confirmed this finding when he stated, “I think they need a better version of WebCT that’s more user-friendly….I think [it] is a great tool if it was more user-friendly” (Interview, Stephen, P79). The follow-up email responses revealed that the case study school replaced WebCT with ANGEL as their course management software. The majority of respondents believed this change to be positive and beneficial. For example, Jack stated, “We now use ANGEL instead of WebCT, and it has been an easy transition for me. The nature of my teaching a text[book] that has great online resources and support has meant a minimum amount of work in switching” (EI, Jack). Ian also confirmed this observation when he wrote, “WebCT is gone and replaced by ANGEL. I find this great as ANGEL seems to be a much more user friendly system for me and my students” (EI, Ian).

Unlike the findings in the literature, a lack of available software was not a barrier to implementing the CLP into teaching practice according to participants in this study. What was a barrier for teachers in this particular school was ensuring reliability for accessing the course-specific software through the network and providing a user-friendly version of course management software. These observations revealed teachers were genuinely thoughtful about how they wanted to use curriculum-based software in their teaching practice—responses that assisted in identifying teachers’ beliefs and behaviours towards their requisite participation in a CLP.
Teacher Professional Development

Unlike the finding from the literature, the data from this study suggested that the participant’s technical support department and administrations financial support were not considered barriers to implementing a CLP. Rather, the data suggested that personal support for professional development initiatives was a definite barrier for implementing a CLP into teaching practice. Teachers seemed to have little say in contributing to their PD. Most teachers believed their professional development activities related to the CLP had been traditional and ineffective and they preferred to engage in more contemporary methods that were personalized, course-specific, hands-on, ongoing, and collaborative.

Ineffective TPD experienced by participants. Consistent with the survey results, the emergent themes suggested that lectures, short-term activities, and irrelevant content were the most common elements of ineffective TPD.

First, lectures in which participants were passive listeners were viewed by the majority of teachers as ineffective TPD strategies. For example, Emi stated that giving her a general IT talk was not helpful (Interview, Emi, P203). Another teacher described his experience:

Sitting in a conference and hear[ing] someone describe a software application and what it will do—you retain so little of it. You go back [to your school] and you really don’t know how to use the program because you sat in a workshop for an hour. (Interview, Art, P313)

Another teacher, Kyle, concurred with this finding when he stated, “I found the school wide PD sessions where someone gets up and demonstrates how to do a new program via a projection onto the screen to the entire faculty…do absolutely nothing for me because I can’t keep up” (FY FG, Kyle, P139).

Second, many participants also found short-term activities ineffective TPD. Jack described his experience:
I was working on how to make a webpage [for my course]. I got it started but never finished…in the end it never became something I used. I could have finished it if I’d had enough time. But as soon as you’re finished the capsulated timeframe, which is the workshop, you tend to put it away and nothing else happens. (Interview, Jack, P411)

Even Evan, the one teacher who used the laptops in mechanical ways, stated that in-house, short-term TPD was required only, “once a year [and] nobody can remember how to do [it], like [getting] all the kids into your MarkBook in a class…. I’m not going to remember how to do it in September, probably very few people will” (Interview, Evan, P449). Others suggested that ‘one shot deals’ were the least effective TPD they had been involved in because they were too short (e.g., Y2 FG, Liz, P201; Interview, Callum, P307) or “by the time you actually got to do it yourself you’ve either forgotten or the lapse [time] is too great (Y2 FG, Liz, P203).

Third, most teachers found irrelevant content that had no meaning to teachers’ specific curriculum areas was ineffective PD. Well over one-half of the participants suggested that their involvement in TPD had primarily been for general technical knowledge rather than content-specific. This observation was demonstrated in the following two quotes:

I’ve gone to teaching workshops and I haven’t been sold on it. One was the electronic writing in residence [workshop]. I think that was great, but it’s expensive, it’s time consuming, and we can do that locally with writers that will come right into the classroom…. I think the PD we did I found tedious and it wasn’t practical for what I needed to know. (Interview, Cindy, P65; P519)

I’ve been to conferences…but most of the conferences that people deal with strike me as simply an attempt to justify the use of the technology. We were supposed to go [to a conference] last week about creative writing on the computer. Because of the weather, we had to cancel going but I looked at all the websites that the person running the conference had put together and there was a website about writing short stories using the computer and it was titled, ‘Illustrated Short Stories’. What you got was a short story with a picture they’d found somewhere on the Internet and I thought, ‘Well, that’s pretty stupid as a use of the whole thing. There’s no point that makes it really interesting to do that’. (Interview, Matt, P229)

These findings indicated that TPD remains relatively traditional in nature and teachers believed it was no longer relevant or effective in their situation within a CLP. The findings
identified teachers valued and sought out more contemporary TPD activities through ongoing, personalized TPD, course-specific content, hands-on activities and collaboration among colleagues. They seemed to need just-in-time, rather than just-in-case, TPD that was curriculum-based and content relevant.

*Personalized professional development.* Over 70% of participants stated they wanted 1-on-1 assistance for both technical and curriculum related issues. At the time this case study was conducted, the participants used primarily the IT Department or their colleagues to personally assist with technical issues encountered when using laptop technology in their teaching practice. In contrast, there was little to no personal support for integrating laptop technology into curriculum.

*Personal IT support.* The majority of participants described calling upon members of the IT department for support when dealing with day-to-day technical issues with the hardware or the software. This finding was supported in the following dialogue with Linda, a teacher who used the CLP routinely in her teaching:

> I actually go to the support person in IT. I often seek her out for assistance…. Whenever I actually create a test or a quiz or a course evaluation in the department, I always go to her for help. It just saves a lot of time. If that person’s there [then] why not utilize them. It’s a lot easier than reading a binder for an hour to figure out one little problem. (Interview, Linda, P338-342)

Another teacher, William, described his need to obtain personal technical support through the IT Department:

> You get on the phone and [the IT support person] she’ll talk you though [the problem]. When we were updating our marks she says, ‘there’s something wrong on your computer that I’m not seeing on mine so I’ll come down’. And sure enough she says, ‘they haven’t done this on your computer and it should have been [done]’. (Y2 FG, William, P349)

A few participants believed the personal technical support needed to be more defined.

Emi, a teacher who integrated the CLP into her teaching practice stated she required PD support,
“anytime, anywhere. Sometimes I call IT and get the help. But generally [I] have to be in tears before I get results” (Interview, Emi, P207). This need was also expressed by Kyle:

What they really need is a tech[no]logy person who floats and goes from department to department and spends two weeks with the Art department so basically if [Patrick] does have specific questions this guru sits down with him and goes through them. (FY FG, Kyle, P209)

Most of the teachers in this study were found to need personalized support and were usually able to obtain technical help from the IT department. Technical support appeared to reach a new level of need for some of these teachers and the IT department readily adapted to the individualized support for personalized technical problems.

**Personal curricular support.** Unlike the availability of personalized technical support, the majority of teachers in this study acknowledged a need for greater personalized PD support through modeling, mentorship, and ongoing 1-on-1 initiatives. An Art teacher suggested that his “ideal situation would be to have an instructor actually come here for a week in the summer and we spend a week with him in our lab” (FY FG, Patrick, P341) and Liz, an English teacher believed that, 90% of my professional development has been laptop technology oriented. For the past eight years I have not done my old fashioned preferable type of PD which is to learn how to teach English better. I would much prefer [to learn] how I can develop my application use of laptops [in my own subject]. I would much prefer to go to see another teacher somewhere and see it [laptop integration in the classroom] in action, not hav[ing] someone tell me how other people are doing it. (Y2 FG, Liz, P229)

Evan, who was the one mechanical user, suggested that his Head of Department was his role model and mentor (Interview, Evan, P353) and believed that, “I’d be three years farther back now that I am right now” (P349) without his mentorship. Even a teacher who integrated the use of laptops into her practices believed that a mentor would assist her in implementing the CLP into her lessons more effectively (Interview, Kim, P51). Other teachers were interested in
opportunities to visit classrooms off-site and observe teachers in their specific subject area integrating laptops into various lessons and units of study (e.g., FY FG, Patrick, P183; Interview, Cindy, P77).

The teachers who were involved in the CLP when it was initially adopted stated that they would like to see a return of the PD model that previously existed—one that provided personalized support for curriculum initiatives within a CLP. During the first two years of implementing the CLP, the school hired a part-time Educational Technology Consultant (ETC) whose job it was to work with small groups of teachers and individual teachers to integrate laptop technology into their curriculum and teaching practice. This ETC was discontinued because they were not being utilized; they seemed to spend a great deal of time with little to do (Interview, George). This view was revealed in comments such as George’s when he was describing a potential hire for the future IT Director’s position:

> What we’re really looking for [are] two people and will we ever find two people in one perfect person? One being somebody who really has both the managerial skills and the IT knowledge to run an IS [information systems] Department and an amazing educator who has a strong IT background who knows how to implement things in other subject areas … kind of like our old ETC type model that is there to support everybody. (Interview, George, P161)

Matt also supported this finding when he revealed that he would “need somebody who was teaching English and had really good ideas that they use teaching English” (Interview, Matt, P229). Even a part-time administrator supported this view when he stated, “it would be nice to return to the days where we had somebody dedicated to working with the teachers solely to give them ideas, to be proactive in [supporting] worthwhile things they could do with the classes” (Interview, Jeff, P177). He continued in this vein when he suggested that the school needed to hire someone, “who could really give teachers some creative ideas. Someone whose job it was to live and breathe that stuff” (Interview, Jeff, P721).
At the time of the study, a train-the-trainer model was the dominant TPD model used in this environment. The model was primarily implemented to allow teachers to learn WebCT. In this scenario, a WebCT specialist from the IT Department trained one person from each academic department (called WebCT Experts). They, in turn, trained the members of their department. The two part-time administrators were, however, conflicted in the success of this model. One administrator believed it was only as effective as the trainer: “I mean it depends so much on how good the trainer is in the department” (Interview, Jeff, P617). It could also depend on how relevant the training is to the trainees. One WebCT specialist suggested that the effectiveness of this TPD model depended on the agenda of department meetings: “I mean we’re supposed to be coming back and taking it to department meetings, so it depends on how much time is available at the department meetings to discuss those particular issues” (Y2 FG, Susan, P611). The other part-time administrator believed that “the train-the-trainer model is the best of the models. In that sense each department has a designated expert who is responsible for teaching teachers within the department great approaches to using the technology in their discipline” (Interview, Lucas, P119). Lucas did, however, suggest that “we probably need to go back to a model where we have a full-time ETC person here” (Interview, Lucas, P191). One aspect of the train-the-trainer model that seemed to be effective was assigning a course leader for each grade. The leaders,

are in charge of designing the lessons for the course. For Grade 9 I am in charge of the grade 9 [Math] program, so I talk to the other Grade 9 teachers and tell them ‘this is good software to use for this [or] here are some good examples’. In Grade 11, my department head is the course leader so he does the same thing. He’ll give me some ideas of things to use. (Interview, Emi, P159)

These data suggested that teachers at this school were able to access personalized technical support. Access to personalized curricular support for integrating laptop technology
into their teaching practice, however, was much more limited. The findings revealed that many teachers and administrators alike desired a more contemporary TPD model which emphasized a need for knowledgeable resources, and on-going, personal one-on-one and small group support for teachers, especially in integrating the CLP into teaching practice. These observations mean that there may be a tendency for CLP leaders to assume that teachers know how to integrate laptop technology into their teaching practice and curriculum initiatives. It appeared this was not the case—teachers wanted support and knowledge about implementing laptop technology into pedagogy and course content. This conclusion assisted in explaining teachers’ beliefs, behaviours, and responses to their requisite participation in the CLP by identifying what they believed was needed to improve teaching practice given the reality of their situation.

*Course-specific content.* Almost all participants in this study revealed they would prefer TPD that was course-specific be it through internal department or external activities. Just over 40% of participants identified independent learning as one of the preferred TPD activities when trying to integrate laptop technology into their teaching practice.

Engaging in departmental TPD was a pattern that emerged from the interviews and focus groups. Most participants believed that effective TPD occurred when they were actively engaged in dialogue or workshops at the departmental level, rather than faculty-wide initiatives. Jeff emulated this finding when he described one of his departmental activities:

> We got somebody into the Science Department to give a PD session on using scientific probes and that was totally hands-on and very applicable to what we were going to do. The most effective ones [PD] are ones that really do apply to your classroom, your teaching, and particularly the things that you can then put into practice right away.  
> (Interview, Jeff, P577)

A math teacher, Emi, also described one of her best PD experiences that demonstrate the overall desire by participants to focus on departmental TPD:
The best one we ever had was when a member of the IT department and our department head both gave us a demonstration on how to use the SmartBoard more efficiently. So instead of just being a math person or just being an IT person, the two of them designed a few lessons that showed some really cool [features] that we could do with the SmartBoard that we weren’t using. (Interview, Emi, P183)

Emi further explains the format for TPD that would benefit her needs:

In the perfect work, I would have someone who is an expert on a program such as Geometers Sketchpad spend a couple of hours with someone who teaches the [mathematics] course and the two of them design a number of lessons that would be very applicable to each grade that I teach or each course that I teach. (Interview, Emi, P219)

A Social Science teacher also described this finding: “I think one of the suggestions would be to have time to talk to our fellow department members” (Interview, Fred, P405). In the English department, Kyle stated that,

the only time I ever learn anything is when it’s either departmental…or when something doesn’t work so I go to the individual…. It’s only when I’m stumbling my way blindly towards some goal that I actually remember what I’m learning. (FY FG, Kyle, P145)

The full-time administrator at this school also believed in the value of internal PD activities:

“I would say that department meetings [are] tremendously valuable. The departments meet on a regular basis to discuss issues of relevance” (Interview, Josh, P20). The desire for departmental TPD activities suggested teachers’ need for initiatives that embrace curricular integration as well as technical integration, rather than an either-or philosophy.

Most teachers preferred external TPD that was specific to the courses they taught, although a few examples cited did not directly involve teaching in a CLP. For example, one English teacher states that she has an external network of colleagues she met from a drama festival that, “all teach Writer’s Craft. We share a lot together over the e-mail and when we get together for the play” (Interview, Cindy, P281). Another teacher also supported engaging in external TPD:
A good friend of mine is a national marketing director [for the music industry] and he contacted me because [a new kind of software] was in trial stages and said, ‘Do you want to try it out?’ So we took a look at it and it’s fabulous. (Interview, Art, 137)

Jeff, an Advanced Placement (AP) Science teacher, stated he used the “AP listserv…. The communication that we have with our AP Chemistry listserv [and] with other teachers is absolutely wonderful” (Interview, Jeff, P221-229).

Almost one-half of the teachers identified independent learning as a form of TPD. The self-learning they did in their own time appeared to have been one of the most beneficial TPD activities (e.g., Interview, Stephen, P285-287). An English teacher mirrored this observation when he stated,

I’ve probably found the things that I look at for myself more effective. I think all of us in teaching have a certain tendency to be conservative so our first reaction to anything new is, ‘Oh, that won’t work, that’s a bad idea’, and we have to figure out for ourselves how exactly to apply things and get them to work for us. (Interview, Matt, P321)

Three of the teachers having only one year teaching experience in a CLP spent personal time learning WebCT and PowerPoint. One of these teachers explained,

I did it [learned WebCT] at my own pace … because it wasn’t a week of here’s everything, which could have been very overwhelming perhaps. I just gathered information in the summer, looked it over, and then just had to learn along the way as the school year progressed. (Y2 FG, Liz, P227)

A few teachers did not believe that learning independently was considered by administration as TPD, even if they themselves did consider it an effective form of PD. One teacher explained:

Professional development, I think, is considered to be attendance at sessions. That’s the only way they [administration] can track what we’re doing. I mean they can’t quantify self-learning. If I’m sitting there, fiddling around with a piece of software trying to get it to work properly [it’s] because (a) I’m interested, and (b) I need the damn stuff to work. (Interview, Stephen, P307)
Stephen’s comment suggests that teacher self-study may need to be recognized as a viable form of professional development.

As supported in the literature and the survey results, these findings indicate that teacher’s desire more TPD spent on departmental, course-specific activities. However, not revealed in the literature or survey, is the belief that personal time spent learning technology to support teaching practice is considered by teachers to be a form of TPD, but not necessarily acknowledged by administrators. This may be a form of TPD that should be recognized as beneficial and necessary within a compulsory laptop program; especially given the rapid advancements in hardware and software technology.

*Hands-on and collaborative activities.* Not only were teachers looking for course-specific TPD, the data suggested that these activities be hands-on, engaging, and interactive. This was evident in comments such as,

> Everyone [in the department] brought their laptops and we had to go up and actually answer questions and do things using the SmartBoard. There were prizes if we answered things. It [the PD] was very good. It was interactive. And it was a small group too so you could ask questions. (Interview, Emi, P191)

An English teacher also described interactive TPD as effective.

> This year we’ve got three new people in the department so we devoted one of our afternoons to working with them. Everybody sat there with their laptops and we shared tests for them, [and] helped them with setting up or planning for teaching certain novels. That was very much a collaborative thing…. It did work well. (Interview, Jenny, P387)

Susan, who attended a WebCT conference described the parts that were the most effective PD:

> “It was all hands-on stuff. I mean we sat and listened to some lectures, but there was hands-on activity every single day, and it was a weeklong too, so it was good” (Y2 FG, Susan, P171).

> On-going, on-site informal sharing also emerged as the most prevalent type of collaboration at this particular school. Many participants identified dialoguing with colleagues
as an important mechanism for supporting their technical and curricular needs within the CLP.

Kim described an informal sharing experience:

A lot of us share stuff. Like [a member of the department] who’s not even teaching Canadian History will frequently say, ‘Oh, I just read about or saw x [a specific] website. Check it out.’ We share amongst our department knowledge of the sites that are useful. (Interview, Kim, P91)

Similar to Kim, Emi explained her primary informal collaborative experiences.

I talk to other members of my department primarily…. We [my department] talk about what would be good software to demonstrate certain things…. We have so many different programs that we use in the Math Department…that it’s just a matter of choice. It’s not really done on a formal basis, it’s more just passing in the hall. (Interview, Emi, P115-119)

Informal collaboration was also demonstrated during the Foundation Year focus group. The following dialogue described one participant asking a specific technical question about Markbook and another participant proceeded to share his knowledge and assist his colleague:

Patrick: Here’s a question. Where do you go in the marks program [MarkBook] to see how many entries you’ve entered so far for each of the four categories? Is there a place to do that? There must be.
Kyle: Yeah.
Patrick: Where is it?
Kyle: I’d just go down and count them up. You can do that.
Patrick: But you’ve got 35 marks.
Kyle: No, it tells me right there, a summary of 1 to 20 or 40 to 50. It’s your last number of your last entry. You’ll see an update or a summary. If you hit that button, it’ll show you your last 10 [entries] or whatever [entries you have].
Patrick: It will count all the marks I’ve entered so far. It’ll tell me how many I have in each category.
Kyle: Hmm, hmmm [yes].
Patrick: There you go.

Very few participants believed that formal collaborative efforts were considered a major contributor to their own TPD, as they included the traditional approaches to PD—large groups, lectures, short-term, and ineffective learning experiences. These findings suggested participants were discovering their own mechanisms of TPD through collaborating to improve both their
technical and pedagogical knowledge within a CLP. It appears teachers were searching for a community of learners to share experiences and knowledge of how better to implement laptops into teaching practice. The follow-up e-mail revealed all respondents were involved in technological TPD involving learning the new LMS ANGEL software. Only two respondents stated they had been involved in effective TPD activities dealing specifically with the CLP, although the purposes of these were also technological in nature. Art stated, “We are given the opportunity to plan some of our own PD so it is possible [to be involved in effective PD]” (EI, Art). Ian also stated that “the PD centred around the use of SmartBoards and…a session on creating class webpages [was useful]” (EI, Ian).

The beliefs, behaviours, and perceptions these teachers exhibited about their past, present, and future TPD provided a deeper understanding of their needs and behaviours in their requisite participation of a laptop program. Teachers’ responses revealed that extrinsic forces prevented them from fully implementing a CLP into their teaching practice. Teachers found more value in informal TPD that was ongoing, course-specific, hands-on, collaborative, and independent, but were more involved in traditional forms of professional development that was out of their control. This indicates a need to re-evaluate effective TPD and consider catering to the needs of individual teachers, rather than to a collective group—not all teachers are at the same level of use or have the same knowledge (technological, content, pedagogical) in a compulsory laptop program. The findings also indicate a need to recognize and acknowledge less structured forms of TPD (independent, informal, personalized support) as important forms of teacher development within a CLP.
Second-order Barriers of the CLP for Teachers

Second-order barriers were caused by basic changes to teachers’ practices and beliefs. These barriers were considered more personal and intrinsic than first-order barriers to change. The findings from the data suggested that pressure and teachers’ beliefs were second-order barriers that inhibited participants in this study from completely implementing a CLP into teaching practice.

Pressure

As identified in the online survey, participants in the case study felt pressure to integrate laptops into their teaching from two major sources: administration and themselves.

Administrative pressure. Most teachers with less than 15 years teaching experience felt pressure to use the laptops on a regular basis in their class, especially with respect to the mandated requirements. For example, one teacher suggested that although she liked the “organizational aspect of WebCT… I generally try to do what I’m told. I like my job. I want to keep it” (Interview, Linda, P170). They did not, however, want the pressure of being told to teach with laptops in specific ways or at specific times (e.g., Y2 FG, Henry, P439-441).

A few participants who had been teaching for more than 15 years and used the innovation on a regular basis believed no pressure was exerted on them to use the laptops in their lessons. As one teacher explained, “I don’t feel that pressure because I simply ignore it” (Interview, Stephen, P431). Emi, a 15 year veteran and also one of the more sophisticated users in the CLP, stated that she did not feel pressure to use laptops in her curriculum: “I’m old. I just say ‘no’. What are they going to do? Fire me. Maybe I’ll just retire early” (Interview, Emi, P179).

Self-imposed pressure. Over one-half of participants identified themselves as a source of pressure to integrate the CLP into their teaching practice. One teacher explained: “I feel so
pressured to use it every day that I feel like I’m not up to par‖ (Interview, Cindy, P551). Another teacher supported this finding when he agreed that he did put pressure on himself to use the laptops in the classroom but believed that “there are many other people that are doing a lot less than me and nothing’s happened to them” (Interview, Fred, P325). The follow-up e-mail also revealed the continued presence of self-imposed pressure by 50% of respondents. Two department heads also acknowledged self-imposed pressures. Art stated that he put pressure on himself to integrate laptop technology into his teaching practice, “especially as Department Head. I feel that I have some responsibility to follow procedures and policies especially if it helps keep the admin[istration] off the backs of my department members” (EI, Art). William also stated that “as much as I am comfortable, I need to learn to use the student calendar function on ANGEL, which I have not yet done” (EI, William).

The self-imposed teacher pressure that emerged from the data assisted in understanding what teachers in a CLP experience during the implementation process. The overriding self-imposed pressure observed by participants appeared to result from the perceived quantity of laptop use, rather than the quality of use in teaching practice. Many of these teachers appeared to feel pressure to use the technology more, rather than a pressure to use it well in their teaching practice—a contradiction to their beliefs about good teaching practice.

*Teachers’ Beliefs*

Many participants in this study identified their personal beliefs about teaching and learning as a barrier for implementing laptops into their teaching practice. Most participants integrated the technology into their teaching practice only when they believed it was meaningful to their students, focused on curriculum needs, and was used as one of many teaching resources. The following examples illustrated this emergent pattern.
Emi, a Mathematics teacher, believed that her department, “only try to use it where it’s [the CLP] actually beneficial. We don’t use it because we’re supposed to use it” (Interview, Emi, P175). A Social Science teacher, one who routinely implements the CLP into her practices stated,

It’s funny, we use these laptop programs and we implement them. I understand from a superficial level why it’s good, but I don’t really know. I haven’t had any professional development since teachers’ college on technology and its impact on the classroom. It’s kind of like the blind leading the blind. I think the Administration knows and has done their research, but what they’re disseminating to us is the how to’s. I haven’t read any academic stuff on the benefits of it. (Interview, Linda, P138)

Linda also stated that technology was not the focus in her classroom; she would prefer to integrate it into curriculum activities:

It’s not the focus of my teaching. I use it all the time, I use it every day, but I wouldn’t define myself as someone who would enquire about technology in the classroom. I would rather talk about document analysis, role-play, how students learn, and developing positive relationships with kids. (Interview, Linda, P150)

An Art teacher, Patrick, stated that he only integrated laptop technology into his curriculum when he determined a specific need (FY FG, Patrick, P133). One of the music teachers also believed,

You’re allowed not to conform if it serves your comfort level and your subject…. Being in the Arts, I’m very sensitive to the one-size-fits-all, because the Art’s doesn’t fit that mould. Computers in the Arts can be very helpful to us, but they will never, ever be the core of our program; it’s not possible. (Interview, Stephen, P471)

Finally, one of the part-time administrators also believed that, “A great philosophical dilemma [is] that we make sure that the technology is serving the kids well, is serving the teachers well too, and it’s not just technology for technology’s sake” (Interview, Lucas, P67).

At the time the data was collected, the majority of participants believed there were distinct levels of implementation within the faculty. This pattern was demonstrated in one teachers comment:
I think we have a spectrum of teachers that wholly embrace the use of laptops to a vast majority that are in the middle and could take it or leave it, to some that are totally rejecting the idea of the use of technology in their courses. (Interview, Callum, P171)

Another teacher suggested that all faculty “understood the nature of the task, not everybody was prepared to cooperate to the letter of the land…[level of laptop integration] varied from individual to individual” (Interview, Jack, P151). A few participants within each department believed that the varied levels of implementation depended on the subject taught. For example, one Social Science teacher stated that “in terms of my department…there’s a fairly good buy in. People are using laptops in really creative ways” (Interview, Kim, P159). Whereas, the Music teachers believed that laptops were not “as critical or as used as [they] might be in some other subjects because we do spend a fair amount of time playing. You can’t play a string instrument with a laptop under your arm” (Interview, Stephen, P71). An English teacher also believed that laptop implementation in English was “not as integrated by nature as it is into other programs in other courses” (Interview, Matt, P57). Even the Guidance teacher did not see CLP implementation “being used as much in the course in Guidance [because] we just don’t have as much need” (Y2 FG, William, P27). One Science and Mathematics teacher described the reason she did not implement laptops into her teaching practice as much as some of her colleagues was because “It may be more applicable in a certain subject area or in a course than [my] course” (Y2 FG, Susan, P175). Even one of the part-time administrators suggested that,

The biggest reasons [for not integrating laptops into teaching] would be the nature of the course that they’re teaching…. I guess if a teacher of high level English says that laptops are of no real educational value, it’s pretty hard to argue against that. (Interview, Jeff, P497)

The data suggest that the majority of teachers in this study were only implementing the technology when they believed it benefited student learning, enhanced the curriculum specific to their subject, and was an effective resource. As supported by the literature, teachers with the
least distance between their philosophical beliefs about teaching with laptops, and little
dependence on the technology they didn’t have immediate access to were determinants in the
quantity of CLP implementation. This may explain the self-imposed pressure teachers felt about
their quantity of laptop use, as it directly conflicted with their intrinsic beliefs about using the
technology to improve the quality of their lessons, teaching and student learning.

Summary of Chapter

The findings identified the levels of use, stages of concern, strengths, and barriers within
a compulsory laptop program from a sample of respondents from CLP environments across
Canada, as well as from the principal research site.

First, teachers described changes to their professional role in a compulsory laptop school
environment through their levels of use and stages of concern about the program. Most
participants in this study were routine and refinement users of laptops in their teaching practice.
The online survey also suggested that a number of respondents were renewal users. Both data
sets identified e-mail and word processing as major uses of laptop technology by teachers, while
emerging technologies such as social networking were integrated very little into teaching
practice. Unlike the online survey in which most respondents were most concerned about
collaborative initiatives within the CLP, the case study data suggested that teachers at the
principal site were most concerned about refocusing their efforts on acquiring a new awareness
of how laptops could enhance teaching practice and student learning, and managing all the CLP
requires of them as teachers. Using the CBAM’s LoU and SoC model, there emerged a need for
a more fluid, non-linear model to identify teachers’ uses and concerns at any given time in the
implementation process. It appeared that awareness issues not only occurred at the initial stages
of implementation, but also after experienced users were refocusing their uses in more sophisticated ways.

Second, teachers perceived five components of the planned change initiative to be essential to the CLP: technical and administrative support, communication, access to resources, and effects on teaching practice. The essential components consisted primarily of performing technological tasks that allowed teachers to survive in the school context. The only essential component that related specifically to implementing laptops directly into curriculum initiatives and teaching practice was the ability to access resources.

Finally, teachers responded to their requisite participation in the school-based laptop program by identifying first and second order barriers they faced during the implementation process. First-order barriers suggested that although there were financial and hardware support by administration, enhanced support for individual teacher professional growth within the CLP was needed through alternative models that were personalized, course-specific, collaborative, and ongoing. The support also focused on technological knowledge, rather than connecting it to pedagogical and content knowledge—two key forms of knowledge important for integrating laptop technology into the teaching and learning process.

Teachers identified the need for a clear understanding of exactly what the CLP was and the policies involved. Very little shared decision-making was initiated by administration within the CLP; rather the majority of decisions were viewed by teachers as top-down approaches. Administrative responses indicated a gap in perception; they believed decision-making was shared among stakeholders. There was also a need for policies to be periodically reviewed and updated, especially given the constantly changing nature of the innovation. The findings
indicated a need for ongoing communication between all stakeholders in order to clarify, support, and inform the CLP mission, vision, mandates, and initiatives.

A lack of time to manage all the requirements within a compulsory laptop program, to learn new software programs, and to develop lessons that integrated laptop technology into teaching practice were also cited in the data as barriers of the CLP. Teachers viewed time spent independently learning applications and informal interactions as more important to their learning process than formal, administration-driven professional development initiatives. Teachers’ preferred TPD activities, however, did not appear to be recognized as valid forms of professional growth.

Second-order barriers were also identified in the study as responses to requisite participation in the laptop program. Although participants viewed the majority of pressure they internalized as administrative and self-imposed, the pressure did not appear to dramatically influence their philosophical beliefs about teaching and learning. The participants believed that their self-imposed pressure was due to the quantity of use, rather than the quality of laptop use in their practices. Overriding the pressures internalized by the participants in this study, were the individual teachers’ beliefs about teaching and learning. Their beliefs appeared to influence the implementation efforts of participants at the principal site. The teachers were emotive in their reasons for when and how to integrate the CLP into teaching practice. The participants’ primary motives were not for their own personal benefit, but for the potential benefit or harm that occurred to student learning and development. Teachers required more compelling reasons to integrate laptops into their teaching practice and they desired a strategy that linked the use of laptops with student achievement and outcomes.
The above responses by teachers about a compulsory laptop program provided a way of interpreting what teachers go through when mandated to teach in a compulsory laptop program. It identified the vital role mandated requirements, time, classroom management, policies, teacher professional development, pressures, and beliefs played in explaining teachers’ beliefs, behaviours, and perceptions as their roles change when implementing a compulsory laptop program in teaching practice.
CHAPTER 5: DISCUSSION

Overview of Chapter

The purpose of this research was to study the impact of implementing a planned change initiative by examining teachers’ responses to a school-wide mandated ICT initiative—the compulsory laptop program (CLP). The three key theoretical frameworks that assisted in formulating the research questions and analyzing the data were innovation implementation as described by the Concerns-based Adoption Model (CBAM), the Adopter Categorization Model (ACM), and educational change theory related to barriers of implementing change. The data were collected using both quantitative and qualitative methods. Descriptive analyses were applied to the quantitative analysis, and inductive and deductive analysis was applied to the qualitative data. This chapter discusses the key findings through the lens of the existing CLP literature and relevant theories in an attempt to better explain teachers’ beliefs, behaviours, and roles during the implementation process.

The chapter addresses the three primary research questions: (1) How do teachers respond to requisite participation in a school-based laptop program? (2) What components of a compulsory laptop program do teachers perceive to be essential? and (3) How do teachers describe changes to their professional role in a compulsory laptop school environment? Teachers responded to requisite participation in the compulsory laptop program by identifying five main components necessary for effective implementation into teaching practice: teacher professional development, policy development and dissemination, hardware and software, essential elements, and changing roles of students, administrators, and teachers. Analyses of these component parts indicate the need for a revised, more fluid implementation model when studying the unpredictable and ever-changing nature of the compulsory laptop program. This
chapter begins with a description of laptop technology in education. Table 17 identifies the sections in this chapter that address both the primary research questions (PQ) and the enabling research questions (EQ).

Table 17

<table>
<thead>
<tr>
<th>Chapter section</th>
<th>Primary question(s) addressed (PQ)</th>
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<td>PQ1</td>
<td>EQ1, EQ2</td>
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<td>Policy development and dissemination</td>
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<td>Hardware and software</td>
<td>PQ1</td>
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<td>PQ2</td>
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<td>PQ3</td>
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The Fluid Nature of Laptop Technology in Education

To date, technology in education reforms and implementation processes have been based on static models—once the stated goals and objectives (articulated in advance of the implementation) are met, the implementation of the technology is considered complete. This study, however, indicates that implementation of the compulsory laptop program (CLP) in education was not based on static models; rather, the process is best described as being dynamic and responsive to changes and patterns that arise from and because of the technology innovation itself.

Implementing a CLP appears to differ from implementing other school-based initiatives, such as introducing a new textbook, reading program or code of behaviour. The CLP, unlike other educational innovation implementation initiatives, provided an open-ended tool for teachers and the menu of possible outcomes envisioned in anticipation of the CLP implementation fell short of the reality. For example, it was impossible to predict the effects
social networking would have on teaching in a CLP given that Internet sites such as Facebook, MySpace, and Twitter were not in existence when this mandated laptop program began. The findings from this study imply that a feature of any model used to describe the implementation of laptop innovation in teaching should be its adaptability to the changing nature of and teacher/student response to technology, as well as changing hardware and software. As a result of the laptop program’s continuously evolving nature, the terms and conditions of the implementation process may be difficult, if not impossible, to predict in advance or control in terms of direction and with respect to the nature of context-specific adoption.

Teacher Professional Development

Teachers’ responses from the online survey to TPD initiatives they had participated in were in stark contrast to those activities identified by teachers in the case study. Over 75% of teachers in the survey were satisfied that their PD was meeting their needs to connect TPCK in constructive and relevant ways. Seventy-five percent also stated that they wanted future TPD initiatives to mirror the types of development they were presently receiving. In contrast, teachers in the case study found that engaging in meaningful teacher professional development (TPD) was a major challenge in spite of the demands for their requisite participation in the laptop program: in part attributable to the simultaneously open-ended and unpredictable nature of the technology. The study identifies the issue of self-imposed pressure and indicates a need for teachers to reconcile this pressure through professional development that addresses their intrinsic motivation and affective characteristics. The findings also reveal a need to connect technological, pedagogical and content knowledge through personalized support, ongoing collaboration, and curriculum integration initiatives.
**Self-imposed Pressure**

Both the survey and case study data support previous research that identified administrative pressure on teachers to implement a mandated change into their teaching to be a common barrier (e.g., Fullan, 2007; Fullan & Stieglbauer, 1991; Livingston, 2006). One of the challenges of requisite participation not identified in the literature, but found to be prevalent among teachers in all parts of this study, however, was the pressure they imposed on themselves to integrate laptop technology into their teaching practice. The literature suggests that a lack of student adaptation inhibits educational change (Hall & Hord, 2006); however, this study reveals CLP students readily embraced the CLP—a reality that may have contributed to the demands teachers placed on themselves.

The demands teachers forced upon themselves appear to be linked to their philosophical beliefs about teaching and learning. The participants in the case study cited a conflict between their personal desire to integrate the technology into teaching practice when it was relevant to their teaching practice and student learning, and to use it enough and in ways appropriate to meet the expectation that they perceived had been mandated. The pressure that was taken on through choice by the teachers appears to be a burden of quantity of use versus quality of use issue. Most teachers believed they used the technology only when it would improve the quality of their teaching, but suggested that the quantity of their laptop use was a challenge when they thought about the (essentially) involuntary nature of the implementation process. This internal tension suggests that in order to increase their sense of belonging within their context, teachers put pressure on themselves to be seen first and foremost as visible users of the laptop technology, not as pedagogically-appropriate users of technology.
Self-determination theory (SDT) suggests that intrinsic motivation is internalized well by teachers, whereas, extrinsic motivation is more controlling over and not internalized by teachers (Deci, Koestner, & Ryan, 2001; Vansteenkiste, Soenens, Timmermans, Lens, & Van den Broeck, 2008) could explain the reasons why teachers responded as they did—integrating laptop technology into teaching practice only when they believed it to be beneficial but then placing pressure on themselves to be perceived as using the technology more in their practices. Consistent with adult learning theory [that assumes social roles are closely related to personal learning, and that learning is motivated by intrinsic rather than extrinsic factors (Knowles, 1968)], most teachers in this study used the technology only when they inherently believed it to be beneficial in their teaching and student learning, yet found ways to be seen as ‘users’ of the technology. As Hargreaves (1998) suggests, a teacher’s motivation or desire to act in specific ways is emotive and connected to Bloom’s affective domain. It is this emotive, affective response that assists in explaining the strain felt by many teachers in this study. In Bloom’s taxonomy, Krathwohl, Bloom, & Masia, (1964) describe the importance of attending to the growth of learners’ feelings and emotions—termed the affective domain. The affective domain includes five levels through which learner’s progress as their feelings towards an innovation develop. These stages can, in turn, be related to teacher’s learning and growth within a CLP as demonstrated below:

1. Receive (willingness to listen to information about the CLP)

2. Respond (actively participate in the implementation of the CLP)

3. Value (internalize the worth of the CLP)

4. Conceptualize values (eliminate intrinsic conflicts about the CLP and create a unique value system for implementing it into teaching practice)
5. **Internalize values (adopt the philosophy about the CLP)**

This affective learning framework could also be equated with intrinsic personal beliefs. The data collected from this research revealed similar findings to those of Bolin, Khramtsova and Saarnio (2005) which suggests that teachers often ignore Bloom’s affective domain objectives and focus on cognitive (knowledge) objectives when teaching students. The same appears to be true for those responsible for educating teachers during TPD activities. Administrators paid little or no attention to the teachers’ affective needs; rather, they focused on teachers learning specific technological aspects of the mandatory programs.

Self-imposed pressure by teachers in the CLP appears to result from a conflict between their beliefs about teaching and their perceptions about the ‘acceptable’ (i.e., to administration, peers, parents and students) quantity of laptop use in the classroom. The identification of this fundamental, internal strain suggests that attending to affective and intrinsic needs of teachers may be required during teacher professional development (TPD) initiatives in order to meet CLP goals and vision outcomes. The revised implementation model presented in this chapter (see Figure 18) explicitly incorporates both intrinsic and extrinsic needs of teachers in order to better address what motivates their beliefs, feelings, and behaviours during the implementation process. Presently, the primary focus of professional development initiatives appears to be ensuring that teachers are technically knowledgeable about using the requisite software applications, rather than also ensuring their feelings, emotions, beliefs, and intrinsic motivation for implementing a CLP into teaching practice is aligned with their beliefs about teaching and learning.
Figure 18. A teacher’s adoption and implementation model for a compulsory laptop program.
Connecting Technological, Pedagogical, and Content Knowledge

The teachers in the case study indicated that the primary form of professional development they experienced was technological training for learning the mandated programs, rather than curriculum-focused agendas. The synthesis of the literature also suggested that the focus of TPD to date has been to address teachers’ technological knowledge (TK) rather than efforts to help teachers make connections to pedagogical-content knowledge (PCK) (e.g., Bain, 2000; Loucks-Horsley & Matsumoto, 1999; Mistra & Koehler, 2006; Zhao et al., 2002). The TPD described by the teachers who participated in this study were efforts to develop mastery of managerial tasks: few instances described professional development activities that had pedagogical foundations or purposes. The focus of technological knowledge PD could be a result of the frequently changing technology and the need to continuously update users’ skills in using the mandated but ever-changing course or marks management and attendance programs—programs not connected specifically to curriculum-based classroom initiatives.

The intersection of all three knowledge areas (technological, pedagogical and content) provides a teacher with the skills necessary to connect their pedagogical-content knowledge with their technological knowledge (TK), thus, promoting effective technology integration (Lawless & Pellegrino, 2007). Providing technological-pedagogical-content knowledge for teachers during professional development initiatives could promote teachers’ understanding and ability to use technology effectively in classroom contexts for teaching their course content (Mistra & Koehler, 2006) yet this element appeared to be lacking in professional development initiatives in this study. The research indicates a need for integrating both technological and personal support for teachers involved in compulsory laptop programs.
Personalized Support

The schools in this study appeared to provide adequate technological support for teachers to be able to use the requisite programs (e.g., course management software, reporting program, and attendance program). In contrast to the survey findings, evidence from the case study revealed that teachers were not provided with personal learning activities that connected technological knowledge (TK) with the pedagogical-content knowledge (PCK) necessary for completely implementing a CLP into teaching practice. Similar to Dalgarno and Colgan (2007) and Sparks (2004), this study found a need for teacher acquisition of TPCK through opportunities for ongoing, one-on-one, and small group interactions, and subject-specific initiatives. This study extends the literature, however, by recognizing the importance of providing, recognizing, and validating teachers with individual time to explore and understand course-specific software. In contrast to literature that suggest teachers need a relatively short time period to learn software (e.g., Kanaya et al., 2005; Means and Olson, 1995), this research reveals that deeper understandings of the pedagogical possibilities for implementing content-specific software applications into teaching practice occurs over time and through personal experience with the programs. It is these opportunities over the long term that allow teachers to become competent and confident in integrating technology into teaching practice. In laptop programs, intense professional development does not seem to be effective due to the constantly changing nature of the technology, software and the unimagined possibilities thus afforded. Hence, there is a need for long-term opportunities for teachers to grow with the hardware and software, in terms of awareness of possible applications, confidence and competence in use, and reflection of the implications these changes could have on their own classroom implementations.
Teachers in the case study wanted the assurance that they would have access to an immediate response to requests for help about course-specific classroom initiatives (e.g., Emi, Cindy, and Patrick). What they need is the confidence to know that they will have the opportunity to access the most appropriate resource in order to ask the burning question of the moment and get the best possible answer. In order to provide this type of specific, time-consuming, and personnel-intense TPD, findings from this study suggest the need for accessible resources that can provide just-in-time support for teachers. Resources available for teachers at an individual, subject, or departmental level may be more productive and beneficial than participating in primarily traditional forms of TPD—school-wide, one-time lectures or short-term workshops. The resources could take on a variety of forms and the menu of possibilities is vast. It could be another teacher, a student, an external resource person, mentor, teacher support groups, and/or technology-facilitated networks which are accessible on a just-in-time basis. Teachers appear to form networks with other teachers and it may be that CAIS could develop a CLP Intranet support to provide a vehicle for teachers to share resources, upload or download videos of their classes, provide teleconferencing to share ideas, and post questions, suggestions or concerns. If an Intranet was created to support teachers, members would be sought out specifically, not because of technological knowledge, but because of the fact that they were lighthouse teachers and able to show how they have had success in the classroom in similar contexts using technology. Teachers respond positively to success stories from other teachers and mentors in their subject areas; generic sessions have not been shown to be as effective (Voytsekhovska, 2008). Vygotsky (1978) describes learning from others as an important component of the Zone of Proximal Development (ZPD). He theorizes that the ZPD is the “distance between the actual developmental 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). He suggests that guided
participation and dialogue are important tools for learning. Vygotsky’s ZPD can be applied to
teachers in the CLP, as they are searching for knowledge, in part, through a community of
knowledgeable peers to help them discuss, share, and collaborate about their concerns, questions,
actions, and behaviours during the implementation process.

As McLaughlin (1991) believes, in order for a planned reform to be successful, human
resources are paramount. Participants in this study, teachers and administrators alike, described
a need for collaborative, one-on-one and subject-specific support for connecting the laptops to
curriculum and teaching practice. This is a support that may need to be continually addressed in
any professional development that involves teachers’ requisite participation in a laptop program.
Whatever form the teacher supports and resources take, it will be important to think outside the
box in order that doors are open to new possibilities for authentic professional development
experiences.

Collaboration

The survey and case study data identifies informal collaboration, through dialoguing and
sharing among teachers, as the primary method and major contributor for acquiring
 technological-pedagogical knowledge (TPK) associated with teaching in the CLP. Teachers are
replacing traditional modes of professional development with authentic, job-embedded
opportunities to talk, meet, and problem solve. The teachers’ responses indicate that, unlike
traditional forms of TPD, they may need access to a variety of knowledgeable resources for very
specific purposes in order to guide their own problem-solving process within a community of
practice. Vygotsky (1978) suggests learning occurs in meaningful contexts and with assistance
from more knowledgeable peers. These learning supports are not necessarily restricted to face-
to-face encounters, but could also include formal options such as lesson study and peer
observation, and informal options such as teacher-teacher conversation, social networking and/or
Intranet-based communities for individual and collaborative support, certainly alternative forms
of TPD.

It appears teachers are searching for a community of practice within which to share and
collaborate about experiences in order to learn how better to implement laptop technology into
their teaching practice. The notion of a “community of practice” is based in social learning
theory (Lave & Wenger, 1991; Wenger, 1998) and is founded on principles of sharing and
collaborating within the community (Dalgarno & Colgan, 2007). The findings from this research
suggest that teachers value frequent informal collaborative efforts with colleagues. By
recognizing that this is a valid teacher professional development practice and understanding that
being so engaged may assist teachers in realizing the collectiveness of their challenges and
realizing that they are not alone in the barriers they face as a result of requisite participation in
the laptop program. A learning community of practice could also include a purposefully
constructed and facilitated virtual community where its members can share, collaborate and
address concerns with colleagues who have similar experiences and needs. It is important to
note that providing a virtual community will accomplish little unless it is member-driven,
facilitated by a trusted, knowledgeable peer (Dalgarno & Colgan, 2007), and provides the best
resources at the specific time of need. A technology-facilitated learning community that
addresses teachers’ emotional, personal, pedagogical, and curricular needs may be most effective
if it includes,

initial community members that have a personal link to, and a loyalty and respect for the
facilitator…. The online forum should be created and developed at the grassroots level;
its growth, however, ought to be the result of previous personal connections. (Dalgarno & Colgan, 2007, p. 1062)

Job-embedded professional learning may be another method of supporting the informal and incidental learning that was found to be important among teachers in a compulsory laptop program, as well as for supporting alternate forms of formal learning initiatives. Job-embedded professional learning can be defined as the learning that occurs in the context in which teachers work (Elmore, 2004; Gallucci, 2008). It is a method of generating and sharing ideas in order to provide knowledge in technology, pedagogy and content. Informal and formal, virtual and face-to-face collaboration among colleagues and providing ‘just-in-time’ resources to support teachers in the context of their teaching may be important steps for responding to the needs expressed by teachers in the CLP. It will be important that the Headmaster/Headmistress accurately read and decode the cues from his/her staff about when an action is needed to move faculty forward in the implementation process. This action could take many forms: collaborating between teachers, observing peers, sharing ideas and resources, or discussing concerns with peers in online forums. This is a change from the notion of a full-time expert sitting in an office waiting to be asked for help or inventing workshops about topics he/she assumes the teachers need, as indicated by George’s and Jeff’s comment about the ineffectiveness of the educational technology consultant position at their school.

Teachers being provided with personal support through a variety of authentic forms of TPD may, in fact, address individual teachers’ challenges and affective objectives which in turn could provide the teacher with the knowledge (technological, pedagogical, and content) necessary to allow both them and their students to use laptops more effectively in the teaching and learning process. The implementation model presented in this chapter (see Figure 18) integrates job-embedded professional learning with colleagues in order to address teachers’
concerns about the lack of connection between technological, pedagogical and content
knowledge in their teaching practice. The TPD models, such as train-the-trainer model used in
the case study school, do not address or alleviate teachers’ concerns; providing one-on-one
collaborative, curricular, and ongoing, as well as technological, support for individual teachers
could assist in bridging the gap between their technological, pedagogical, and content needs.

*Classroom Management*

All teachers in this study noted student distractions (e.g., social networking, gaming, and
surfing the Internet) as a challenge when teaching in a requisite laptop program. This was not
predicted at the onset of the adoption and implementation process. In the past, students were
distracted by the novelty of the computer technology itself in computer labs, but with the
adoption of individual student laptop programs, this, and new, unforeseen distractions have
permeated the daily classroom environment becoming a common classroom management
challenge for teachers. The teachers, such as Emi, Jack, and Linda, who integrated student-
centred laptop initiatives into their program alongside implementing alternative classroom
management techniques (e.g., engaging students in laptop-based lessons, students closing their
laptops when they are not being used, and using classroom configurations that promote on-task
behaviour) experienced greater CLP implementation successes than those who relied on
traditional methods. (e.g., primarily teaching at the front of the class, and planning lessons that
do not integrate the technologies students now possess). Those teachers who did not deal with
the challenges of laptops in the classroom in alternative ways (e.g., Kyle and Matt) continued to
become frustrated with the educational innovation to the point that some teachers in the study
told students not to bring their laptops to certain classes. TPD activities that include teacher-to-
teacher discussions and problem-solving opportunities could address alternative classroom
management issues, especially given the new classroom configurations required to accommodate student laptops in the classroom. Teachers need to feel very safe before raising the issue of classroom management, and they would feel better if they knew they were not alone in their challenges and knew that other teachers had experienced similar difficulties and frustrations but have found effective solutions. Addressing this challenge during individual, small group, or departmental TPD may promote more teachers to implement the CLP into the teaching and learning process rather than limiting their use to managerial tasks. The model described at the end of this chapter addresses the importance of attending to classroom management issues within the realm of personalized professional development.

Curriculum Integration

Both the online survey and the case study data revealed that laptops were integrated into teaching practice most frequently for word processing, presentations, lesson preparation research, e-mail, and mandated requirements (e.g., WebCT, MarkBook). Social networking and videoconferencing programs now appear to be a part of students’ technological knowledge, but are very rarely integrated into curriculum related activities according to teachers in this study. For example, almost 80% of the online survey responses indicated they never use videoconferencing, and Jack was the only teacher in the case study to use a social networking application with students in his teaching practice and students’ learning. They may be a part of teachers’ technological knowledge, but not their technological-pedagogical or technological-content knowledge. Personalized TPD may allow teachers to move from not only implementing standard software such as presentation software, Internet researching, e-mail, and word processing but to also implementing curriculum initiatives that relate and engage laptops to students’ real-life interests (e.g., social networking). At present, the case study teachers are
mostly concerned about the negative effects social networking sites have on teaching and learning (e.g., Facebook, MSN, MySpace), rather than the educational potential they may have in the classroom. As teachers work one-on-one or in small subject-specific groupings, they may have greater opportunity to discover or develop innovative curricular ideas, the pedagogical value, and given personal just-in-time support, these teachers may be more likely to implement a greater variety of emergent laptop technology initiatives more readily into pedagogy and content. By providing the time and opportunities for front-line teachers to access other front-line teachers in order to connect, share, and problem-solve may allow teachers to receive the just-in-time support they need. This could take face-to-face and technological forms, i.e., an Intranet community, question and answer discussion board, or a social networking group, in which teachers could post a question and get an immediate response from someone working in the field.

It seems that one of the challenges is a defined need or purpose for requisite participation in the CLP. Teachers were more successful when there was a need to introduce an educational innovation such as the introduction of a new mathematics textbook series that stemmed from the implementation of a new provincial math curriculum (Ministry of Education, 2005). Since the CLP was mandated not as a means to an end but as an end itself, it seemed to be viewed as a forced need. Hence, there is a genuine need to define the purpose of the CLP and design professional development to illuminate the purpose in meaningful ways. This extension of TPD models may require a transition from focusing strictly on extrinsic goals for teachers (e.g., learning a program to survive in the context of a CLP environment) to include intrinsic goals (e.g., addressing personal teaching philosophies) as motivation to engage more fully in implementing a CLP into teaching practice; this need is addressed in the model described in Figure 18. By addressing these goals and its implications for teachers in the CLPs policy, an
important phase in the implementation process is addressed (Guba, 1985)—how the CLP is interpreted by teachers. In order for TPD activities to be most effective, the findings identified a need for developing and implementing ongoing, transparent policies that are continually communicated effectively to the teaching community.

Policy Development, Dissemination, and Implementation

In contrast to the online survey, the case study data suggests that policy-making and disseminating processes hindered teachers’ understanding of their role in response to the top-down mandate to initiate a school-wide laptop program, as all teachers and administrators had difficulty describing the laptop program in terms of policy, vision, and an explicit implementation plan. Most of the teachers identified the need for (a) shared policies that reflect the changing needs of teachers, (b) ongoing review, revision, and communication of the policies’ processes, and (c) benchmarks\(^{14}\), rather than standards, as indicators of successful implementation. These findings also mean that the traditional definition of complete implementation of the CLP into teaching practice, as defined in the literature, may be difficult to attain given the changeable nature of technology in laptop programs.

The Policy-making and Review Process

Policy-making processes are viewed as important components in the implementation of educational innovations (e.g., Fullan & Pomfret, 1977; Marsh & Willis, 2007). The literature suggests that definitions of policy identify certain essential elements necessary for successful implementation initiatives, purporting that policy-making should include a documented plan that outlines both the intended outcomes and the behaviours expected (Guba, 1985; Ornstein & Hunkins, 2004). Three cyclical phases of successful policy-making emerged from a synthesis of

\(^{14}\) Benchmarks are points of reference to measure behaviours that are based on a continuous implementation process.
the literature: intended, actual, and in-use policy (Bowe, Ball, & Gold, 1992; Guba, 1985; Hope, 2002; Timperly & Robinson, 1997).

The findings from the online survey indicated that most teachers’ stages of concerns indicated that there was a shared decision-making process and their CLP was directly aligned with their school vision. This does not, however, appear to be the perception of teachers in the case study. First, the case study findings and literature indicate a need for CLP schools to focus on developing an intended policy that reflects an understanding of the changing needs, concerns, and beliefs of teachers—the “policy implementers” (Guba, 1985, p. 64) and allowing the decision-making process to be shared among all stakeholders, not just the administrative team (Fullan, 2007). The online survey indicates most respondents believe this to be true in their school. The responses from the case study, however, indicate that these teachers were unable to articulate a clear description of the rationale, goals, and expectations for integrating the CLP. This is not surprising given the ubiquitous nature of the innovation and the technology continually changing forms and applications, as well as the indication that teachers had not received a clear message about the initiatives’ fundamental goals. Participants also suggested that in their view, the primary goal of the laptop program was for marketing purposes, rather than for improving teaching and learning—a view in conflict with their personal professional teaching beliefs and goals.

Second, most teachers in the case study were not aware of actual school-based CLP vision, goals, or policies nor did they share in creating, revising or evaluating any existing policies. In stark contrast, however, through the interview process it was found that administrators believed decisions were made through a shared process that included teacher’s input. Guba (1985) and Joshi (1991) suggest that the development of an actual policy is an
important part of the policy implementation process, especially if the policy vision, goals, action plan, and outcomes are to be clearly understood by the principal implementers (in this case, teachers). The CLP policies at the case study school were neither developed by nor communicated effectively to teachers. It may be that teachers need to have a more active role in establishing and revising those policies since they are the ones who must enact them. The results indicate a need for tangible and accessible CLP policies with revision processes that are clearly communicated on an ongoing basis to the implementers of change—the teachers. This may also assist in bridging the gap between the teachers’ and administrators’ perceptions of a shared decision-making process.

Finally, the results from all data sources (online survey, interviews and focus groups) indicate that the policies may need to be continuously revisited, re-evaluated and revised during the implementation process in order to determine if the desired vision, goals, and action plan are still appropriate, are being attained or remain relevant to new advancements in technology and teacher/student behaviours. One of the challenges of adopting and implementing a CLP is ensuring that teachers have a clear understanding of what their role in the process is. As Fullan (2007) explains, a shared vision is essential for success but requires a reflective process in order to shape and reshape the emerging change. For example, in the past when there were computers in the classroom or lab, the teacher remained in control of the technology because typically only a few software programs existed so there was little else for the student to do. In laptop programs, however, teachers no longer own the locus of control because the technology and applications are constantly changing and the students, being technologically savvy, can assume control. This takes control away from teachers, individually or collectively, because of the networking possibilities. Given the changeable nature of compulsory laptop programs, ensuring there is a
continuous review process is essential for effective implementation, as teachers are experiencing a paradigm shift in terms of control of information in the classroom.

Since most teachers in the case study did not have a clear, initial understanding of the policy, their responses to enacting the implicit CLP policies and vision indicated a variety of interpretations with respect to what they believed the policy was. From the teachers’ perspectives, the implementation of the CLP had been effective in achieving what they believed to be a major goal: using the technology for administrative and managerial purposes, i.e., computerized reporting and attendance systems. The teachers were less clear of the expectations for them to use the technology in their everyday classroom teaching/learning and assessment practices. Lack of understanding of their part in the school-wide action plan as it related to pedagogy and curriculum was a challenge for teachers, meaning that they were unsure of the goals and expectation for their teaching practice or what their expected behaviour was to look like in the classroom. The lack of clarity about the policy and the challenge of meeting the standards of use for the continually changing mandated technology emerged as teachers’ concerns about the CLP. It may be that initiating benchmarks as indicators of implementation success, rather than using standards as measures of achievement may address these concerns.

Implementation policies that identify standards (a set of tasks to be accomplished) suggest that once the standards have been met (match the articulated descriptors), the implementation process is complete and the innovation has become status quo within the school environment. Such standard-based plans are fixed and linear in nature; however, given the unpredictable nature of today’s technology, as this study suggests, through teacher responses in the case study (e.g., Art, Emi, and William) these types of predictable implementation policies are not effective. Whereas, standards are quantitative and use a summative evaluative process to
determine whether or not the expectations have been achieved (usually through ‘yes or no’ criteria), benchmarks are qualitative and based on formative assessments for learning. They provide descriptors to define the characteristics of a teacher’s behaviour at each stage of implementation and the purpose is to interpret the qualitative differences between the stages in order to plan how to move people to the next stage in the continuum. Benchmarks can provide a point of reference to identify milestones along a continuous yet inestimable learning continuum. CLP policies that focus on benchmarks would allow the milestones to change with the technology. Benchmarks could provide individual teachers with the support they need to learn and implement the CLP into their teaching practice.

If an innovation starts from a point at which teachers are actively included in creating and revising the CLP vision for their own students and classroom, within a professional learning community in which there are shared goals, learning, leadership, and support, better implementation results (Hall & Hord, 2006). Fullan (2007) further suggests that ‘deep ownership’ by teachers in the change process is a result of the learning that occurs from engaging in a community over time. Teachers in this case study have an advantage of learning over time, as there is less mobility in the independent school system and teachers usually stay in the same school over the long term. A shared, ongoing policy process may include greater emphasis on connecting a CLP to pedagogy and curriculum, especially given that most of the case study teachers’ responses suggest that they were not sure of the expectations for instructional purposes during the implementation process i.e., Patrick, Susan, and Cindy. It is suggested that administrators apply the principles of organizational learning theory in order to solve the implementation challenges for the benefit of the whole community.
Organizational learning theory suggests that an organization (the school) can constantly learn by reflecting on past actions and providing support for the implementers (teachers) (Argyris & Schön, 1998). Organizational learning occurs when individuals within a particular context collectively experience a problem and try to solve it for the benefit of the organization (Argyris & Schön, 1998). Organizational learning concerns growing competence within individuals and the community in order to communicate and overcome challenges successfully, both in the short-term and over the long-term. Administrators’ efforts to create a learning organization are an attempt to establish a learning ideology (Steiner, 1998). Two approaches to organizational learning include behaviour and cognition. The behavioural approach describes how learners cope with existing organizational routines or mandates (Senge, 1990) and the ways in which the organization responds to the pressures to maintain the level of innovation necessary to remain competitive (Yeo, 2002). The cognitive approach relates to the thinking processes involved in learning and the emotional responses of learners (Yeo, 2002). Learning is regarded as creating rather than coping (Senge, 1990). Greater emphasis on the cognitive approach that relates to the affective, emotional responses of the teachers by administrators may better address the challenges teachers face when implementing a CLP into teaching practice, especially given that the case study teachers are emotionally and affectively connected to their belief in using the technology only when it will benefit student learning. For example, even Evan, identified as the only mechanical user, demonstrated this connection through his responses to implementing sound probes into his physics classes only because he says the benefit to his students’ learning. By acknowledging that learning occurs on many levels, administrators may recognize that organizational learning cannot occur unless they value, respect, and acknowledge individual learning.
In order to address teachers’ concerns, the administrators at the case study school may need to alter their focus from primarily mandated requirements associated with the behavioural approach to an organizational learning focus because this includes teachers’ feelings and beliefs—attributes that appear to receive little attention in the mandate to use laptops. It appears important to recognize that learning occurs both affectively and cognitively. The case study teachers had opinions and concerns, but no one seemed to hear their voices. Administrators may need to watch past actions of teachers and continually assess how they learn in order to provide effective supports for their needs at a particular point in time during the implementation process. This may be accomplished by creating ongoing policies and reviews, providing continual communication about the policies, and identifying individual teachers’ intrinsic motivations for implementation within the organizational context. As the model described in Figure 18 reveals, gears depict the responsive and interdependent nature of the policy-making and implementation process within a CLP—one gear drives the other and is concomitantly driven by yet another. It is difficult to create a static policy that has a traditional definition for complete implementation when the innovation is continually changing and requires the implementers to change and learn with it. Until all stakeholders share a goal and vision for understanding what is considered to be ‘complete implementation’, it is difficult to measure successful implementation of the CLP.

Redefining Complete Policy Implementation

The literature about adopting and implementing innovations (e.g., Desimone, 2002) suggests that four linear levels of educational policy implementation can assist in determining the completeness of the implementation process (see Figure 19).
Figure 19. Levels of educational policy adoption and implementation of an innovation.

The findings from the case study suggest that an original statement of goals and visions did not appear to be distributed to the teachers (Level 2 of policy implementation) causing varied interpretation by participants in terms of how they believed they were intended to implement the CLP into their curriculum and teaching practice, or what complete implementation actually was. This observation is supported in the educational change theory literature: partial understanding by teachers of the change promotes inconsistent implementation (e.g., Fullan, 2007). Complete or ongoing and consistent implementation may be a challenge to attain without teachers having a clear vision, purpose or action plan to which to refer. Given the unpredictable nature of the CLP, complete implementation in the traditional sense may be impossible to accomplish. Complete implementation in the case of the CLP, may be a continual process that does not necessarily have a defined end result. A lack of understanding of the changeable nature of this innovation and an assumption that it fits into existing policy implementation models and definitions may have caused some of the challenges and concerns teachers faced in their requisite participation in the

<table>
<thead>
<tr>
<th>Level 1: Adoption</th>
<th>• The policy is accepted by the system.</th>
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<tr>
<td>Level 2: Initial Implementation</td>
<td>• The policy is distributed to local stakeholders.</td>
</tr>
<tr>
<td>Level 3: Partial Implementation</td>
<td>• The policy is being interpreted, adapted, and used to varying degrees. There is an overall effort to reach the vision, mission, and goals of the program, but they may not have been attained.</td>
</tr>
<tr>
<td>Level 4: Complete Implementation</td>
<td>• The policy has become the status quo (routinized) within the community. The goals of the program are being met and the policy has become a norm within the school and classroom.</td>
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laptop program. Figure 18 redefines complete implementation as a flexible, constantly changing, ongoing process, rather than one that reaches set standards and becomes static.

**Hardware and Software**

Unlike past technology-driven initiatives, the quantity of hardware or funding for software were not considered barriers for teachers implementing a laptop program into their teaching practice in this study. New generations of hardware and software challenges did, however, emerge from this study.

The findings from both the online survey and the case study revealed two main challenges associated with hardware. First, older models of laptops (owned by some students) were unable to support emerging course-specific software programs deemed essential by some teachers for particular topics or courses. Second, there was an insufficient quantity of peripheral technology (e.g., SmartBoards, printers) to support emerging curriculum and teaching initiatives. These observations suggest that hardware needs to be updated regularly to support curriculum initiatives and the focus on individual hardware needs that are equitable, not equal\(^\text{15}\), in order to support teachers’ needs.

Software challenges were also identified through interviews with teachers, such as Art and Matt. It was suggested that many software programs were not compatible with the school’s network system and some of the mandated software was not user-friendly as the programs were difficult to navigate and time-consuming to learn and use. These challenges suggest the need for technical support to identify those applications that are network compatible while teachers are searching for course-specific software to use in their curriculum. This has not been an issue in the past since teachers were rarely responsible for their own course-specific software needs.

\(^{15}\) In terms of the CLP, equitable refers to meeting the hardware and software needs of individual teachers that are differentiated by these needs. Equality means providing all departments and/or individual teachers with the same hardware and software allocation whether they use it or not.
Teachers’ responses also indicated the importance of adopting and implementing mandated software that they perceived to be user-friendly. Teachers appeared exhausted from learning how to post tests, schedules, and course material on WebCT, and entering marks to being very concerned about learning how to use dynamic course-specific software programs (e.g., a geometry or music composition application). This tiredness was expressed in responses identifying the learning to be a mechanical burden (Interview, Jack), e-mail being an epidemic that takes a great deal of time to reply (e.g., Interview, Linda; Interview, Evan), and being required to add one WebCT feature every year whether it was considered beneficial to student learning or not (Interview, Matt).

These findings suggest that implementing a compulsory laptop program is a process in which the hardware and software are continually changing. This constantly evolving feature of the laptop program makes it especially difficult for teachers to keep abreast of the changes. Due to frequently changing hardware and software technology, teachers find it challenging to maintain a consistent and comfortable level of expertise. For example, there were changes to the learning management system (from WebCT to ANGEL) that required re-training; the attendance program was a new feature that needed to be learned; and the marks management program was revised. However, teachers’ stated priority was in keeping up-to-date on learning to use hardware and software in ways that directly translated into better teaching practice and student learning, as almost all teachers stated they only used it in their teaching practice when it made sense and focused on student learning (e.g., Emi, Kim, and Art). They lacked the time and knowledgeable resources to achieve this goal. Recognizing that teachers wish to spend more time focusing on ways to integrate technology into their curriculum, suggests a need for administrators to listen to their voices when adopting hardware and software. Teachers need to
be involved in decision-making about policy but also about practical decisions that have implications for them in the classroom.

Essential Components of the Compulsory Laptop Program

Teachers in both the online survey and the case study identified three major components that they believed to be essential for implementing a CLP: communication of vision, goals and action plan, administrative support, and access to resources.

Vision, Goals, and Action Plan

The findings from both the online survey and case study revealed that the teachers’ beliefs, behaviours, and perceptions exhibited when implementing the compulsory laptop program were a result of the perceived actions by administration—classified as second-order barriers to change. Most teachers in the online survey stated that they knew and understood their schools’ vision, goals and purpose of the CLP through shared decision-making structures that were transparently communicated. This addressed teachers’ beliefs about what they perceived to be most effective for their teaching practice and students’ learning. Teachers in the online survey believed they were provided with effective, alternative forms TPD that addressed their need for connecting the technology with pedagogy and content. This is in stark contrast to the findings from the case study.

Most teachers in the case study believed it was a top-down decision to adopt and implement the laptop program. The case study school lacked a clear, focused policy on what the implementation plan was and there was little to no guidance for teachers about why they were implementing the CLP or how they were to implement it. Most teachers stated that the reason for the CLP was as a marketing strategy to attract potential clients (students); a reason that contradicts these teachers’ belief that educational change should be about improving student
learning. The administrative team in the case study school did not seem to know what teachers were to do with the laptops in the classroom. As well, there was no clear teacher professional development plan to ground successful implementation. The focus of TPD was on technological knowledge, rather than pedagogical and curricular intention. As a result of an undefined vision, goal, purpose, and educational rationale, teachers tried to define and enact their own visions, implementation plans, and educational purposes. They attempted to develop their own set of principles of practice (general guidelines) to align with each other and/or their department. Teachers also created their own informal learning opportunities that attempted to connect their technological, pedagogical, and content knowledge. It appears administration provided the training, whereas the teachers provided themselves with education and learning that focused on pedagogy and content.

Another essential component of a CLP appears to include the need to pay attention to the connectedness between teachers’ beliefs and teaching practice. The literature suggests that some researcher believe that beliefs must change before there can be a change in practice (e.g., Becker, 2001; Gritter, 2005), while others believe that teaching practice must change in order to affect beliefs (e.g., Kagan, 1992; Pajaras, 1992). The findings from the case study, however, suggest an essential component for using laptops in the classroom in through a combination of the two perspectives. For example, Evan believes his teaching practice without laptops was more effective for his students’ learning. However, when he was introduced to scientific probes interfacing with laptop technology, he recognized that this would improve his student learning and he changed his practices to include laptop use; in this case his beliefs changed his teaching practice. Emi, on the other hand, tried using SmartBoard technology with her laptop and due to the success she had in her teaching practice, her belief about using this type of technology
changed. An essential component appears to recognize that teachers’ beliefs and teaching practices are closely connected and one can help to change the other.

An essential component of adopting and implementing a CLP is explicitly creating, reviewing, and revising a shared vision and implementation plan, and acknowledging the influence teachers’ beliefs and practice have on the process. Effective implementation may only be effective; however, if there is a transparent communication between administration and teachers, and administrative teams provide the supports deemed essential by teachers in CLPs.

Administrative Support

Both the online survey and the case study data revealed the need for the administrative team to support teachers by providing them with technical, financial, and TPD support that connects the technological knowledge with their teaching practices and students’ learning.

Administration that provides methods for teachers to access just-in-time technical support was found to be an essential component for the majority of all teachers involved in this study: it allowed teachers access to immediate resources for technical difficulties they encountered with the hardware and software. It was this support that provided teachers with the necessary technological knowledge necessary to complete the day-to-day managerial tasks associated with the laptop environment. As well, most teachers in both the online survey and the case study identified strong financial support by administration as essential to teaching in the CLP. Teachers recognized and valued the efforts made by their administration to provide the necessary hardware (e.g., laptops), and funding for software and professional development requests and gave credit to these efforts in achieving what they perceived was aiding their level of implementation. The data suggested that administration was particularly adept at providing teachers with the supports they needed to obtain the technical trouble-shooting (e.g., IT
Departments). Unlike the survey findings, however, the case study teachers believed that considerably less attention was paid by administration to teachers’ efforts in integrating pedagogy and content into the CLP. Teachers’ responses suggest that an essential component is not only technical and financial support, but also learning ways to implement a CLP into teaching practice that is curriculum-focused.

Access to Resources

Almost all respondents in both the online survey and case study believed that one of the essential components of the CLP was the unlimited access to electronic communication and resources. First, most participants used e-mail, course management software, and a marks program to communicate with students, parents and colleagues. Electronic communication appeared to be an important part of a teacher’s professional life and they embraced this aspect afforded by the technology as a more efficient way to achieve effective communication. It appears communication as described by teachers in the case study is in the form of information transfer—data regarding marks, course requirements, due dates, schedules, and homework are transferred from one stakeholder to another (e.g., Jenny, Patrick, and William). This is in contrast to the lack of ongoing and meaningful communication between administrators and teachers about creating, understanding, and enacting the CLP policy.

Second, participants in all data collection methods found that access to resources was an essential component of the CLP. They had access to unlimited online resources that could be accessed from their laptop at school. Teachers believed that access to a wider variety of resources, enabled by the CLP, increased motivation in some students and allowed for more interesting lessons. An overwhelming majority of participants in this study wanted the CLP to continue, in part because they perceived that the increased access to resources enhanced their
classroom instruction. Teachers described the access to resources made available by the CLP provided to be essential when it directly affected their teaching practice and was related specifically to course-content and delivery methods. All teachers viewed access to resources as strengthening their curriculum by providing students with access to previously unavailable sources of information (e.g., museums, course-specific software). It was this component of the CLP that teachers found to be one of the most important aspects of the CLP, possibly because it related directly to their course content, curriculum initiatives, teaching practice and student learning.

Access to Internet resources was the only essential component presently implemented at the case study school that directly related the CLP to improved teaching practice and student learning. Given that the Internet has been in existence for some time and most teachers integrated Internet resources into their teaching practice suggests that although the Internet is constantly changing—many diagrams are now replaced by videos, websites come and go—teachers do not require continual re-training for interactions with the Internet. Instead, they can spend time connecting the resources available on the Internet directly to their subject domain. However, with the emergence of interactive websites that teachers are not using indicate this may no longer be the case; they may need re-training in learning how to interact with the new online web applications. These findings indicate teachers are searching for knowledge and skills in integrating their technical knowledge with the curriculum and teaching techniques in the classroom. Support of this nature, however, appears to be scarce in the CLP at the case study school. This need is also identified in personalized professional development support within the implementation model illustrated in Figure 18.
The findings from both the survey and case study revealed an essential component of the CLP was providing teachers with (a) a clear vision, (b) a shared ongoing process of creating, reviewing, and revising the CLP policy, (c) an implementation plan that is understood by all teachers, and (d) a transparent network for communicating the vision action plan, and review process to the implementers of the change. The findings from the case study data also suggest that the majority of essential components presently found in the laptop program included features that were managerial in nature, rather than curriculum-focused. The CLP provided easier access to students, parents, and colleagues; teachers with a personal laptop of their own without any of the financial burdens; and with unlimited access to resources from school and home—all features of a CLP that provide more efficiency in managing administrative tasks. Essential components they found necessary, but were lacking in the case study, included a shared vision, implementation plan, transparent communication network, and TPD that connected TPCK.

It is also important to note that the case study teachers’ responses focused more intently on their beliefs and behaviours towards their requisite participation in the school-based laptop program than on the essential components they believed already exists as part of the CLP (communication, support, access to resources). It appears that this research provided a much needed opportunity for teachers to voice their concerns and opinions about the components they believe should be a part of successful implementation of a CLP. Teachers want to discuss both the challenges of requisite participation and possible solutions to the challenges faced. The fact that most teachers in this study wanted the CLP to continue indicates that they perceived some positive changes had occurred and believed that in time more positives would emerge. All teachers in this study appear to have a genuine desire to improve their teaching practice within the school context and better understand their role in the change process.
The Changing Roles of Students, Administrators, and Teachers

Compulsory laptop programs have prompted student, administrator, and teacher roles to change, as indicated in the findings from this research. Students are no longer required to gain access to learning materials through their physical presence in a classroom or library. They can now work and learn in a variety of spaces and access an overwhelming number of resources with hugely differing quality, accuracy, and validity. Students now need to become responsible, independent, self-directed, and thoughtful users and consumers of the technology. This did not appear to be a part of the students’ introduction to the CLP. As with the teachers, the focus of the required Grade 9 technology course was on students learning how to use the technology, rather than learning to also become responsible users (e.g., Interview, George).

Administration’s role in a compulsory laptop program is also changing. Not only do they need to support teachers financially, but they also need to support them personally. Alternative forms of professional development that involved informal initiatives and personal support could be recognized as important mechanisms for implementing the unpredictable and ever-changing nature of the laptop program. Administrators may need to realize that it is very difficult to define ‘complete implementation’ in the traditional sense, given the dynamic nature of using, learning about, assessing and understanding the many ways to implement laptop technology in teaching practice and curriculum initiatives—many of which are presently unknown. Administrators have a huge role to play in the implementation process by actively and explicitly supporting the teachers who are striving to find ways to become successful implementers of the change. A top-down approach to policy-making and support may not be effective, given that administrators appear to be the last to learn about new uses of the technology in the classroom. It may be that teachers need to know how student learning will be enhanced through, for example, a curriculum
appropriate Facebook activity. It will be important for administration to create conditions which support ever-changing teacher roles and help allocate resources and time to the implementation process.

Teachers in both the survey and case study this research setting indicate that the challenges they face of making the CLP work in the classroom are still at the forefront of their concerns, even after eight years of requisite participation. A teacher’s role in the laptop program is that of the implementer; they are visible actors of the implementation process. Teachers in the case study findings indicate that laptop classrooms are continually changing as is the unpredictable nature of technology—new and updated hardware and software entering classrooms, access to emergent Internet applications in the classroom by students, and new classroom configurations to support laptop classes are just some of the perpetual changes experienced by teachers in laptop classrooms. This has complicated effects on the teacher’s role in the laptop program. Although the intended curriculum content remains fairly consistent, teachers acknowledge that they must revise their instructional and assessment practices to generate new meaningful learning experiences to match the expectations and possibilities of the new CLP classroom culture. There appears to be a teaching paradigm shift associated with teaching in a CLP. Most of the case study teachers, i.e., Art, Emi, George and Jack, indicate students are learning outside the classroom as well as inside, delivery methods are changing, assessment strategies are being re-evaluated, and teachers are both facilitators and coordinators of the unlimited number of course-specific resources available. Teachers in this study had difficulty understanding their new role in the laptop program due to the continually evolving nature of technology. This resulted in a feeling that they would never be done in terms of
successfully implementing the CLP initiative. It appears that a revised model of implementation is needed for teachers involved in a CLP (see Figure 18).

A Revised Model for Implementing a Compulsory Laptop Program

The compulsory laptop program (CLP) is an innovation for teaching and this study suggests that the implementation process is fluid because of the changing nature of the innovation. The various components are neither separated nor static, or predictable. The terms and conditions of the CLP cannot be controlled because hardware and software development are continuous and external to any implementation and there is enormous variability in the actual uses that individuals may imagine and find for the technology. This was demonstrated through the variability in the levels of use (LoU) and stages of concern (SoC) of teachers in both the survey and the case study. Teachers were categorized in five of the eight different levels of use (mechanical, routine, refinement, integration and renewal), and their concerns ranged the spectrum of the six stages from awareness to refocusing.

The CBAM model suggests that teacher’s progress through predictable levels and stages when implementing any innovation. The results from this study, however, suggest that this is not the case in laptop programs due to three main discrepancies. First, according to the CBAM, even those teachers who integrate the laptop into their teaching program are categorized as being most concerned with issues dealing with the possibility of use. This is contradictory to the findings in the case study. The teachers who were routine, refinement, or integration users also had concerns about awareness. The data suggest, however, they were seeking a ‘new awareness’ of laptop use directed at impacting integration into their teaching practice, rather than an initial awareness of potential uses for teaching with laptops. Due to the linear configuration of the Concerns Based Adoption Model, this ‘new awareness’ is not accommodated. Once a
participant attained the final stage of concern, renewal, the CBAM model did not permit movement back to an awareness concern because it was rigidly defined as an initial awareness of the possible uses of the innovation, and does not leave the door open to the possibilities of a new awareness of emergent technologies and their potential uses.

Second, refocusing concerns in this study were found to mean that teachers sought new ways to teach lessons and integrate the laptops into their curriculum, rather than to look for alternatives to the innovation itself as the CBAM suggests. This observation suggests that the adoption and implementation process is not rigidly fixed or staged. As collaboration through sharing and dialoguing occurs during implementation, a new, more sophisticated awareness of the potential for integrating the innovation into teaching practice arises. In this study, the stages of concern could be more accurately described using a continuous process that accommodated multiple, continually developing uses of this particular innovation, beyond initial adoption by the community.

Third, no teachers in the case study were identified in the first three levels of use. Technically, in fact, no one could be classified by CBAM as non-users of the innovation. This is consistent with the compulsory nature of the implementation. Once the decision to be a laptop school was made by school authorities, all teachers were required to use the laptops to some degree in order to survive in the context of their teaching environment. The data suggest that the strict stages delineated in the original CBAM model may not be appropriate milestones for assessing a mandated educational innovation such as this. Short of leaving the school to teach elsewhere, teachers did not have the choice to opt out of implementing the CLP once the institution had adopted it across-the-board. A revised non-linear model may be more appropriate in this case; one with multiple entry points so that implementers may move freely and iteratively
between components of implementation at any given time as their uses, concerns, beliefs and behaviours change with this constantly evolving innovation—laptop technology. Figure 18 illustrates a new configuration, introducing an interrelated, non-hierarchical arrangement to CBAM’s stages of concerns and levels of use. It eliminates the first three levels of use (defined as non-users) due to the fact that in a mandated laptop program everyone must use the technology on some level as soon as it is adopted by the system on his/her behalf.

As teachers in the case study, such as Art, Emi, Kim, Matt, and Patrick, suggest many of the teachers’ levels of use of the laptops were fairly sophisticated in terms what they would like to do (e.g., use Publisher, video, and the midi-lab). The computers actual use, however, was limited by the teachers’ views that the constraints of the laptops and the mandated applications promoted non-creative, unsophisticated uses, as explicitly stated by Art. It seems that some of these teachers may have blamed the laptops and applications but many helped each other and did some very creative things (e.g., students making videos and sending them to CBCs Outfront and students creating interactive geography websites). Little time was given to learning, understanding, and integrating course-specific software into curriculum and teaching practice. Fullan (1993) reinforces the participants’ views when he suggests that it is difficult to mandate what is important to teachers, since what really matters to them is thinking creatively, possessing the skills necessary for effective teaching, and committing to the learning process.

The mandated requirements of use (e.g., course management software) were cumbersome to learn and time-consuming to use. The time invested in complying with this mandate translated into less opportunity for teachers to explore, learn about, and design classroom resources that better matched their own professional goals for implementation. All the teachers in the case study, from Evan the mechanical user, to Emi and Kim the integration users,
appeared thoughtful and informed about their subject, the curriculum, and when to implement laptop technology into their teaching. This was true regardless of where they might be classified using the levels of use or stages of concern tools. It was evident that even teachers at the lower levels of use (LoU) and stages of concern (SoC) were genuinely concerned about how the innovation would impact their students more than how it would impact them personally. The original CBAM does not take into account the deliberate and informed critique of the innovation regardless of where a teacher may be defined according to the fixed stages in the LoU or SoC models. When teachers are not included in clear and continuous dialogue with administrators about the vision, goals, and action plan for the CLP and administrators do not value or respond to teachers’ professional concerns, it appears that the opportunities for greater diffusion of this planned change initiative are severely limited.

Diffusion is considered a process of communication in which the idea about a new innovation is conveyed to stakeholders and over time the innovation may be adopted at varying levels by various members of the community (Rogers, 2003). As the levels of use identified, Rogers (2003) suggests five adopter categories which in the past “tend to hold up across innovation and cultures” (Hall & Hord, 2006, p. 71). The term adopter categories suggest that teachers are placed in a type classification within a fixed taxonomy when the innovation is initially adopted by the system, rather than during the actual implementation of the innovation. The school-wide laptop innovation studied in this research was, however, implemented to different degrees at different times by teachers as a reflection of their individual, professional learning process; rather than taken on in response to an external force. Hence, implementer phases that emerged from the adoption, rather than advance-descriptor adopter categories, may be a term that more adequately depicts the depth of use of this particular educational innovation.
Nonetheless, once the innovation has been broadly adopted on their behalf, it is the teacher-implementers who are charged with making it work. Teachers were found to move between levels of implementation depending on what new information and knowledge they obtained about integrating laptop technology into their teaching practice. For example, if teachers decided to integrate a new course-specific software program into their teaching practice, they would move from gathering new information to learning the program to integrating it into curriculum. They would return to previous implementer uses and concerns. Yet these same teachers would be at a high level of use in the implementer continuum for programs with which they had prior implementation experience through interactions in their teaching and curriculum. This unrestricted movement is illustrated in the model shown in Figure 18 by identifying a ‘new awareness’ in the ever-changing concerns for implementers.

The conclusions reached about the limitations of certain aspects of CBAMs’ s LoU and SoC for this particular educational innovation suggest a need for a revised, more responsive and dynamic model that allows unrestricted movement to and from various levels of use and stages of concerns; rather than a linear model that prevents teachers from having newfound awareness concerns, informational concerns, and personal concerns due to continually changing uses of the innovation that resulted from past learning experiences with the innovation. Explaining the model to administrators may help them to better understand what might happen in their school.

With respect to CLPs, it seems that implementation is a function of teacher learning. Teachers in the case study were looking to learn more about connecting TPCK which translates into classroom implementation. Teachers are asked to learn to use the innovation and then apply their learning in the classroom. They have to learn about such things as hardware, software, classroom management, and connecting technology to curriculum. One of the steps that appear
to be missing from past implementation models is acknowledging that teachers must embark on a new learning continuum. This study underscores the need to make and honour connections between the learning and implementation processes. Just as children go through developmental stages when learning to read, count or add single digits, so must teachers go through a non-linear process of learning how to implement a compulsory laptop program into their teaching practice. In essence, learning can be thought of as “a process by which behaviour changes as a result of experience” (Maples & Webster, 1980, quoted in Merrian & Caffarella, 1999, p. 124).

The survey data identified experienced users of laptop technology as better able than intermediate users to share in decision-making, develop an individual professional action plan, use technology in creative ways in the classroom, learn informally and independently, and collaborate with others more frequently. This suggests experiences play a role when implementing a CLP into teaching practice. Kolb’s learning model (1984) suggests learning is a process that creates knowledge and transforms learning through past experiences based on a sliding continuum about how a learner perceives and processes information. Kolb posits a two level model. Level 1 is a 4 stage approach that includes concrete experiences (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Teachers who learn primarily through concrete experiences need empirical data that the change is effective, while teachers who prefer to learn in abstract ways need to internalize the change before implementing it. Level 2 represents a four-type definition of learning styles and includes diverging (CE/RO), assimilating (AC/RO), converging (AC/AE), and accommodating (CE/AE) learning styles. Divergent learners (CE/RO) place importance on feelings and cooperation. Assimilating learners (AC/RO) tend to be integrative, inductive thinkers. Converging learners (AC/AE) prefer practical, technical issues rather than interpersonal issues. Finally,
accommodating learners (CE/AE) use discovery-based techniques rather than reflective processes to learn. Figure 20 illustrates Kolb’s theory which states that the combinations of perceiving and processing experiences can predict one of the four learning styles in determining how people prefer to learn.

It appears possible to classify the teachers in the interviews using both Kolb’s learning model (1984) and CBAM, given their current location in the implementation process at the time the data were collected. For example, Evan who was described as a mechanical user with awareness concerns according to CBAM, tends to move between being a converging learner who learns to implement laptop technology into teaching practice by being provided with concrete examples and active experimentation (e.g., demonstration of scientific probes) to that of a diverging learner—one who feels the need to include some of the course management software requirements but has his Department Head actually use the technology for him. However, given the unpredictable nature of the innovation, it will be necessary to complete an ongoing needs analysis if teachers’ learning needs in the implementation process are to be continually met.

Kolb’s learning model could assist administrators, teachers, and support professionals involved in implementing a CLP by focusing attention on teachers’ changing professional roles and needs by ensuring their learning within the CLP implementation process is relevant, motivated and differentiated (e.g., based on an individual’s current learning preference and past experiences). Past, present, and future experiences within a CLP become important components in an ever-changing implementation model, as shown in Figure 18.
Figure 20. Kolb’s experiential learning model. (Adapted from Kolb, 1984)

Figure 18 depicts a model for complete implementation and is one that focuses on the implementer’s role in the change process. In the case of the compulsory laptop program, it is the teachers who are the implementers. Complete implementation in this model takes on a new meaning in the context of a compulsory laptop program. It is defined as meeting the ongoing, continually revised CLP policy vision, goals, and benchmarks that have been developed for a particular learning community and context. All phases of the model can be enacted at any time by implementers in the change process. It is a responsive, interconnected model in which implementers move back and forth, up and down depending on their learning, motivations and experiences at any given time. It incorporates (a) new forms of teacher professional development, (b) ongoing policy initiatives, (c) continuous levels of use and stages of concerns and (d) adult learning theories to assist stakeholders in implementing a successful CLP. The
model in Figure 18 illustrates the implementation process that could assist stakeholders involved in the change process better understand teachers’ roles in the complexity of learning, implementing, and diffusing a CLP into teaching practice.

The new model begins with policy initiatives that are not static, based on standards or characterized by a specific end-point. Rather, it combines the intended, actual and in-use policy into a changeable state that emphasizes the importance of ongoing review, revisions, and communication between administrators and teachers. The model highlights the importance of ensuring sound policies are in place and communicated effectively to the implementers on an ongoing basis. Once the policy is ready to be implemented, it is essential to focus on implementers’ intrinsic and extrinsic needs for motivation of use. This study demonstrates how important it is to consider and plan on the basis of teachers’ differentiated experiences in the implementation process.

The model then adapts Hall and Hord’s (2006) CBAM levels of use and stages of concern. It has been modified in this particular case to ensure that there is connectivity between each level of use and stage of concern, rather than a linear progression from one level of use to another. As this study described, depending on the type of use, teachers experienced a ‘new awareness’ of how the CLP could be further implemented into teaching practice, rather than only an awareness of potential uses for the laptops. The model also recognizes the importance of personalized TPD support for teachers that addresses their own challenges and concerns.

It is essential to emphasize the importance of ongoing communication between administration and teachers in order that all policies are transparent and clearly understood by all stakeholders. By understanding how adults learn, providing personalized TPD support, and recognizing teachers’ changing role in a CLP throughout the adoption and implementation
process, teachers may be able to have new experiences based on a professional learning community of practice, job-embedded professional learning, curriculum integration initiatives, technological-pedagogical-content knowledge, classroom management strategies, and any unforeseen and/or unintended results of implementing a CLP into teaching practice.

Summary of Chapter

This chapter discusses primarily the case study teachers’ responses to their obligatory participation in a school-based compulsory laptop program, the essential components of a CLP, and the changing professional roles within a CLP. It identifies, (a) the need for a revised implementation model (addressing PQ3, EQ4, and EQ5) (b) teacher professional development needs (addressing PQ1, EQ1 and EQ2), (c) policy development, dissemination, and implementation processes (addressing PQ1, EQ1 and EQ2), (d) essential components of a CLP (addressing PQ2, EQ3, and EQ5), and (e) changing roles of students, administrators, and teachers (addressing PQ3, EQ1 and EQ3). This study recognizes that compulsory laptop programs are not static, but represent an open-ended continuum. This unpredictability and infinite nature of technology creates challenges when trying to define terms and conditions within the implementation process that are based on traditional models that have a defined end product.

Given this constantly changing innovation, teachers in both the online survey and the case study identified the need for professional development to address self-imposed pressure, connect technological, pedagogical, and content knowledge to the laptop program, and classroom management issues. Self-imposed pressure experienced by teachers suggests a need for attending to the intrinsic motivation and the affective domain of teachers—their beliefs and perceptions. It may also be important for administrators to attend to organizational learning that
emphasizes cognitive approaches (e.g., Knowles, 1968; Kolb, 1984; Mezirow, 1997; Vygotsky, 1978), as well as behavioural approaches, in order to address teachers’ emotional and affective needs as expressed in this study. Teachers also expressed a need for informal and formal, collaborative, and job-embedded professional learning through a community of practice, knowledgeable resources, and just-in-time support; these emerged from teacher responses to the survey and case study as essential professional development components for teachers in the compulsory laptop program.

Awareness and understanding of what the CLP goals and vision actually is also emerged as a challenge for teachers implementing a CLP. A shared process for developing an intended policy that reflects teachers’ concerns and their changing needs may promote greater motivation for teachers to implement the technology more readily into their teaching practice. It is also essential that the policy has an ongoing review process, especially given the rapidly changing technology in society today, and its direct and unforeseeable influences on teachers and students in a CLP environment. An action plan that focuses on benchmarks, rather than standards, may better reflect a more fluid and responsive policy implementation process. This study also revealed the potential need to reconceptualize the traditional meaning of complete implementation to reflect the dynamic nature of change this innovation possesses. Explicitly acknowledging that reaching a status quo may never be possible when implementing a compulsory laptop program could address some of the pressures, concerns, and feelings expressed by teachers.

Teachers from all data sources identified essential components of a CLP to be: (a) developing and communicating a shared vision, goal, and action plan that recognizes the intimate connection between teachers’ beliefs and teaching practice, (b) receiving administrative support
that involves technological, pedagogical and content knowledge, and (c) accessing online resources. Most of the essential components presently in place in the case study, however, were based on technological proficiency rather than on curriculum and pedagogy. This study indicates a need to refocus complementary/supplementary professional development initiatives so that the goal is redirected towards teaching and learning with technology.

This study recognizes the influence a CLP has on changing the roles of students, administrators, and teachers. Intrinsic and extrinsic support of teachers by administrators emerged as important for teachers, rather than a focus solely on first-order barrier supports (e.g., financial). Students should become responsible consumers and users of emerging technology, especially when using social networking sites. Teachers’ roles are now that of a facilitator, mentor, creative guide, and coordinator of the variety of technology available for teaching and learning. They are the implementers of the CLP.

This study also suggests that incorporating learning theories (e.g., Kolb’s learning cycle and Bloom’s affective taxonomy) into innovation models may alleviate some of the challenges and concerns to implementing a CLP identified in this study. These findings indicate the need for a revised implementation model that reflects the ever-changing nature of technology and changing roles in the implementation process; one that incorporates the ways adults learn, uses, concerns, policy processes, and professional development initiatives for teachers implementing the compulsory laptop program into teaching practice.
CHAPTER 6: CONCLUSIONS

Overview of Chapter

This chapter explains the educational significance of the research, provides recommendations to stakeholders involved in adopting and implementing a CLP, describes the limitations of this study, and indicates future research possibilities. This chapter begins with the educational significance of the study.

Educational Significance of Study

This study contributes to the development of knowledge about the adoption and implementation of an education innovation (the CLP) and provides implications for further educational research and practices. First, the detailed descriptions afforded by this study add to research on ICT innovations by focusing on teachers’ concerns about their levels of use of, the barriers faced, and their TPD practices related to the educational ICT innovation. Second, this study is unique in its use of first- and second-order barriers, within the change theory literature (e.g., Fullan, 2007) as a theoretical framework to identify and explain the challenges faced by teachers trying to implement a CLP into their teaching practice. This study gives voice to teachers. It generates a set of actionable recommendations that support change facilitators in the adoption and implementation of an educational innovation by focusing on teachers’ changing roles in a CLP. Third, this research assists in the development and refinement of models, concepts, and theoretical explanations that helps to clarifying the phenomena that occurs in the adoption and implementation process of an educational innovation.

Recommendations for Adopting and Implementing a CLP

This study contributes to the current body of research on adopting and implementing educational innovations. It was initially influenced by three dominant theoretical frameworks:
(a) Hall and Hord’s (2007) adopting and implementing change using the concern-based adoption model through identifying teachers’ levels of use and stages of concern, (b) Roger’s (2003) adopter categorization model, and (c) Fullan’s (2007) barriers to educational change.

The results of this study suggest five recommendations to support teachers in fully implementing a CLP into their teaching practice. First, it would be helpful for stakeholders to address the self-imposed pressure felt by teachers trying to implement a CLP by understanding the effects of teachers’ intrinsic and extrinsic motivation (Lens & Van den Broeck, 2008), and teachers’ affective goals (Krathwohl, Bloom & Masia, 1964). By addressing this pressure through clearly communicated policies and providing knowledgeable resources to support teachers’ needs and concerns, implementing a CLP by teachers may become less stressful and more productive.

Second, it may be constructive if teacher professional development strategies provided a menu of opportunities that included formal and informal job-embedded learning strategies that are more responsive and immediate than traditional forms of TPD, i.e., technology-facilitated learning and school-based initiatives, in order to connect technological knowledge with pedagogical and content knowledge. By connecting technological, pedagogical and content knowledge, teachers may better understand how laptop technology fits into their past, present, and future teaching and learning initiatives, and align their beliefs about teaching practice and student learning with the vision and goals of the CLP. The focus of TPD should be on teaching and learning, rather than on technology, as teachers have the support for most of their technology questions, but little support for their questions about learning to teach with laptop technology. A key to this recommendation, however, is the need for ongoing, personalized, just-in-time TPD, rather than a one-size-fits-all model. For example, classroom management issues were directly
related to the student distractions resulting from the laptops. Most frequently cited distractions resulted from social networking sites (e.g., MSN, Facebook, gaming, and MySpace). Providing teachers with knowledge that connects social networking to their course-specific curriculum and teaching practice may allow teachers to engage more fully in integrating laptops into relevant teaching practice that relate to students’ real-life situations. This may also decrease the level of student distractions caused by the laptops.

Third, initial policy brainstorming, documentation, and implementation could be shared among all stakeholders, and include benchmarks of success. Clear dissemination and ongoing communication in all phases of policy-making and revision processes are then essential for unified understanding by the implementers (in this case the teachers). For example, all sources of data revealed that revising CLP policy was rarely attended to. Given the rapidly changing nature of the technology (both hardware and software) within a laptop program, ongoing reviews and revisions would be essential in order to accommodate the changes. For example, when the CLP was first introduced, social networking was not widely used; however, that is not the case today and CLP policy should reflect these changes if teachers are to better understand their role in the implementation process. Addressing all phases of policy-making may also assist in attending to the conflict teachers have between quality of use and quantity of use for integrating laptop technology in teaching practice. It may also be important to eliminate the notion of complete implementation in this context and replace it with a definition that clearly communicates the fact that ongoing implementation that incorporates benchmarks of success is attainable, rather than standards that indicate reaching status quo.

Fourth, administrators may need to budget for more regular replacement or upgrading of hardware and software for both students and teachers. As well, individual teacher requests for
Peripheral CLP support could be a larger priority than ensuring sameness between departments. Some departments may have teachers implementing a CLP more innovatively than teachers in another department.

Finally, by adopting an implementation model that is fluid, continuous and addresses elements affecting a teacher’s role in a compulsory laptop program (policy, intrinsic and extrinsic motivation, concerns and barriers, uses, learning experiences, and TPD support), a more inclusive, realistic method for explaining what occurs when teachers try to implement a CLP in their school and classroom is possible.

Limitations of Study

It is important to understand the limitations to this study. Both qualitative and quantitative data were collected for this study, however, the qualitative case study data were the primary focus of the research. The limitations of this study include the type of educational institutions that were the focus, the online survey, the assumptions made for this study, and the generalizability of the case study findings to other implementation efforts surrounding a planned change initiative.

The study was limited to independent schools in Canada that have compulsory laptop programs. Independent schools are the focus of this study since they were the first Grade 9 to 12 educational institutions to adopt and implement laptop programs in Canada. The study, in part, focused on teachers’ stages of concern about and their levels of use of the innovation. It did not distinguish between the differences in implementing a CLP among specific subject areas (e.g., music, geography, history, math, science, art).

In the online survey, the number of schools and participants, and the response rate meant that no analysis beyond descriptive statistics could be performed. In order to promote a high
return rate the instrument constructed was adapted and shortened. By omitting certain sections from the CBAM’s LoU and SoC measurements, it is possible that respondents’ category placements were slightly altered. Although the return rate (32%) was higher than average (Mertons, 2005), it was still quite low. The survey may have been too lengthy and perceived by participants as taking too much time to complete, which may have affected the rate of responses.

Finally, this study was not intended to be generalized to other innovations. The focus of the study was on qualitative and quantitative data at one school setting and educational context. The results may, however, offer direction to stakeholders trying to adopt and implement other similar educational innovations.

Future Research Possibilities

The significance, recommendations and limitations of this study may be addressed by the following future research possibilities and extensions: (a) determine the strengths of a CLP in terms of curriculum, (b) conduct a large-scale longitudinal study on CLPs in order to generalize the findings, (c) conduct a study that determines the effects on student achievement, especially for those teachers who require empirical data in order to change their teaching practice, (d) study the implications that subjects have on implementing a CLP into classroom practices, (e) focus on the effects leadership has on CLP implementation, and (f) study the possibility of large-scale diffusion of a CLP into other educational systems in Canada.

Ultimately, this research attempts to explain the process of adopting and implementing a mandated school-wide planned change initiative (the CLP) from the teachers’ perspectives by focusing on the beliefs, behaviours, and perceptions of those responsible for translating CLP policy into classroom-based reality.
Glossary of Acronyms and Terms

ACOT  Apple classrooms of tomorrow

**Adopter Categorization Model** A classification system used to identify when teachers decide to use the innovation.

Asynchronous  Communication that does not require time or place constraints.

**Benchmarks** Qualitative points of reference to measure behaviours that are based on a formative assessment for learning.

CBAM  Concerns-based adoption model

**Classroom configurations** The various placements and groupings of hardware, desks, teachers, and students.

CLP  Compulsory laptop program

GIS  Geographic information system

GPS  Global positioning system

ICT  Information communication technology

**Implementation** The activities, behaviours and feelings groups or individuals have in attempting to meet the vision and goals of policy. Four levels include adoption, initial, partial and complete implementation.

**Implementation gap** The difference between strategies conceived by administrators and the awareness of these strategies by teachers.

LMS  Learning management system

LoU  Levels of Use

MSN  Multiple subscriber number

SDT  Self-determination theory

SoC  Stages of Concern

**Standards** A set of tasks to be mastered. They are quantitative and use a summative evaluative process to determine whether or not expectations have been achieved.
**Teachers’ beliefs** Teachers’ personal philosophy about pedagogy when teaching in a compulsory laptop program. They are teachers’ concepts about what effective pedagogy, curriculum and learning are. This can include an intrinsic philosophy that is reflected in their practices.

**Technology/Laptop integration** Embedding technology (both hardware and software applications) into pedagogy, curriculum content and student learning in meaningful and productive ways through both teacher and student use.

**Classroom Configurations** The various placements and groupings of hardware, desks, teachers, and students.

**TPD** Teacher professional development

**Ubiquitous** Technology that is omnipresent; it seems to be everywhere.

**WWP** Wireless writing project
References


APPENDICES

Appendix A

ONLINE TEACHER SURVEY

Teachers’ Responses to the Adoption and Implementation of Compulsory Laptop Programs

INSTRUCTIONS

This survey is divided into six parts.

The questions in this survey can be answered by using your computer mouse to select the appropriate response.

Your responses to this survey cannot be saved. If you need to exit the document before completing the survey you can either scroll to the end of it and submit the unfinished document or return to the survey and complete the questions at a later time.

The educational innovation referred to in this survey is the laptop program at your school.

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Part A: Facilitators and Barriers to Using the Innovation

1. Please indicate the extent to which you think the following statements about resources would facilitate the use of laptops in your teaching. Use the 1 to 5 point scale described below.

   1 = Strongly Agree
   2 = Agree
   3 = Don’t Know
   4 = Disagree
   5 = Strongly Disagree

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<th>More exposure to examples where faculty has successfully integrated laptops into teaching.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>More opportunities to discuss with colleagues the use of laptops for my teaching.</th>
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<th>Statement</th>
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<td>More exposure to curriculum and pedagogy that integrates laptops into my teaching.</td>
<td>1 2 3 4 5</td>
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<td>d)</td>
<td>More opportunities to collaborate with other faculty and/or support staff regarding the use of laptops for my teaching.</td>
<td>1 2 3 4 5</td>
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<td>e)</td>
<td>More professional development opportunities.</td>
<td>1 2 3 4 5</td>
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<td>f)</td>
<td>More time to attend professional development opportunities.</td>
<td>1 2 3 4 5</td>
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<td>g)</td>
<td>More time to change the curriculum to better incorporate laptops into my teaching.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>h)</td>
<td>More access to hardware.</td>
<td>1 2 3 4 5</td>
</tr>
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<td>i)</td>
<td>Better physical classroom structures that support the use of teaching with laptops (e.g., Internet connections, electrical outlets, classroom configurations, etc.).</td>
<td>1 2 3 4 5</td>
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<td>j)</td>
<td>More variety in software.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>k)</td>
<td>More reliable technology.</td>
<td>1 2 3 4 5</td>
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<td>l)</td>
<td>More funding for equipment (e.g., printer)</td>
<td>1 2 3 4 5</td>
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<tr>
<td>m)</td>
<td>More funding for laptop related projects.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>n)</td>
<td>More technical support.</td>
<td>1 2 3 4 5</td>
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<td>o)</td>
<td>A clear description of the range of choices for the integration of laptops into teaching.</td>
<td>1 2 3 4 5</td>
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<td>p)</td>
<td>More compelling reasons to incorporate laptops into teaching.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>q)</td>
<td>A clearly conceived strategy that links the use of laptops for teaching to student achievement and outcomes.</td>
<td>1 2 3 4 5</td>
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2. Please indicate the extent to which you think the following statements about leadership facilitate the use of laptops in your teaching. Use the 1 to 5 point scale described below.

1 = Strongly Agree
2 = Agree
3 = Don’t Know
4 = Disagree
5 = Strongly Disagree
a) There is visible support from the highest levels of administration.  

1 2 3 4 5

b) Decision-making regarding the use of laptops in teaching is shared among faculty.  

1 2 3 4 5

c) Leaders in this school provide moral support by promoting an atmosphere of caring and trust among staff.  

1 2 3 4 5

d) Leaders in this school encourage me to pursue my own goals for professional learning.  

1 2 3 4 5

e) Leaders in this school encourage me to try new practices consistent with my own interests.  

1 2 3 4 5

f) Leaders at this school have high expectations for us as professionals.  

1 2 3 4 5

g) Leadership in the school is shared among staff.  

1 2 3 4 5

h) Decision-making regarding the use of laptops in teaching is shared among faculty.  

1 2 3 4 5

3. Please indicate the extent to which you think the following statements about decision-making relate to your school, using the 1 to 5 point scale described below.

1 = Strongly Agree  
2 = Agree  
3 = Don’t Know  
4 = Disagree  
5 = Strongly Disagree

a) Our school goal(s) and priorities encourage improvement of the laptop program.  

b) Our school’s vision fosters commitment to continuous learning by our teachers.  

c) In our school, school policies are frequently reviewed.  

d) School policies influence my curriculum decisions.  

e) I know what our school’s laptop policy is.  

f) As a school, we work toward consensus in determining which initiatives can be implemented.  

g) Teachers in this school have the information they need to participate in school policy-making.  

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Our school policies are revised to meet changing needs of students and the community.

Our school finds the right balance between attempting too much and too little change.

Our school policies encourage implementation of new teaching practice.

In our school, there is a regular review and, if necessary, revision of school policies.

I am encouraged to develop action plans for improving our own professional growth.

Our school introduces new programs only when there is a clear implementation plan.

4. Do you feel pressure to use the laptop in your teaching practices?  
   □ Yes  □ No

5. From whom do you feel pressure to use the laptops in your teaching practices? Select all that apply.
   □ No one
   □ Administration
   □ Students
   □ Other teachers
   □ Parents
   □ Self
   □ Other (Please specify)

Part B: Teacher Professional Development Related to the Innovation

Sources:
6. Please indicate the extent to which following statements about professional development relate to you. Use the 1 to 5 point scale described below.

1 = Strongly Agree  
2 = Agree  
3 = Don’t Know  
4 = Disagree  
5 = Strongly Disagree

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>Scale</th>
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<tbody>
<tr>
<td>a</td>
<td>I am encouraged to attend conferences during the school year.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>b</td>
<td>I am supported financially to attend professional development activities.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>c</td>
<td>Professional development activities I attend about technology are effective.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>d</td>
<td>I have implemented a technology idea I learned at a workshop immediately with my class.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>e</td>
<td>An effective mentor is essential to my success in the laptop program.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>f</td>
<td>My colleagues give me good ideas for teaching in the laptop program.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>g</td>
<td>Teachers in my school meet regularly to discuss the laptop program.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>h</td>
<td>I feel isolated in planning my laptop program.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>i</td>
<td>I feel isolated when teaching with laptops.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>j</td>
<td>I feel part of a larger community because of my involvement in the laptop program.</td>
<td>1 2 3 4 5</td>
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<tr>
<td>k</td>
<td>I have shared my experiences with the laptop program to a group of people.</td>
<td>1 2 3 4 5</td>
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7. Over the past year approximately how many days have you spent attending formal training sessions regarding the use of laptops for teaching?

- None
- 1 day or less
- 2-5 days
- 6-10 days
- 11 or more days
8. What was the timeframe for most of the professional development sessions you attended over this past year? (Select the one answer that best applies)
   - Does not apply
   - 1 – 3 hours
   - Full day
   - Institutes (more than one day)
   - On-going
   - Other (Please specify)

9. When are most of your professional development opportunities provided? (Select the one answer that best applies)
   - Does not apply
   - During school hours
   - After school hours
   - On the weekends
   - In the summer
   - Other (Please specify)

10. Over the past year, approximately how many days have you spent on your own learning to use laptops for teaching?
    - None
    - 1 day or less
    - 2-5 days
    - 6-10 days
    - 11 or more days

11. How often do you participate in informal (spontaneous and unplanned) conversations about using the laptops in your teaching?
    - Never
    - A few times a year
    - Monthly
    - Weekly
    - Daily

12. How often do you participate in formal meetings about using the laptops in your teaching?
13. Please give examples of the most effective professional development activities you have been involved in? Why were they so effective?

14. Please give examples of the least effective professional development activities you have been involved in? Why were they not effective?

15. What type of professional development activities would you like to be involved with in the future? Why?

**Part C: Uses of the Educational Innovation**

16. Please read the following eight descriptions and select the one statement that best characterizes your overall use of the laptops.

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<tr>
<td>a)</td>
<td>I have little or no knowledge of the laptop program, no involvement with it, and I am doing nothing toward becoming involved.</td>
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<tr>
<td>b)</td>
<td>I am seeking or acquiring information about the laptop program.</td>
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<td>c)</td>
<td>I am preparing for the first use of laptops in my teaching.</td>
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<td>d)</td>
<td>I focus most effort on the short-term, day-to-day use of the laptops with little time for reflection. My effort is primarily directed toward mastering tasks required to use the laptops.</td>
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<td>e)</td>
<td>I feel comfortable using laptops in teaching. However, I am putting forth little effort and thought to improve the laptop program or its consequences.</td>
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18 Sources:
f) I vary the use of laptops in teaching to increase the expected benefits within the classroom. I am working on using the laptops to maximize the effects with my students.

g) I am combining my own efforts with related activities of other teachers and colleagues to achieve impact in the classroom.

h) I reevaluate the quality of use of laptops in teaching, seek major modifications of or alternatives to the laptop program, present the innovation to achieve increased impact, examine new developments in the field, and explore new goals for myself and my school.

17. Please read the following six descriptions and select the one statement that best describes where you are in the adoption of technology.

| Stage 1: | I am aware that technology exists but have not used it. I am anxious about the prospect of using laptops. |
| Stage 2: | I am currently trying to learn the basics. I am sometimes frustrated using laptops. I lack confidence when using laptops. |
| Stage 3: | I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful. |
| Stage 4: | I am gaining a sense of confidence in using the laptop for specific tasks. I am starting to feel comfortable using the laptop. |
| Stage 5: | I think about the laptop as a tool to help me and am no longer concerned about it as technology. I can use it in many applications and as an instructional aid. |
| Stage 6: | I can apply what I know about technology in the classroom. I am able to use it as an instructional tool and integrate it into the curriculum. |

18. In your use of laptops, do you consider yourself to be a:

- Nonuser
- Novice
- Intermediate
- Old hand (Experienced)
- Past user

19. Please select the response that best describes on average how often you use the laptops for the following technology in your teaching.
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<tr>
<td>a) Presentation software (e.g., PowerPoint, SmartBoard)</td>
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<td>b) Word processing (e.g., Microsoft Word)</td>
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<td>c) Spreadsheets (e.g., Microsoft Excel, Fathom)</td>
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<td>d) Internet as a course resource</td>
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<td>e) Web course pages (e.g., WebCT)</td>
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<td>f) Email</td>
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<td>g) Specific software programs (e.g., subject-specific software, CDROMS)</td>
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<td>h) Chats or discussion</td>
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<tr>
<td>i) Videoconferencing</td>
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<tr>
<td>j) Other (Please specify)</td>
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**Part D: Teachers’ Concerns about the Educational Innovation**

The following statements represent different types of concerns about the laptop program. Using the 0 to 7 point scale provided, please respond to the items in terms of your present concerns. If an item is not relevant to you, please choose “0”.

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<tbody>
<tr>
<td>0 Irrelevant</td>
<td>1 Not true of me</td>
<td>2 Somewhat true of me now</td>
<td>3 Very true of me now</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<tr>
<td>20. I am concerned about students’ attitudes toward this laptop program.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. I know of innovations, other than the laptop program, that might work better.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. I would like to help other faculty in their use of laptops in their programs.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. I have a very limited knowledge about the laptop program.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<th></th>
<th>Statement</th>
<th>Score</th>
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<tbody>
<tr>
<td>24.</td>
<td>I am concerned about conflict between my interests and my responsibilities in the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>25.</td>
<td>I would like to develop working relationships with both our faculty and outside faculty who are using laptops.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>26.</td>
<td>I am concerned about how the laptop program affects students.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>27.</td>
<td>I am not concerned about the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>28.</td>
<td>I would like to discuss the possibility of using the laptops in my teaching.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>29.</td>
<td>I am concerned about my inability to manage all the requirements associated with the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>30.</td>
<td>I would like to familiarize other departments or persons with the progress of this laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>31.</td>
<td>I am concerned about evaluating my use of laptops impact students.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>32.</td>
<td>I am completely occupied with things other than the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>33.</td>
<td>I would like to modify our use of the laptop program based on the experiences of our students.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>34.</td>
<td>I would like to excite my students about their part in the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>35.</td>
<td>I am concerned about my time spent working with nonacademic problems related to the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>36.</td>
<td>I would like to coordinate my efforts with others to maximize the effects of the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>37.</td>
<td>I would like to have more information on time and energy commitments required by the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>38.</td>
<td>I would like to know what other faculty are doing with the laptops.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>39.</td>
<td>At this time, I am not interested in learning about the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>40.</td>
<td>I would like to determine how to supplement, enhance, or replace the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>41.</td>
<td>I would like to use feedback from students to change the laptop program.</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td></td>
<td>I would like to know how my role will change when I am using the laptops for teaching.</td>
<td></td>
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<tr>
<td>---</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coordination of tasks and people is taking too much of my time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I would like to know how this innovation is better than what we have now or had before.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Please describe any other concerns you have about the laptop program.</td>
<td></td>
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**Part E – Background Information**

46. **Gender:**
- [ ] Male
- [ ] Female

47. **Age:**
- [ ] 20-29
- [ ] 30-39
- [ ] 40-49
- [ ] 50-59
- [ ] 60 or older

48. **Work status:**
- [ ] Full-time
- [ ] Part-time

49. **Total years you have been teaching:**
- [ ] Less than 1 year
- [ ] 2-5 years
- [ ] 6-10 years
- [ ] 11 or more years

50. **Number of years at your present school:**

---

51. In what grade do you teach with laptops most frequently?
   - Grade 9
   - Grade 10
   - Grade 11
   - Grade 12

52. Number of years you have taught in a laptop program:
   - Less than 1 year
   - 1-2 years
   - 3-4 years
   - 5 or over

53. What courses do you teach? (Select all that apply)
   - Mathematics
   - Physical Education
   - Science
   - Health
   - English
   - Music
   - History
   - Arts
   - Geography
   - Civics
   - French
   - Other(s) (please specify)

54. Do you think the laptop program should be continued?
   - Yes
   - No

Please click the submit button below to submit the data.

THANK YOU
Appendix B

LETTER OF INFORMATION AND CONSENT FORM FOR ONLINE SURVEY

Title: Teachers’ Responses to the Adoption and Implementation of Compulsory Laptop Programs

My name is Nancy Dalgarno and I am a Ph.D. Candidate at Queen’s University at Kingston. I am writing to request your participation in research aimed at studying the adoption and implementation of laptop programs in independent schools. The ultimate goal of this research is to support teachers, administrators, and change facilitators in planned change initiatives involving educational innovations. This research has been cleared by the Queen’s University General Research Ethics Board.

In this part of the research, I wish to document the views of teachers about their concerns about laptop programs, their uses of the laptops, their professional development practices, and their use of school policy documents. Your insights are invaluable in this research and I invite you to participate in the study by completing this online survey.

The survey should take approximately 35 minutes to complete. Your participation is entirely voluntary and you are not obliged to answer any questions you find objectionable. No information collected will identify you or be reported to anyone who is in authority over you. You are free to withdraw from completing the survey at any time by closing your browser. Your participation in this study and all information you provide are completely confidential. This research may result in presentations and publications of various types including journal articles, newsletters, books, and instructional materials for schools. Your name will not be attached to any form of the data that you provide; thus your name will not be known to anyone analyzing the data, nor will it appear in any publication created as a result of this research.

There are no known or anticipated risks associated with your participation in this study. The website is programmed to collect responses on the survey items alone, and will not collect any information that could potentially identify you. Additionally, none of the information collected will be transmitted to me until you select the submit button. The data collected from this study will be accessed only by the researcher and will be maintained on a password-protected computer database. As well, the data will be electronically archived after completion of the study and maintained indefinitely. If the data are made available to other researchers for secondary analysis, your identity will never be disclosed.

For questions about this survey, or if you would prefer to complete a paper version of this survey, please contact the researcher Nancy Dalgarno at (613) 549-5347 or by email dalgarnn@educ.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.
By clicking on the button "I Understand & Agree" at the bottom of this page I am confirming my agreement to participate in this survey study, and that all my questions have been sufficiently answered. I understand the purposes and procedures of this study, have been notified that participation is voluntary, and understand that I may withdraw at any point during the study without any consequences to myself. I have also been told the steps that will be taken to ensure confidentiality of all information. Lastly, I have been provided with the appropriate contact information in case of questions, concerns, or complaints about participation in this study.

I encourage you to print and retain a copy of this letter.

I Understand and Agree
Appendix C

Introductory Email to Headmasters & ICT Coordinators for the Online Survey

[Name of Headmaster & ICT Coordinator]
[Name and address of School]

Dear [Name of Headmaster & ICT Coordinator]

My name is Nancy Dalgarno and I am a Ph.D. Candidate at Queen’s University at Kingston. I am writing to request your schools’ participation in research aimed at studying the adoption and implementation of educational innovations (specifically the laptop programs) in independent schools. The purpose of this research is to study a planned change initiative by examining the ways in which classroom teachers’ concerns for and levels of use of an educational ICT innovation informs teacher professional development practices and policies. By focusing on the attitudes, opinions, needs, actions, and behaviours of those responsible for translating innovation policy into classroom-based reality (the classroom teachers) this research aims to generate a set of actionable recommendations that support administrators and change facilitators in the adoption and implementation of an educational innovation.

As part of this research, I am conducting an online survey for teachers (also available in paper form). Your faculty’s insights are invaluable to this research and I would like to invite them to participate in the study by completing the online survey. I am asking for your permission to distribute the URL for the online survey to your faculty members.

The survey should take approximately 35 minutes to complete. Participation is entirely voluntary and there is no obligation to answer any questions that may be objectionable. No information collected will identify individual teachers or your school. Teachers are free to withdraw from completing the survey at any time by closing the browser. Your participation in this study and all information provided are completely confidential. This research may result in presentations and publications of various types including journal articles, newsletters, books, and instructional materials for schools. Names will not be attached to any form of the data that you provide; thus your name will not be known to anyone analyzing the data, nor will it appear in any publication created as a result of this research.

There are no known or anticipated risks associated with participation in this study. The website is programmed to collect responses on the survey items alone, and will not collect any information that could potentially identify participants. Additionally, none of the information collected will be transmitted until the submit button is selected. The data collected from this study will be accessed only by me, the researcher, and will be maintained on a password-protected computer database. As well, the data will be electronically archived after completion of the study and maintained indefinitely.

I look forward to talking with you about this research and the possibility of having your teaching faculty participate in it.

Sincerely,

Nancy Dalgarno
Ph.D. Candidate
Queen’s University, ON, CA    K7L 3N6
Tel: 613-548-8388
Email: dalgarnn@educ.queensu.ca
Appendix D

Letter of Information to Administrators of School Involved in the Case Study

Title: Teachers’ Responses to the Adoption and Implementation of Laptop Programs:

My name is Nancy Dalgarno and I am a Ph.D. Candidate at Queen’s University at Kingston. I am writing to request permission to conduct research in your school. The research aims to study the adoption and implementation of laptop programs in independent schools. The purpose of this research is to study a planned change initiative by examining the ways in which classroom teachers’ concerns for and levels of use of the laptop program informs teacher professional development practices and school policies. By focusing on the attitudes, opinions, needs, actions, and behaviours of those responsible for translating innovation policy into classroom-based reality (the classroom teachers) this research aims to generate a set of recommendations that support administrators and change facilitators in the adoption and implementation of an educational innovation.

As part of this research, I would like to use your school and faculty to collect some of the data. As one of the first schools to adopt and implement a laptop program in Canada, the insights from you and your teaching faculty are invaluable to this research. I have enclosed a fuller two-page description of the proposed research. The research will involve an online survey for teachers (also available in paper format), and no more than 20 individual teacher interviews, 4 administrator interviews, 4 teacher leader interviews, four focus group interviews, and six classroom observations.

I give you my word that the identity of the school, teachers and administrators will not be disclosed in any reports emanating from the research.

If you are interested in arranging for you and your teaching faculty to participate in this study, please respond to me at dalgarnn@educ.queensu.ca. I will only contact you about further participation if your interest is expressed through a return email. I look forward to talking with you about this research and the possibility of having you and your teaching faculty participate in it.

Sincerely,

Nancy Dalgarno
Ph.D. Candidate
Queen’s University, ON, CA
K7L 3N6
Phone: (613) 549-5347
Email: dalgarnn@educ.queensu.ca
LETTER OF INFORMATION FOR INDIVIDUAL INTERVIEWS

Title: Teachers’ Responses to the Adoption and Implementation of an Educational Information and Communication Technology Innovation: A Focus on Teachers’ Concerns, Uses, and Professional Development Practices

I am writing to request your participation in research aimed at studying the adoption and implementation of educational innovations in secondary school programs. The ultimate goal of this research is to support teachers, administrators, and change facilitators in planned change initiatives involving educational innovations. I am a Ph.D. candidate in the Faculty of Education, Queen’s University. This research has been cleared by the Queen’s University General Research Ethics Board and also by your school administration.

In this part of the research, I wish to document the views of teachers and administrators about their concerns of 1-to-1 laptop computer programs, their uses of the laptops, their professional development practices, and their use of policy documents. To do this, I am planning to conduct several individual interviews. I am inviting you to participate in one of these interviews.

The individual interview will be conducted at a time and location that is convenient to you. The interview will be for approximately one hour and will be audio taped. The taped interview will be transcribed, and then the tape will be destroyed. None of the data will contain your name, or the identity of your place of work. The place of work will be identified using general terms only. Data will be secured in a locked office and confidentiality is absolutely guaranteed.

I do not foresee risks in your participation in this research. Your participation is entirely voluntary. You are not obliged to answer any questions you find objectionable, and you are assured that no information collected will be reported to anyone who is in authority over you. You are free to withdraw from the study without reasons at any point, and you may request removal of all or part of your data.

This research may result in publications of various types, including journal articles, professional publications, newsletters, books, and instructional materials for schools. Your name will not be attached to any form of the data that you provide, neither will your name or the identity of your place of work be known to anyone tabulating or analyzing the data, nor will these appear in any publication created as a result of this research. A pseudonym will replace your name on all data that you provide to protect your identity. If the data are made available to other researchers for secondary analysis, your identity will never be disclosed.

If you have any questions about this project, please contact Nancy Dalgarno at (613) 549-5347 or by email dalgarnn@educ.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.

Sincerely,

Nancy Dalgarno
CONSENT FORM FOR INDIVIDUAL INTERVIEWS

For: Nancy Dalgarano of the Faculty of Education, Queen’s University at Kingston

Title: Teachers’ Responses to the Adoption and Implementation of an Educational Information and Communication Technology Innovation: A Focus on Teachers’ Concerns, Uses, and Professional Development Practices

I have read and retained a copy of the letter of information concerning the study, Teachers’ Responses to the Adoption and Implementation of an Educational Information and Communication Technology Innovation: A Focus on Teachers’ Concerns, Uses, and Professional Development Practices, and all questions have been sufficiently answered. I am aware of the purpose and procedures of this study, and I have been informed that the interview will be recorded by audiotape.

I have been notified that participation is voluntary and that I may withdraw at any point during the study without any consequences to myself. I have also been told the steps that will be taken to ensure confidentiality of all information.

I am aware that if I have any questions about this project, I can contact Nancy Dalgarano at (613) 549-5347 or by email dalgarnn@edu.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.

Participant’s Name: ____________________________________________________________

Signature: _________________________________________________________________

Date: ____________________________

Please write your e-mail or postal address at the bottom of this sheet if you wish to receive a copy of the results of this study.
Appendix F

LETTER OF INFORMATION FOR FOCUS GROUPS

Title: Teachers’ Responses to the Adoption and Implementation of Compulsory Laptop Programs

My name is Nancy Dalgarno and I am a Ph.D. Candidate at Queen’s University at Kingston. I am writing to request your schools’ participation in research aimed at studying the adoption and implementation of laptop programs in independent schools. The ultimate goal of this research is to support administrators and change facilitators in planned change initiatives involving educational innovations. This research has been cleared by the Queen’s University General Research Ethics Board and also by your administration.

In this part of the research, I wish to document teachers concerns about laptop programs, their uses of the laptops, their professional development practices, and their use of policy documents. To do this, I am planning to conduct several group interviews. I am inviting you to participate in one of these interviews. These interviews, called focus group interviews, will involve about 4 to 8 teachers.

The focus group interview will be conducted at a time that is convenient to all who are being invited. The location will be neutral. I will lead the focus group, it will take approximately one and a half hours, and it will be audio taped. In addition, my faculty supervisor, Dr. Lynda Colgan, will be the notetaker will take notes to make a written record of the sequence of questions and answers. These notes will be written up by me and maintained as a computer file. The taped interview will be transcribed, and then the tape will be destroyed. None of the data will contain your name, or the identity of your place of work. The place of work will be identified using general terms only. Data will be secured in a locked office and confidentiality is absolutely guaranteed. Participants should not discuss the contents of the focus group with anyone outside of the focus group for the sake of confidentiality.

I do not foresee risks in your participation in this research. Your participation is entirely voluntary. You are not obliged to answer any questions you find objectionable, and you are assured that no information collected will be reported to anyone who is in authority over you. You are free to withdraw from the study without reasons at any point, and you may request removal of all or part of your data.

This research may result in publications of various types, including journal articles, professional publications, newsletters, books, and instructional materials for schools. Your name will not be attached to any form of the data that you provide, neither will your name or the identity of your place of work be known to anyone tabulating or analyzing the data, nor will these appear in any publication created as a result of this research. A pseudonym will replace your name on all data that you provide to protect your identity. If the data are made available to other researchers for secondary analysis, your identity will never be disclosed.

If you have any questions about this project, please contact Nancy Dalgarno at (613) 549-5347 or by email dalgarnn@educ.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.

Sincerely,

Nancy Dalgarno
CONSENT FORM FOR FOCUS GROUPS

I have read and retained a copy of the letter of information, provided by Nancy Dalgarno, concerning the study, *Teachers’ Responses to the Adoption and Implementation Laptop Programs: A Focus on Teachers’ Concerns, Uses, and Professional Development Practices*, and all questions have been sufficiently answered. I am aware of the purpose and procedures of this study, and I have been informed that the focus group interview will be recorded by audiotape.

I have been notified that participation is voluntary and that I may withdraw at any point during the study without any consequences to myself. I have also been told the steps that will be taken to ensure confidentiality of all information.

I am aware that if I have any questions about this project, I can contact Nancy Dalgarno at (613) 549-5347 or by email dalgarnn@educ.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.

Participant’s Name: ____________________________________________________________

Signature: ____________________________________________________________________

Date: ________________________________________________________________________

Please write your e-mail or postal address at the bottom of this sheet if you wish to receive a copy of the results of this study.
Appendix G

Follow-up E-mail Interview

Dear [Insert Name],

I hope this email finds you well and enjoying the first half of the school year. I am well into writing my dissertation and I hope to have a first draft completed by early December. I would, again, like to thank you for all your assistance with my research. I thoroughly enjoyed talking with you about the laptop program.

As the data I collected was quite a while ago, I have a few follow-up questions I would like to ask you. I am hoping you would be willing to take a few minutes to respond to the questions below. They are straightforward and wouldn’t take more than five minutes of your time. I realize how precious time is in your environment, but I would be very appreciative if you could email me your responses to the questions below.

Thank you so much for helping me with my work. I will be sure to contact you when the final product is complete.

Yours sincerely,

Nancy Dalgarno
Ph.D. Candidate
Queen’s University
Email: ndalgarno@sympatico.ca; dalgarnn@educ.queensu.ca

Follow-up Questions
1. Are you using the laptops any differently in your teaching practices now than you were three years ago? If so, how?
2. What new concerns do you have about the laptop program which developed within the past three years?
3. How have the mandated requirements changed in the past three years, if at all (e.g., WebCT standards, MarkBook, Attendance Program)? If so, do you agree with them?
4. Do you put pressure on yourself to use the laptops in your teaching practice?
5. In the past three years, have you or your administration evaluated the use of laptops in your teaching practices? If so, how?
6. Have you been involved in making laptop policies within the past three years? If so, how?
7. Have you been involved in revising policies within the past three years? If so, how?
8. Have you been involved in effective professional development activities that deal specifically with integrating laptops into your teaching practices? If so, please describe the activities.
LETTER OF INFORMATION FOR CLASSROOM OBSERVATIONS OF TEACHERS

Title: Teachers’ Responses to the Adoption and Implementation of Compulsory Laptop Programs

My name is Nancy Dalgarno and I am a Ph.D. Candidate at Queen’s University at Kingston. I am writing to request your participation in research aimed at studying the adoption and implementation of laptop programs in independent schools. The ultimate goal of this research is to support teachers, administrators, and change facilitators in planned change initiatives involving educational innovations. This research has been cleared by the Queen’s University General Research Ethics Board and also by your school administration.

In this part of the research, I wish to document the use of laptops. To do this, I am planning to conduct classroom observations. I am inviting you to participate in one of these observations.

The classroom observations will be conducted at a time that is convenient to you and your students. The observation will be for the duration of three lessons. I will write field notes during the observations; they will then be written up and maintained as a computer file. None of the data will contain your name or the identity of your place of work. The place of work will be identified using general terms only. Data will be secured in a locked office and confidentiality is absolutely guaranteed.

I do not foresee risks in your participation in this research. Your participation is entirely voluntary. You are not obliged to answer any questions you find objectionable, and you are assured that no information collected will be reported to anyone who is in authority over you. You are free to withdraw from the study without reasons at any point, and you may request removal of all or part of your data.

This research may result in publications of various types, including journal articles, professional publications, newsletters, books, and instructional materials for schools. Your name will not be attached to any form of the data that you provide, neither will your name or the identity of your place of work be known to anyone tabulating or analyzing the data, nor will these appear in any publication created as a result of this research. A pseudonym will replace your name on all data that you provide to protect your identity. If the data are made available to other researchers for secondary analysis, your identity will never be disclosed.

If you have any questions about this project, please contact Nancy Dalgarno at (613) 549-5347 or by email dalgarnn@educ.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.

Sincerely,

Nancy Dalgarno
CONSENT FORM FOR CLASSROOM OBSERVATIONS OF TEACHERS

I have read and retained a copy of the letter of information, provided by Nancy Dalgarno, concerning the study, *Teachers’ Responses to the Adoption and Implementation of Laptop Programs: A Focus on Teachers’ Concerns, Uses, and Professional Development Practices*, and all questions have been sufficiently answered. I am aware of the purpose and procedures of this study, and I have been informed that the classroom observations will involve written field notes.

I have been notified that participation is voluntary and that I may withdraw at any point during the study without any consequences to myself. I have also been told the steps that will be taken to ensure confidentiality of all information.

I am aware that if I have any questions about this project, I can contact Nancy Dalgarno at (613) 549-5347 or by email dalgarnn@educ.queensu.ca, or her supervisor, Dr. Lynda Colgan at (613) 533-6000 ext. 77675 or email at colganl@educ.queensu.ca. For questions, concerns or complaints about the research ethics of this study, contact the Dean of the Faculty of Education, Dr. Rosa Bruno-Jofré, (613) 533-6210, or the Chair of the Queen’s University General Research Ethics Board, Dr. Joan Stevenson, (613) 533-6081.

Participant’s Name:  

Signature:  

Date:  

Please write your e-mail or postal address at the bottom of this sheet if you wish to receive a copy of the results of this study.