Tech Team Technology Support Model and New Technology Adoption at Calgary Girls' School

by

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A Thesis Submitted to the School of Education and Technology in Partial Fulfillment of the Requirements for the Degree of

Master of Arts
In
Learning and Technology

Royal Roads University, Victoria British Columbia

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September, 2015

COMMITTEE APPROVAL

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Abstract

Technology use and adoption in innovative ways is a challenge facing users in today's work and learning environments. Having physical access to technology is not the simple solution to fully integrated use of that technology. This research asks the question: How will a proposed *TechTeam* technology support model impact new technology adoption by Calgary Girls' School in 2014-2015? This qualitative study used an exploratory case study approach with respondents that included students, staff, and administrators. Fifteen semi-structured interviews were conducted covering topics such as how respondents learned new technology, who they asked for help with technology problems, and what attitudes they had towards trying new technology. Students and staff were also given the opportunity to participate in an anonymous online survey, which asked respondents to share their experience with technology at Calgary Girls' School. A total of 17 respondents completed the single question online survey. Interview responses supported the *TechTeam* support model as having a positive impact on their technology use and adoption of new technology during the 2014-2015 school year. Respondents' views were mixed, however, on whether perceived ease of use and perceived usefulness of a tech tool affected adoption of new technology. Time and digital literacy were themes that emerged through both the semi-structured interviews as well as survey feedback. This thesis concludes that easy to access collegial technology (tech) support based on the Community of Practice theoretical framework positively contributes to technology use at the Calgary Girls' School.

Acknowledgements

Dr. Siomonn Pulla:

Thank you for your early interest in my research, for guiding me in asking the right questions, pushing me to think deeply, and for seeing so many possibilities.

Dr. Deborah Zornes:

Thank you for your encouragement, verbose feedback, and your willingness to be part of this wild ride. Your attention to detail pushed me to want the same, particularly with learning APA citations!

Dr. Marguerite Koole:

Thank you for your detailed evaluation of this study. Your comments and encouragement will be the seeds of future research.

Ric Sack:

Thank you for your friendship and for sharing this journey. Thank you for being an Excel wizard and designing a way for me too deeply analyze the data. I look forward to returning the favor.

Calgary Girls' School:

Dianne McBeth, Superintendent. Thank you for the opportunity to conduct this research at CGS and for your willingness to share organizational resources that were critical to the success of this study.

Judi Hadden, Principal. Thank you for the many hours of discussion and brainstorming that precipitated my research question. Your support has been foundational to the success of this study.

Staff and students who made this research project possible. Thank you for living in the struggle of learning and technology.

My Family:

Lara, the love of my life. You have been through it all with me, and encouraged me to never let my dreams go. I love you forever. To my children, Andre, Jonathan and Shyla, thank you for supporting my dream through the many days when time was the most valuable and elusive commodity. I love you all. To my Mom and Dad, family and friends who have been interested in and supported this research. You have been gracious when studies took a front seat; I'm so fortunate to have you all in my life.

My Creator:

Thank You for giving me the curiosity and opportunity to think, dream, and never stop learning.

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Chapter 1: Introduction

Change and innovation can play a significant role in how we learn and adapt (Bates & Poole, 2003). Key factors regarding how we respond to change include: personal stress (Vakola & Nikolaou, 2005), attitudes towards change (Legris, Ingham, & Collerette, 2003), timeline of the change process (Isabella, 1990), and how that change is implemented (Jones, Jimmieson, & Griffiths, 2005). Innovation, by its very nature, requires change, and technology plays a critical role in the creation of competitive innovation (Dodgson, Gann, & Salter, 2006). Whether in business, school, or personal life, how change is implemented may affect our adoption of new environments or technology.

This study focused on technology integration in a grades four to nine all girls' public charter school in Calgary, and how different models of implementation practice may affect and impact adoption and use of the new technology. My research asked the following question: "How will a proposed *TechTeam* technology support model impact new technology adoption by Calgary Girls' School in 2014-2015?" The sub questions that were asked to support and illuminate answers to the main question were;

1. What is the perceived usefulness of the Learning Management System (LMS) at Calgary Girls' School as measured by the TAM model?
2. What is the role of school administration in technology implementation decisions, and how does this impact technology adoption and integration? and
3. What is the perceived level of engagement with technology of *TechTeam* members, both teachers and students, and how does this influence the adoption and use of technology?

As the research study progressed, these sub-questions shaped the following questions asked during the semi-structured interviews;

1. Does more timely response to questions of a *tech support* or *helpdesk* nature support faster integration and adoption of new technology?
2. Does peer technology assistance allow for the user of the technology to have a greater degree of comfort in both sharing their question as well as asking for assistance in the first place?

Since 2002 I have worked full time as a Systems and Network Administrator in Kindergarten to Grade 12 (K-12) education, in both private and public institutions. I have been involved with numerous technology implementations. From my experience, little thought was given to pedagogy, or how specific software might be used to tangibly impact learning. I was also largely unconcerned with user adoption of technical resources that I was making available. Over the last few years, however, I have become increasingly focused on how the technology that I support is adopted and used to further the goals of the Calgary Girls' School (CGS). This new focus resulted from seeing low adoption rates and significant resistance to using the new technology solution on the part of many users. Significant resources of both money and human effort are consumed each school year to enhance the learning environment for both students and teachers. New technology that is not adopted successfully will not make the anticipated impact on learning, and therefore is a cause of considerable concern to all stakeholders (e.g., school board, teachers, administration, students, etc.). The simple availability of hardware resources and infrastructure may not guarantee 'actual usage' on a daily basis (Ma, Andersson, & Streith, 2005, p.388). Research studying technology integration in places such as Singapore and Australia (Hew & Bush, 2006; Pegrum, Oakley, & Faulkner, 2013) has shown that government mandated changes to educational curriculum and technology use also plays a role in the adoption of technology.

This research studied the impact of collegial technology support on teacher and student adoption of technology, and in particular, how the exploration of the *TechGirls/Techsperts* support model at CGS can add to our understanding of how peer support for students impacted their adoption of technology. The *TechGirls (*also called *Techsperts)* support team mimics the *TechTeam* model and is comprised of students who provide tech support for fellow students as well as teachers. The study also looked at how the daily use of the Apple iPad by grade four and five students was supported by the *TechTeam* and *TechGirls* model. My research adds to the present understanding of mobile technology and its integration, a topic where little research currently exists (Pegrum et al., 2013). It was hoped that this study could also provide a better understanding of how readily available peer led tech support could support the adoption of technology in learning spaces. If there are findings that support the use of this collegial model, there may be application to further study and a positive impact on future tech support model development.

The Calgary Girls' School Technology Infrastructure

Calgary Girls' School is a public charter school that offers education to its students on two separate campuses. The Bel Aire campus houses students in grades four and five; and the Lakeview campus provides education to girls in grades six through nine. Notable differences between these campuses are the technologies that are deployed. Students at the Bel Aire campus are provided Apple iPads in a 1-1 model. Students at the Lakeview campus are provided with Apple MacBook Air computers. CGS IT Services staff manages both the iOS and Mac OS platforms. Applications (Apps) for the iPad are provided by CGS for student use. A software image created and maintained by CGS is provided to all students using Apple laptop computers. Calgary Girls' School manages both of these platform images for the sake of consistency and

application availability to all students and teachers. Students at the Bel Aire campus are trained to assist with support of iPad (iOS 8.x) specific programs and students at the Lakeview campus are trained to support applications running on Mac laptops running the OS X 10.9.x operating system.

Definition of Terms

- Communities of Practice - "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2011, p.1).
- Perceived Ease of Use - Ease of use was defined in this study as "the degree to which the prospective user expected computer technology to be free of effort" (Davis, Bagozzi, & Warshaw, 1989, p.985).
- Perceived usefulness - defined in this study as "the prospective user's subjective probability that using computer technology would increase his or her job performance within the school context" (Davis et al., 1989, p.984).
- Technology Acceptance Model (TAM) - "Davis proposed that system use is a response that can be explained or predicted by user motivation, which in turn is directly influenced by an external stimulus consisting of the actual system's features and capabilities" (Chuttur, 2009, p.1).
- TechTeam – a technical support team comprised of teachers from each grade level.
- TechGirls – a technical support team comprised of one or two students from each grade homeroom.
- Techsperts – a technical support team comprised of one or two students from each grade homeroom

Chapter 2: Literature Review

As dependence on technology and its adoption in both corporate and educational environments grows, the need for a clear understanding of factors affecting successful adoption has also increased. The literature reviewed shows that through government mandates or organizational goals, technology adoption is a reality in many environments (Pegrum et al., 2013; Dodgson et al., 2006). Pegrum et al. (2013) for example, found that governments are realizing the need to educate "digitally literate, technologically able" graduates who will be ready for a worldwide information economy (p.66). This literature also supports the idea that only when implemented technology is adopted and used regularly, will expected gains or improvements be seen (Oliviera & Martins, 2011;Yi, Jackson, Park, & Probst, 2006). Successful planning of technology use and implementation is also shown to positively impact adoption. This includes long range planning and including teachers in IT policy planning (Vanderlinde & van Braak, 2010; Kanuka, Smith, & Kelland, 2013; Tondeur, Kershaw, Vanderlinde, & Van Braak, 2013).

Necessity for Technology Implementation and Adoption

Technology adoption has been studied through various research lenses, such as "(1) perceived benefits; (2) technology and organizational readiness; and (3) environmental and external pressure" (Oliviera & Martins, 2010, p.1339).

Information technology (IT) often referred to as information and communications technology (ICT) is an essential tool in ensuring a nation's competitive economy. Oliviera and Martins (2011) argue that this competitive edge however, can only be realized when IT systems and technology are widely used and adopted. Yi et al. (2006) agree, adding that the expected

benefits from investment in IT can only be realized when the technology is "adopted by their intended users and subsequently used" (p.350). Understanding and then creating the conditions and environment to support this successful adoption of technology is increasingly important (Yi et al., 2006).

Preparing people/students for a competitive work environment is also important. Yi et al. (2006) note, "the factors that have been identified as important here should be actively managed and manipulated to fully realize the expected benefits from the investment in IT" (p.361). These factors, such as the value of a user's propensity to experiment with IT and using highly innovative users to test and spearhead new technology, need to be examined by those planning new technology implementations.

Decision Making Practices in Technology Implementation Planning

How decisions are made, who is involved at the decision making table, and the different groups or stakeholders considered for their input when making these decisions are important contributing factors to the successful integration and adoption of technology. Vanderlinde and van Braak (2010) have researched what factors contribute to successful information and communication technology (ICT) planning. They found that the IT policy plan was ultimately an iterative process, constantly being reevaluated; particularly as technology change is ongoing. These researchers also found that IT policy planning was strongly related to the development of organizational vision, and the planning process needed to be collaborative, with all teachers involved (p.545).

In their research on philosophies of technology and teaching, Kanuka et al. (2013) posit that administrators and decision makers must consider each of the major philosophies of how technology impacts education. They found that it is unlikely that true consensus will ever be

reached on the *impact and purpose* of technology within the sphere of higher education. This reality seems to provide additional support for Tondeur et al. (2013) who found that teachers who were involved in the technology planning process were more likely to use technology in innovative ways.

Research continues to strongly support the inclusion of a variety of stakeholders to contribute to decision-making in IT integration and IT planning overall. Bates (2011) argues that while the role of IT professionals remains critical, "increasingly this role is being shared with end users, such as faculty and administrators" (p. 124). Vanderlinde and van Braak (2010, p.544) report that when teachers are at the planning table, there is a positive association with educational innovation, and in fact call it a "crucial condition" for fostering large and innovative educational programs and an important factor in ICT integration. Tondeur et al. (2013) also found that teachers involved in decision-making were more likely to apply the technology innovatively.

The Role of Administrators in Technology Implementation and Adoption

Administrators play an important role in deciding the direction of technology implementation and adoption. Building on the literature relating to the philosophy of technology use (Ferre, 1995; Feenberg, 1999, 2002; Dahlberg, 2004; Dusek, 2006; Kanuka, 200; Kanuka et al., 2013) suggest three main philosophical orientations to technology: (1) uses determination; (2) social determination; and (3) technological determination. Uses determination looks at technology as neutral tools which when used, allow the user to extend their capacity. Social determination focuses on how technology is embedded in social culture, therefore concerned with how technology and social use may shape technology use in learning spaces. Finally, technology determination views technology as causal to learning itself.

Yi et al. (2006) found that if administrators and top managers were committed to new technology and its innovative use, their example positively impacted the ease of use beliefs of others. Therefore it can be argued that it is crucial that leaders, whether key administrators, principals, or IT professionals play a role in positively influencing perceived usefulness of new technology.

Technology Implementation and Adoption in Schools

Studies suggest that a key reason why ICT adoption and integration is important in schools is because governments are mandating it to be part of the curriculum (Hew & Bush, 2006). Singapore for example, began their initial "Master plan for Information Technology in Education" in 1997. In that year, the cost of the plan was reported to be approximately 1.2 billion dollars (p. 224). All Singapore schools were expected to "…acquire and integrate technology in their curriculum in order to develop in students a culture of thinking, lifelong learning, and social responsibility" (p.224). A second Master plan was unveiled by the government of Singapore in July, 2002 to continue this goal in the Singapore education system. Australia also provides examples of government authored technology integration plans (Pegrum et al., 2013). A 2.4 billion dollar "Digital Education Revolution" which was linked to the new Australian curriculum was designed to "promote Information and Communication Technologies (ICTs)" in Australian schools (p. 66). In their study of mobile devices and learning, Pegrum et al. (2013) cite studies that have shown outcomes that suggest an improvement in communication and potential for better teaching models (Herrick, 2011) as well as improved learning with the support of quality teaching and "…purposeful and effective use of ICT" (Department of Education and Early Childhood Development, n.d.). This is explored in greater depth later in this paper.

The literature looking at new technology implementation in schools agrees that technology is changing rapidly. Baytak, Tarman, and Ayas (2011) note that "the history of the last decade is also evidence that technological tools are changing dramatically and therefore technology integration in classroom essentially changes as well" (p.140). The Horizon Report (2011) agrees strongly with this perspective, reporting "Internet-capable mobile devices will outnumber computers within the next year" (Johnson, Adams, & Haywood, 2011, p.12). A collaborative effort between the New Media Consortium and EDUCAUSE Learning Initiative (ELI), the Horizon Report notes that emerging technologies that will likely impact K-12 education. The report is read in over 160 countries (NMC Horizon, 2015).

Technology, and mobile technology specifically, allows for learning to take place out of static, traditional environments. Challenging the traditional assumption of learning happening at fixed times and places, Looi et al. (2010) and Pegrum (2013) found that with the diffusion of technology and mobility, the notion of a learning space has radically changed. Learning is no longer constrained by specific times of day or classroom locations. According to Looi et al. (2010) "with the mobile technologies at hand, students can learn seamlessly—both in classroom and out of classroom…" (p.156-157).

The successful adoption of technology in education is critical to its use and potential to aid in learning. However, Pegrum (2013) noted a number of significant issues tied to failure or problematic adoption. Staff, including teachers, were found to be "overwhelmed and unprepared" when faced with adoption opportunities and expectations (p.75). Pedagogy that was not inclusive of technology, and had not been modified to include it, was also a significant finding (Keengwe, 2008; Pegrum, 2013). Another variable that was found to be relevant was the general lack of time those teachers reported having to embrace new technologies; this in turn

made professional development (PD) opportunities to embrace new technologies difficult.

Kopcha (2012, p.1109) identified five key barriers that teachers face that make technology adoption problematic: access; vision; beliefs; time; and professional development. In the Mueller, Wood, Willoughby, Ross, and Specht (2008) study of factors that affect full or partial integration of technology, educators were the focus of interest. The reason for this investigation was because it was "…educators that have the primary contact with students and it is educators that experience the barriers and supports to integration of technology first-hand" (p.1524). The conclusions of this study showed that computer experience variables such as frequency of use and comfort with technology were contributing factors with teachers who were successful integrators of technology. Specific positive experiences with technology also played an important role. Mueller et al. (2008) for example, found that teachers needed to see that an innovation had the potential to "improve learning or instruction" before willingly endorsing its use (p. 1532).

The literature ultimately shows there is a connection between how many barriers are faced by teachers and their decision to infuse technology in their teaching (Mueller et al., 2008; Inan and Lowther, 2010; Kopcha, 2012).

Successful Adoption of New Technology in Schools

Student learning should be the focus of any attempt to adopt technology. Sanchez-Garcia, Marcos, GuanLin, and Escribano (2013) in their study of 85 teachers who participated in in-service sessions, found that both mentoring and peer collaboration played a role in the positive use of technology in teaching. They posit that technologies are "…becoming crucial tools for teaching because they improve students' performance and motivation" (p.529).

Past research has supported a number of communication strategies for managers or

administrators when it comes to encouraging the use of new technologies successfully. Among them is research by Im, Kim, and Han (2008), which supports communication differences based on the degree of perceived risk of the specific technology. For example, if a technology needs to be deployed and adopted that is perceived as risky, emphasizing its "ease of use" could be effective. Alternatively, when a technology is perceived to be low risk by potential users, administration and management should focus on the "usefulness" of the technology (p.7).

Although these results are from a study looking at the adoption of a Hotel Information System (HIS), these results and implications are applicable to the study conducted. We learn that the length of time from technical difficulty to receiving continuous feedback, encouragement and support from either a manager or colleague played a significant role in how quickly new technology was both adopted and accepted. (Huh, Kim, & Law, 2009).

In addition to the speed of technical support and positive feedback, focus on the overarching philosophy of the organization where technology adoption is occurring must be a mix of philosophical and technical intention. There needs to be a clear understanding why technology is adopted and used instead of simply focusing on what to do with the technology (Keengwe et al., 2008). Yi et al. (2006) report that when a school leadership team understands user intention, appropriate organizational intervention for what teachers need to successfully adopt technology can then be provided.

Perceived behavioral control is another important concept in this review. The Huh, Kim, and Law (2009) study defined this concept by decomposing it into two dimensions: self-efficacy; and technical support. Both of these concepts and variables of interest will be studied in greater depth in this thesis. Martocchio and Dulebohn (1994) define self-efficacy as "the judgments an individual makes about his/her capability to mobilize the motivation, cognitive resources, and

course of action needed to orchestrate future performance on a specific task" (p.357). Technical support was defined as "the assistance of the information system department…and availability of network of support" (Hu et al., 2009, p.124). Huh et al. (2009) looked beyond IT or IS personnel solely, and suggest "knowledgeable peers, superiors and support personnel" (p.124). The concept of *knowledgeable peers* in support of the adoption of technology, however, is an identified gap in the current available research examined as part of this thesis.

Quality Tech Support. The idea of quality tech support is also the subject of previous research (Vanderlinde and van Braak, 2010). Tech support was found to be a necessary part of the school environment for teachers to successfully implement and use technology. Going a critical step further, they add "…ICT support further needs to be understood as a form of pedagogical support that teachers require when integrating ICT into their classroom"(p.545).

Although their study took place a number of years ago, the operationalization of *quality ITC support* is a relevant construct to the present study. Quality ITC support was operationalized by Dexter, Anderson, and Ronnkvist (2002) as consisting of:

> (1) access to one-on-one personal guidance and help; (2) frequent teacher participation in technology-oriented professional support among teacher peers; (3) professional development content focused on instruction and integration; and (4) access to resources (p. 265).

Fuller (2000) used an "in-house" technology expert to provide in-person tech support to both students and teachers in the school environment. This person's ongoing support would work at reducing *technical uncertainties* of how the technology worked (p.514). Buabeng-Andoh (2012) agrees with this concept, adding that the better the technical support given to teachers, the more time they can spend integrating technology into their teaching and not

troubleshooting hardware problems in their classrooms.

Teacher, Students, and Technology Integration

The question of what responsibility teachers have in the daily use of technology in their classrooms and teaching draws from numerous results from previous research. Faculty preparedness and training is key to successful experiences for both students and teachers. Baytak et al. (2011), for example, found that teachers who were not trained adequately for the available technology might experience a distancing from their students who are often more familiar and adept with the technology. Sanchez-Garcia et al. (2013, p.530) concur, finding that it was critical for teachers to *interiorize* their technical skills so that they could move quickly to a high level of technical knowledge.

Fuller (2000) found increased computer usage by students in environments where teachers and the ICT coordinator were in collaboration, where technical expertise and the teacher's pedagogical expertise complemented each other.

Research is critical of the effective use of technology by teachers (Aldunate & Nussbaum, 2013; Tondeur et al., 2013). Teacher attitudes play an important role in how technology adoption and integration success are measured (Keengwe, Onchwari, & Wachira, 2008). Tondeur et al. (2013, p.443) acknowledge the key role that attitude plays, citing teacher attitude toward technology as one of three clear results of past research. The role of the school as well as how a teacher progresses in technology use are the remaining two roles.

Keengwe et al. (2008) argue for complexity in technology integration as a phenomenon. One must understand teacher "motivations, perceptions, and beliefs about learning and technology" (p.560). Tondeur et al. (2013, p.436) ultimately find that these complex factors are "insufficient" to answer the question of why the majority of teachers have not demonstrated a

successful integration of technology into their practice.

Current literature regarding student experience and expectations of technology integration at school has been limited (Baytak et al., 2011). There are some studies that have looked at technology topics such as computer vs. pen-based testing (Lim, Ong, Wilder-Smith, & Seet, 2006), and the perceptions of undergraduate and graduate students to computers in their life (İşman, Çağlar, Dabaj, Altınay, & Altınay, 2004). I was not, however, able to find any relevant literature that looks at how well students might adopt and integrate technology into their learning when being supported by their peers or teachers who are a part of a collaborative technical support team.

Baytak et al. (2011) studied students who were part of a technology club. It can be extrapolated that the students in this study integrated the game and animation design software they were given well, but as the authors point out, the students participating in the study were already "good at technology use" (p.139).

Students see technology and connectivity as a means to share their learning and experiences. Baytak et al. (2011) also found that the student subjects in their study were largely cognizant of the balance needed when integrating technology into their learning. Student experience is similar to those of adult subjects in previous research in that as the technology changes, their experience also changes (p.148). This is a critical gap in the research and one that the proposed study will address; in particular, the effect collegial tech support might have on the experience of new technology and its adoption. Theoretical Framework: Technology Acceptance Model (TAM), Community of Practice (COP), and SAMR (Substitution, Augmentation, Modification, Redefinition)

Researchers acknowledge the many user acceptance models and theories to choose from

when engaging in user adoption research (Venkatesh, Morris, Davis, & Davis, 2003). Oliviera, Martins, and Lisboa (2011) highlight these succinctly:

> The most used theories are the technology acceptance model (TAM) (Davis 1986; Davis, 1989; Davis et al., 1989) theory of planned behaviour (TPB) (Ajzen 1985; Ajzen, 1991), unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), DOI (Rogers, 1995) and the TOE framework (Tornatzky and Fleischer, 1990, p.110).

Oliviera et al. (2011) found that the TAM helped to inform the study of technology adoption at an "individual level", which in their review was one of only two models to do so, along with the TPB and the UTUAT (p.110). The Technology Acceptance Model (TAM) is a useful and relevant theoretical framework for this study. Davis (1985) proposed that technology use can be explained and predicted by *user motivation* or attitude. This attitude may be influenced by two factors; perceived usefulness of the technology and the perceived ease of use of the technology. Davis (1985) hypothesized that perceived ease of use has a direct affect or influence on perceived usefulness (Chuttur, 2009, p.2). Ma et al. (2005) suggest that the Technology Acceptance Model was designed to explain individual technology acceptance and adoption decisions across a wide range of organization contexts, technologies and user populations (p.388). This helped frame the research to focus on students and teachers in elementary and middle school. Using the TAM as a theoretical framework allowed me to look through its lens at how users make the decision to try new technologies. How useful and easy a technology is, for example, were important factors considered as part of my document analysis and when constructing and conducting interview questions.

The Technology Acceptance Model (TAM) was originally conceived by Davis, (1985) and has been widely used since then, in iterative versions, to study acceptance behavior within a

broad range of IT and ICT environments (Huh et al., 2009). The foundation of the TAM hypothesized how behavioral intention (BI) was affected by three main variables: 1) *perceived ease of use*, (PEU) which was conceptualized as "the degree to which a person believes that use of a particular system would be free of effort", 2) *perceived usefulness* (PU) described as the "…degree to which a person believes that use of a particular system would enhance his/her job performance" (Huh et al., 2009, p.122); and 3) *system usage* (SU) is determined by *behavior intention* which can in turn be determined by PEU and PU *(Yi* et al., 2006). Criticisms of the original model have led to improvements and iterative versions (Venkatesh et al., 2003; Lopez-Nicolas, Molina-Castillo, & Bouwman, 2008). Lopez-Nicolas et al. (2008) found that the technology being used in the study and being measured by TAM had a "significant moderating effect on user behavior" (p.360).

At its very foundation, the current research wishes to discover how successful technology integration and adoption can occur generally, and specifically, with the support of a *TechTeam* support model in an all-girls elementary and middle school. Behavioral intention is a key concept and influencing variable in decisions to adopt technology. There has been support for a strong behavioral and attitudinal component to adoption. A goal of the *TechTeam* support model in the current study, and a foundational element of perceived usefulness is to lead in building support for the belief among all users that the technology being offered is better than the current practice or what is currently in place (Yi et al., 2006). Having variables such as perceived usefulness, perceived ease of use, and system usage as part of the underlying framework for this research allows respondents' experiences with those variables to be carefully examined. The pervasive use of technology at CGS as well as frequent additions to technology tools have provided an environment rich in user experiences to explore.

A Community of Practice is a theoretical framework that is also an excellent fit for this study. A Community of Practice is a term coined by Lave and Wenger (1991) to put forward the idea that learning is a largely social process and does not take place in isolation. More recently, Wenger et al. (2002) has further explored this concept of learning taking place by social participation. An individual would be an active participant in social communities, and by doing so would begin to construct an identity through this interaction. A shared identity can be created through participation in a community of practice. In the rapidly changing field of information technology, the individual learner may not be able to master the technical skills required. However, through a "collective knowledge" found in a community of practice, members can learn at a more achievable pace (Wenger et al., 2002, p.14). This idea fits very naturally with the learning communities at Calgary Girls' School (CGS). As a Charter public school offering single sex education for girls in Alberta, CGS intentionally focuses learning opportunities in groups and collaborative communities or cohorts. This is a focus for both students, who work with their cohorts in grade teams, and also for staff, who work closely on a day-to-day basis with colleagues from their grade level teams.

Communities of Practice are not a new way or means of learning. Coined by Lave and Wenger (1991), a COP is defined as "… groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (p.1). Communities of practice are further operationalized by three main characteristics (Wenger, 2011, p.1):

(1) The domain, or "shared domain of interest" gives the community its identity. Commitment to this domain and the shared competencies of members are implied and foundational;

(2) The community, where "members engage in joint activities and discussions, help each

other, and share information"; and

(3) The practice, where members are "practitioners" Shared resources are developed, including ways to address recurring problems.

Interestingly, Cox (2005) who compared four seminal works on Communities of Practice, summarizes three of those works as viewing CoP as primarily a way of socializing newcomers to a formal group or topic into knowledge by way of apprenticeship. This is in contrast to the fourth work by Brown and Duguid (1991) who viewed CoP as focused on improvising new knowledge in a group that forms in resistance to management.

Criticisms of CoP come as the concept evolves and more environments employ its learning potential. Wenger et al. (2002) note the more negative aspects of communities of practice including issues such as hoarding knowledge, limiting innovation, and holding members hostage to their expertise. Wenger et al. (2002) also acknowledge that community members may "fail to connect enough to develop trust" (p.56). They go on to say "The intimacy communities develop can create a barrier to newcomers, a blinder to new ideas, or a reluctance to critique each other (p.56). Roberts (2006) argues that the very things that make the CoP an ideal structure for learning also tend to hold it "hostage to its history and achievements" (p.626). Another potential weakness is the CoP may be applied in a great number of different organizational settings, opening opportunity for inappropriate environments for application. Roberts (2006) refers specifically to small and medium sized businesses, where the resources required to *cultivate* communities of practice may not be available, and as such may not be appropriate environments for CoP. Very small organizations tend to form communities spontaneously, and large organizations often have the resources to support the cultivation of communities of practice (Roberts, 2006).

SAMR, the work of Puentedura, (2012) is comprised of a 4-rung ladder model of technical sophistication in teaching and learning. As one uses technical tools to teach or learn, how that technology is integrated and harnessed to assist in the learning process becomes more innovative. At the substitution level, one might substitute a technology tool in place of a non-technical solution, but it is simply that, a substitution. On the fourth rung of this ladder, redefinition, "…tech allows for the creation of tasks previously inconceivable" (p.14). The SAMR model is an excellent theoretical framework for this research as teachers had been given professional development by Dr. Puentedura and others on how SAMR can provide a roadmap for more innovative and adoptive us of technology at Calgary Girls' School.

The *TechTeam* support model, which is a main feature of the current study, is populated with members of class grade teams, themselves functioning as a community of practice. As this review has shown, teachers helping teachers has met with success. As Pegrum et al. (2013) found, this might specifically include encouraging teachers to "tap into professional communities of practice" (p.71).

Summary

My review of the existing literature suggests that significant barriers to adoption include: an instructor's technical ability; their confidence with technology; and their understanding of how to use the technology effectively in their teaching (Aldunate and Nussbaum, 2013; Tondeur et al., 2013). Instructor attitudes towards the use of new technology (Keengwe et al., 2008), and how they received support to adopt the technology were also key barriers to adoption highlighted by the literature (Buabeng-Andoh, 2012).

Behavioral intention, attitudes towards technology, and the availability of focused planning and technical support have all been shown to be factors in both adoption success and

failure. What is also clearly evident is that my current research fills a gap in previous studies to date. Primarily, the unique focus of the study, the impact of a *TechTeam* technology support on new technology adoption by Calgary Girls' School, adds to our current understanding on the impact of collegial tech support on teachers and students. The unique addition of the *TechGirls* support model in the current study adds to our understanding of how peer support for students impacts their adoption of technology. This model was not found in previous research. The study also adds to the present understanding of mobile technology and its integration, a topic where little research currently exists (Pegrum et al., 2013). This research also provides and contributes to insights on student experience and their expectations of technology integration at school.

Chapter 3: Methodology

Every potential researcher looking at undertaking serious research must face the decision of what underlying methodology to employ. Qualitative research approaches are incredibly "diverse, complex and nuanced" (Braun & Clarke, 2006). It is this reality itself that drew me to a qualitative approach for this study. Technology integration and the many factors that appear to be involved in successful adoption create an inviting climate for a qualitative methodology.

In a qualitative study research design should be a "reflexive process" (Maxwell, 2009, p.214). This process fit nicely with the goals of this study, which were to understand student and staff adoption and integration of technology in learning spaces. An exploratory case study approach was used to guide the research. Creswell (2014) suggests a case study approach can be used to explore single or multiple cases to learn how people address a "specific issue" (p.30). The specific issue being explored in this study is the adoption of technology through a case study of the Calgary Girls' School *TechTeam* and *TechGirl/Techspert* model. Yin (2014) defines the case study as "investigating a contemporary phenomenon in its real world context" (p.2). Yin goes on to add that a case study can include single or multiple cases. The case study approach was a good fit for this study in that it supported the study of a particular approach to technology support, the *TechTeam* and *TechGirl/Techspert* model. Equally important, it allowed for the study to look at this model in the distinctive environment of an all-girls school. Data collection included semi-structured interviews with 15 interview subjects. I paid particular attention to documenting the individual experiences of the participants. This was done by making a digital audio recording of each interview as it transpired, allowing me to be more fully engaged in the conversation with the interviewee instead of worrying about taking notes to capture their

responses. This study design allowed for deeper and more meaningful responses and subsequent analysis of those responses.

Research Sample

Participants were selected by a purposeful random sample. Due to the size limitation of 15 interview participants, the participant group was selected as follows: Invitations to participate were emailed sent to each teacher via the CGS All Staff email distribution group. This was done to ensure that all staff received the invitation email at the same time, giving each staff member as equal access as possible to respond with interest if they chose to do so. The invitation email was sent out on Friday, December 5, 2015 at 8:25am. The first five staff members that responded were chosen to participate. Acknowledgement emails were sent to each of the first 5 staff respondents immediately upon receiving their email responses. An email was also sent to the CGS All Staff distribution list once I received the five staff respondent emails. This email thanked the staff for their consideration and support of the research study, and acknowledged that staff interviewee spots had been filled. The Superintendent and Principal were also asked to participate in the interview portion of the study. Once all five staff and two administrator participants were chosen, I emailed each of them individually to set up interview schedules that worked with their teaching schedules. In coordinating this with the Principal, guidance was given to arrange interviews with teachers either before or after school, or during one of their teaching prep periods.

Student participants were chosen by grade level random draw. To achieve this, the Senior Administrative secretary at the Lakeview Campus randomly drew numbers cut from uniform pieces of paper. Each piece of paper was numbered. Numbers ranged from one to the highest number of students in that particular class. Once the number was chosen, it was matched

with the number of the student, and listed alphabetically in a grade list in spreadsheet form. Once all six grade level potential interview participants were randomly chosen, two more numbers were randomly drawn to represent the *TechGirls* at the Lakeview campus, and the *Techsperts* at the Bel Air campus. Once all eight-student participants were randomly chosen, their parents or guardians were contacted by email. I did not notify the students chosen until I received a signed letter of consent from the parent or guardian. The email briefly introduced myself as the researcher and also contained a parental consent form (see Appendix 2). If the participant or their guardian did not wish to be involved, a second random draw was undertaken using the same procedure described previously. Once I received a signed parent consent form, I contacted the student and their homeroom teacher to organize a time for the interview to take place.

The two tech teams comprised of student representatives from each grade level were functionally equal in purpose. The names differ due to the genesis of their origin in time. The *Techsperts* were started two years ago, and the *TechGirls* at the Lakeview campus are in their first year of existence. I felt it critical to distinguish between the two groups using their unique names to ensure that respondents at the two campuses were clear as to whom we were talking about when discussing the two student-led tech support teams.

To ensure anonymity to the greatest degree possible, teacher's teaching assignments as well as student homeroom assignments were not documented. As well, teacher/administrator age was not collected, and was not asked for during the interviews. When respondents were asked how long they had used technology, it was in the context of desktop or laptop computers, tablet devices, or smartphones. Also of interest is participation of more than one grade 4 and 7 student. This is due to random selection of members of the *TechGirls* (Lakeview campus, grade 7

selection) and *Techsperts* (Bel Air campus, grade 4 selection).

Respondent (R)	Homeroom/Role	Years at CGS	Age (Student)	Years Using Tech
R1	Grade 7 Student	4	12	10
R2	Teacher	1	NA	16
R3	Administration	1	NA	20+
R4	Grade 5 Student	2	10	3
R5	Administrator	4	NA	30
R6	Teacher	3	NA	33
R7	Teacher	5	NA	5+
R8	Grade 8 Student	2	13	4
R9	Grade 9 Student	6	15	6
R10	Teacher	2	NA	20
R11	Grade 4 Student	1	9.5	2
R12	Grade 6 Student	3	10	4
R13	Grade 7 Student	3	12	8
R14	Teacher	4	NA	40
R15	Grade 4 Student	.5	9	6

I also invited students and staff of Calgary Girls' School that did not have the opportunity to participate in the semi-structured interviews, to anonymously provide feedback about their experience with technology at CGS. There were a total of 74 respondents that logged in and began the one question open-format survey. 17 respondents completed the survey and their responses are presented within the thematic main question or sub question sections contained in this chapter. To identify survey respondents from interview respondents, I will refer to them as SR#.

Data Collection Methods

The problem of technology adoption can be seen and experienced in organizations of varying size and focus. Having the opportunity to be a participant observer in a school with 612 students and 50 staff afforded a unique and invaluable view of technology adoption from numerous perspectives. Research subjects varied in age, gender, familiarity with technology, and motivation to use new technology.

Data was collected from three main sources: semi-structured interviews; an anonymous 'suggestion box' online survey consisting of one question; and an analysis of organizational

documents. Relevant documents such as Administrative Procedures (AP), both past and present were examined and analyzed.

Semi-structured interviews (see Appendix 1) were conducted with a sample of the student and staff subjects (Vanderlinde, Van Braak, & Dexter, 2012). Interviews took place on the campuses of Calgary Girls' School where I interviewed each subject individually. Each interview was recorded digitally using a MacBook Pro and Blue Snowball high-density digital microphone. After each interview recording was completed, the interview was stored in a secured, onsite file storage system, which only I had access to.

At the commencement of each interview, the interview candidate was read some introductory paragraphs containing preamble to the interview. This was done to ensure that all necessary instructions were given and ethical considerations were verbalized, such as confidentiality and the opportunity to decline to participate.

This study also gave both teachers and students who were not chosen for the semi-structured interviews the opportunity to anonymously submit their thoughts on technology integration at Calgary Girls' School. These responses were analyzed as part of the thematic analysis process. This was accomplished by setting up a website hosted locally at CGS to gather these responses. Limesurvey version 2.05+ Build 141126 was used. The choice to use this particular survey tool was based on it being Free and Open Source Software (FOSS). It was also chosen because of being highly configurable for future surveys that Calgary Girls' School might want to create. To ensure the highest level of security and privacy possible, this server was built and configured by myself using tools and resources from the IT department of Calgary Girls' School. No other IT staff was given access to user accounts or passwords that would allow access to this server. Access to the survey website hosted on this server was limited to users of

the internal CGS network. This was done to ensure to the greatest degree possible that only Calgary Girls' School students and staff had access to participate in the survey. The survey website was not accessible to the general public, outside of the internal CGS network.

The research sample was comprised of students and staff of the Calgary Girls' School. Students ranged in academic grade level from grade four to grade nine. Staff participants included teachers and administration. Uniquely, this study focused on students in single sex education, namely girls attending a public charter girls' school run under the governance of the Government of Alberta.

Data Analysis Methods

Coding of the study data was initially planned with a tool such as Vanderlinde and van Braak's (2010a) *e-capacity framework*. However, after reading through the interviews, I decided to use a more informal process. Alhojailan (2012) suggests the use of thematic analysis as a comprehensive way to code and interpret qualitative data gathered by observation and interviews. Alhojailan (2012) also asserts "…good qualitative research needs to be able to draw interpretations and be consistent with the data that is collected"(p.40). Braun and Clarke (2006) concur, saying, "Thematic analysis is a method for identifying, analyzing, and reporting patterns [themes] within data" (p.6). Importantly, Braun and Clarke (2006) also add "Thematic analysis can be an essentialist or realist method, which reports experiences, meanings and the reality of participants..." (p.9).

The interviews were completed in three distinct groups. A transcription service was used to transcribe each interview. This was done for accuracy and time efficiency on my part. Transcriptions were completed over a few months between December 19, 2014 and February 15, 2015.

Once the interview data were transcribed, I slowly and methodically read through the transcribed interviews. As I read, I looked for themes in both individual responses within the specific interview, as well as themes that began to emerge between the 15 individual respondents. Once all 15 transcribed interviews were read through once, I listened to each of the 15 interviews in their original audio form. As I listened to the interview in audio format, I had the transcribed interview in front of me. This enabled me to follow along with the transcribed document and to check the accuracy of the original transcription. It also provided an opportunity to note any additional information found in voice inflection and tone as the respondent answered the interview's semi-structured questions. This second pass through the data also allowed me to begin to connect themes between respondents. I used the comment function of Apple *Pages* to note these interconnecting ideas and themes as well as any additional questions that arose that needed further investigation.

I then used a Microsoft Excel spreadsheet to organize my findings from each respondent into the various themes that emerged. A summary of a respondent's answer to each question was organized in columns, with the corresponding questions in rows. This allowed me to categorize some of the responses where possible, and aided in keeping thematic responses organized in a visually clear manner. As I placed respondents' feedback into the columns, I was able to select a dropdown menu in each cell that assigned the response to a theme I had found in pass one and two of the thematic analysis. The analysis tab of the spreadsheet then allowed me to view patterns across all 15 respondents' columns, showing a visual representation of similar responses to a particular question. Although this research is a qualitative case study, seeing the number of thematic responses across the sum of interviewee responses was very helpful in gaining a contextual perspective on a particular interview question.

Document data was analyzed, as it was made available to me. Specifically, this included pertinent Calgary Girls' School administrative procedure policies, both past and present that pertained to technology and its use and integration at CGS. These documents underwent a similar thematic analysis as the interview transcriptions, in an effort to provide context and a deeper understanding of their relevance to this study. Permission to analyze organizational documents like administrative procedures was requested in writing to the Superintendent with permission granted.

Results, once coded and organized were written up and presented with tables and diagrams where appropriate to lend to a helpful understanding for the reader. It is hoped that findings have been presented in an informative way, and that larger implications stemming from the results of this study will be visible and acknowledged with potential future research.

Ethics

Ethical considerations were significant in this study. All study processes to gather information from students, teachers, staff and administration required an ethics review. Ethical guidelines from both Calgary Girls' School as well as Royal Roads University (RRU) Research Ethics Policy were followed. A practice of free and informed consent was followed throughout the research study. For participants under the age of 18, who are considered a vulnerable population, two signatures were required: one from the participant and one from the legal guardian. No data or information would be kept for any participant who wished to withdraw from the study. Participants were invited and were free to contact me at any time during the study if they needed additional information, or if they wished to withdraw from the ongoing research study. There was no exclusion of research participants on the grounds of attributes such as race, age, culture, race, and mental or physical disability. In the case of students, interview

participants were randomly chosen from each grade level and from each *TechGirl/Techspert* team. In the case of staff and administrators, five staff were chosen on a first come volunteer basis, and the final two administrators were invited to participate. Randomly drawn, volunteered or invited participants would only be excluded because of their own personal choice or a lack of parental consent if the participant was a minor.

Conflict of interest for myself as the researcher was not expected but requires explanation. As the Director of Technology at Calgary Girls' School (CGS) I was responsible for the rollout of new technology, both hardware and software throughout the academic year. However, none of the participants of the study were under my direct or indirect supervision. I led a team of technology-focused teachers as a professional development (PD) team only; they reported to the Principal. I did supervise one employee, but he did not participate as a subject in the study. I studied how the *TechTeam* tech support model we introduced impacts the integration and adoption of new technology. The new technology rollouts were carried out as per usual, and training and support was based on the *TechTeam* and *TechGirls/Techsperts* framework. Because these rollouts were a regularly occurring event, how the rollout/training occurred is what was of interest, not if students and teachers/staff *liked* what was being rolled out. For this reason my influence over those participating was expected to be minimal.

Limitations and Delimitations

Time restraints imposed on this study were a limitation. In perfect conditions, this study would be more longitudinal in nature, measuring technology adoption and integration over an entire school year. However, this study needed be conducted over a much shorter timeframe due to the Royal Roads University masters' program schedule of 10 months. Interviews needed to be conducted and analyzed over a few months.

Participants were asked to compare the innovative *TechTeam* support model with experiences they had had with technology deployments in the past. This had the potential to be difficult to report for younger students, particularly in grades four and five. Due to the semi-structured nature of the interview questions, I was able to ask additional questions to younger participants who may have not experienced previous technology implementations in the past. An example was a question such as "how learning technology at home or with friends and family outside of school might compare with your experience at Calgary Girls' School with the support of the *TechTeam* and *Techgirls* program"?

Delimitations were present in the proposed study to aid in its successful completion. A size limitation of 15 interview participants was used to ensure that a thorough qualitative analysis could be completed. Study participants were also limited to a purposeful random sample that included students, teachers, and administrative personnel. Other stakeholders such as parents and board members were not selected in this study as the focus is on adoption of technology within CGS learning spaces. Although a large research sample was at hand within the school community, quantitative methodologies were not used in this study. This decision was made based on the time available for the study (10 months) but more importantly because of the narrative goals of the case study approach. It was a goal of this research to allow each participant to share their story of technology use at CGS. A truly narrative and individual response was a goal of semi-structured interview methodology.

Parent Permission and Consent. As outlined in the *methods* section of this paper, signed parental/guardian permission was required prior to me asking the selected student whether she was interested in participating in the semi-structured interview. Of the eight selected students in the first round of the selection process, students representing grade 4, 6, 7, and the

Bel Air *Techsperts* responded within a week, sending signed parental permission forms to me by either email or hand delivery by the student. The selected student in grade 5 declined to participate. The parents of the selected students in grade 8, 9, and the Lakeview *TechGirls* did not respond to the invitation email within the first week, so a second email invitation was sent to them. The second round of parental invitation emails successfully collected signed parental permissions forms from students in grades 5, 9, and the Lakeview *TechGirls.* The student chosen in grade 8 declined to participate, so a third student in grade 8 was randomly selected and a parental permission invitation was emailed. This third round selection process was successful as a signed parental permission form was returned.

In total, roughly two months elapsed from the time from initial parental invite in round one, sent out on December 9, 2014, until the final parental permission form was returned for the grade 8 student in round three of the parental permission invitation process on February 2, 2015. Even with parental permission through email, the last signed parental permission form was not delivered to me until February 11, 2015. Difficulty in gaining parental permission in a timely manner, either because of the parent or student declined to participate, or time taken for the permission to be delivered to me was not expected. While the semi-structured interviews with students were completed successfully, the extended timeline for completion is worth noting as it extended the research timeline past the proposed data collection end date of January 15, 2015

Chapter 4: Findings

This chapter examines in detail my research on how group and cohort learning at CGS affects the integration and adoption of technology. Technology support is delivered in part through a *TechTeam* comprised of teachers from each grade level (grades four to nine) and *TechGirls/Techsperts* comprised of students representing the same grade levels. I also looked at whether current communities of practice could be identified, and whether they play a role in supporting technology mediated learning opportunities. In addition, this research looked at whether the formation of *TechGirls/Techsperts*, a tech support team for students by students, would develop its own community of practice. Wenger (1998, p.6) adds that for legitimate sharing and knowledge creation to take place in a community of practice, *recognized experts* need to be involved, whether they do much of the actual work or not. I studied how the *TechTeam* members might fulfill this expert role amongst their colleagues in larger groups. This was particularly true for student members (*TechGirls/Techsperts*), who were the *first responders* to technical issues or questions that originated in their homeroom classrooms and learning spaces.

Findings from the 15 semi-structured interviews follow. These data are presented in the order that the questions were given to the interview participants. The questions were grouped in topical themes to aid both the interview participants and myself as the interview proceeded. The sections are divided by main questions, followed by highlights of respondent feedback to the main question and sub questions. I also invited students and staff of Calgary Girls' School that did not have the opportunity to participate in the semi-structured interviews, to anonymously provide feedback about their experience with technology at CGS. There were a total of 74 respondents that logged in and began the one question open-format survey. 17 respondents

completed the survey and their responses are presented within the thematic main question or sub question sections contained in this chapter. To identify survey respondents from interview respondents, I will refer to them as SR#.

Introducing New Technology in Schools

Question One focussed on some general demographic-type questions being asked of the interview participants. Question Two focused on the introduction of new technology into the school, and included sub questions regarding what aspects of technology responders enjoyed; level of comfort in trying new things, and trying new technologies; and respondents' feelings when a new technology is announced and implemented in the school.

Six of the 15 interview respondents noted that the ease that technology afforded them was what they appreciated most. Ease of access to up-to-date online information, good spellchecking, and laptops that easily transported work to and from school were top reasons for three participants. Three other respondents felt that being able to type documents and papers instead of handwriting offered substantial benefits. R2, for example, pointed to the engagement of students with the use of multimedia, particularly by enabling them to become producers of content, not simply consumers. The idea of efficiency emerged in the responses of R4 and R5. Online banking and being able to complete work much faster were offered as examples of improved efficiency. R9 and R15 pointed to how the technology helped in their learning, particularly with the use of iPad apps, both at home and at school.

A total of eight respondents characterized themselves as *risk takers* and *very comfortable* with trying new things, willing to *dive right in* to using new technology. However there were differences for some respondents in how comfortable they were with trying new things, and how comfortable they were with trying new technology. Five of the respondents reported being very

comfortable with new technology and ready to *dive right in*; and two reported being completely comfortable with diving right into new technology, but exercising much more caution and feeling timidity with trying new things in *real life*.

While R9 was reasonably comfortable with trying new technology, she raised what she felt was a critical foundational understanding to use technology successfully:

> I think with technology, you have to be really open-minded because there's always going to be new changes and like new updates and everything. So I mean really technology is not really going to work with you if you aren't keeping an open mind.

A number of respondents also described barriers to using new technology. A fear of breaking the technology or exposing one's self to security holes or issues was expressed by three participants. Another barrier was a lack of adequate instructions to use of the new technology or time to play with and become familiar with its use. An important but unique barrier to using new technology noted by one respondent was the proprietary nature of some technology. R14 expressed a concern that he was hesitant to put in the time required to learn and fully adopt new technology if that technology was changed, taken away, or became cost prohibitive to use based on the price and position taken by the technology maker or software designer.

Respondents were divided as to how they felt when a new technology was announced or implemented in their classroom. Six of the 15 respondents reported that they were excited and ready to *dive right in* when new technology was announced. Among these six, R5, a staff respondent, pointed to the example that must be set. "…I think about what the impact is going to be. But I see myself as a person who needs to try it first because if I go there's a good chance that others will go". R7 responded with positivity, based on how things were working: "Right now, excited because everything seems to be working really easily for us, so quite excited about

anything new that comes our way and how we can use it which is good". R13 and R15 added that there was a feeling of excitement when they had the opportunity to try out new technology.

Two respondents reported feelings of anxiousness and apprehension when they faced new technology. R2 used the analogy of a duck, where everything on the surface appears calm, while under the water, the duck's legs are paddling very fast. R10's apprehension came from the feeling of disruption in the technology that he was currently using. SR7, a teacher, noted being overwhelmed by all of the new technology he or she was expected to use. Along this same theme, R11 reported a feeling that she might wreck or break the technology. She said, "I feel weird from inside like I don't know if I would do it right. Like since when we're doing the library card thing, I couldn't do it so that it could work". And interestingly, R9 pointed to a loss of familiarity when a new technology tool was introduced: "Usually, sometimes it's good, sometimes it's bad. I know when we switched over from Gmail to Outlook, I was like, 'What is going on?' because I was using Gmail since Grade 4 so I was like, 'Oh my goodness'".

Learning New Technologies

Question Three and its sub questions regarding learning new technologies focused on learning styles including whether respondents learned better in a group or individually; aspects that made learning new technologies more difficult; how respondents approached their learning; and whether knowing how the technology works impacted the learning or teaching. This series of questions also asked respondents to identify one aspect of having to learn new technologies that they would change within the school.

Overall, the group was fairly evenly split regarding whether they preferred learning individually or with a group or one-on-one sessions. Eight of 15 respondents reported they preferred learning on their own; and there was commonality in a willingness to explore and try new things as an individual learner. A number of qualifications were made to learning on one's

own however. An example can be seen in the response by R6. "I usually learn better if I'm just plugging away and breaking it until I get to a point where I've broken it so far that I have to seek out some help". R14 often found that he uses different software and technology tools than most other teachers, sort of a "different starting point" than other people. He also cited pragmatic reasons for working on his own, stating that if his goals for technology use are not the same as the group's goals, there would likely be little benefit in working in a group. R15 felt that learning best alone, in a group, or one-on-one (1-1) was situation dependent.

For the four of 15 respondents who preferred working in groups, varied reasons were given. R9 said she obtains knowledge better in a group environment. R12 agreed, saying she finds she can, "…learn off of other people's ideas". R13 reported that group learning allows her to learn the *basics* of a new technology platform or app.

Two respondents said they learn best 1-1. R3 preferred 1-1 learning because she could ask questions as they came up. Help specifically with what she was asking for was important, as too much information was often found to be confusing and not helpful. R2 said he prefers 1-1 initially, at least to provide him with a basic understanding of the technology.

Seven respondents reported that time was a significant factor in how they learned a new software program, or if there were able to learn successfully. Among these seven words like *play*, *read*, *tinker*, and *doodle around* were used to describe how they learned. Of particular importance all required time. R1 reported that in order to learn how to use an art tablet, she "…just messed around with different art programs and I was like 'I know how to do this now. I was good at it, it was fun'". R6 agreed by saying that time and space is required to understand tech at a fundamental level.

"Diving right in" to new software was reported by a third of the respondents. R15, who

was the youngest respondent, reported she was eager to try new apps out on her iPad, but only after knowing for sure that the app has been approved by the IT department or her teacher. A number of respondents varied in their practice of learning new software. Tutorials were an important piece of learning new software for R4. She described that "most of the time she'll <classroom teacher> go up in front of the classroom and she'll usually airplay another student's iPad. And she'll just be like, 'Well, you click here and then I'll give you your password'". R7, a teacher, stated that to learn new software she would typically ask her colleagues first to get their ideas and feedback.

Respondents' answers were divided and diverse when it came to looking at what made learning new software most difficult. Confusion was noted, largely due to having too many steps in instructions or in simply completing a task. R11 noted that *Techsperts* in her classroom were very eager to help, and at times, gave different answers to the same question, or gave differing instructions to help solve the same issue. She was also worried about falling behind in whatever was being learned because she did not know how to use the technology tool.

Three of the interview participants, and four of the survey respondents, reported frustration with technology not working as a major factor making learning new software difficult. *Network lag*, and software platforms such as Filr and Microsoft Outlook not working as intended were cited as significant frustrations. R2 pointed to a feeling of obligation to use specific software (similar to R14), and an obligation to spend the time required to learn the software adequately for daily use. He gave the example of the Learning Management System (LMS) as something he needed to know in order to do his job as a teacher. The Apple TV conversely, was not a necessity to his daily teaching responsibility, so he chose not to spend time learning it. R9 and R6 acknowledged that there was a perceived benefit to software, and that

often the benefits and features of new software were not communicated well. R6 spoke of his own preconceived ideas about what software should do and what he wanted it to do as making learning the software the most challenging. "The thing that makes it most difficult for me to learn software is my own preconceived desires, what I want. I want it to work like this and it doesn't".

Time was again a key factor for five of the respondents. If adequate time was given for learning new software, then R1 described new software as "great". This included the learning curve coming from Microsoft Windows to the Mac operating platform that R1 experienced when she came to the Calgary Girls' School. R4 commented that tech issues often show themselves when you don't have time for them, at the least opportune time.

Twelve of the 15 respondents reported that digital literacy, or understanding how a specific technology works, was important and did help in their teaching or learning. Within these 12 respondents there were diverse examples of how digital literacy impacted them. R4 stated that understanding how Apple Pages handles formatting allowed her to insert and manipulate pictures in text without having to ask a classmate. R6 mentioned a benefit of understanding how a computer works helped him be more patient with technology in general, realizing the complicated tasks being completed. R9 acknowledged how her mother struggled with tasks such as attaching a file to an email, and how that negatively impacted her mom's productivity. R7, a teacher, acknowledged an increased sense of confidence when talking to parents if she understood the technology. "…Talking to parents and students about it, I feel way more comfortable if I know and confident if I know how it all works".

R12 gave a unique response, saying that if you really get to know the technology, you can build a sense of trust with the technology. Other respondents did not mention this sense of

trusting the technology. R10 pointed to the need to have an inquiry-based mindset, where asking lots of questions and freely exploring the technology would allow for a deeper understanding. R11 shared discovering the importance of having a Wi-Fi connection on her iPad shortly after starting Grade 4. "When I know I have network, I can search up such as we were doing like the Social Studies project or something, I could search through that". She went on to say that when waiting at her bus stop, she could not listen to streamed music off the Internet. She finally realized that not having a Wi-Fi connection at the bus stop was why music streaming was not working for her. R3 shared that it is easy to assume that the old way of doing things also applies to how technology works and that is not always true. R5 pointed to the growing use of the *cloud* and the immediacy of access to resources that it provides. She argued that when storing files on a floppy disk, you actually knew where the files went when you pushed save. You could physically see the floppy disk. Saving to the cloud tends to remove that understanding of where the files you save actually live.

R14 offered a unique and deeper perspective on why he thought digital literacy was critical in supporting teaching and learning suggesting that understanding technology is important because it is the infrastructure of our time.

> Not only do you have to understand programming language to some degree, this is to recognize that people are programming and they've made choices for you, they define your role, but also that there's this social economic structure that is driving technology. If you're outside of where that structure moves, you are disenfranchised.

Unlike other respondents, R2 reported that digital literacy was only useful on a very superficial level. Understanding technical details were of no use to him. "Show me how it is a useful teaching tool. Show me how it will make my life easier".

Responses were mixed on the question of techniques used to learn new skills. Four of the 15 respondents reported that they prefer to learn on their own. Four respondents preferred tutorials to best learn new technology skills. R2 noted that tutorials that have been given to staff worked very well for him. R5, R10 and R12 all agreed that tutorials, particularly video screen captures showing exactly how to perform a specific task were most helpful. R5 pointed out the differences are how each person learns, and that simply getting verbal instructions is often ineffective long term as people's memory fails to recall those verbal step-by-step instructions. Video tutorials on the other hand, allow for review when the learner chooses it, and as a result can be a confidence builder.

Time was once again a theme that emerged as respondents answered this question. R9, a student, agreed, that learning tech involved a lot of *playing around* in it. Many of the staff respondents noted the importance of time in learning new tech (R5, R6, R7, R10), but most felt that enough time was not available to fully immerse in learning new tech due to time-restrained obligations as teachers.

Responses were diverse when participants were asked what they would fix in the process of having to learn new technology. R1 pointed out that new technology was typically launched without much instruction or guidance. Tutorials explaining the process in a self-help format would be of great value to her. SR9 and SR10 wholeheartedly agreed. R7 pointed out that launching new technology without a well-communicated plan with best practice examples was not effective for her. R9 noted the value of better communication and tutorials for students and parents alike:

> I know that we have tutorials for LMS and Portfolio, but I think really for not only students but also parents so that parents also know how to get on to the programs and on

to like how to look at the marks and stuff.

R4, a Grade 5 student, proposed an ingenious way of deploying audio tutorials. She imagined that her teacher would hand out small boxes that students could plug in their headphones to. Then, the student could listen to audio instructions of a tutorial covering a specific task.

The need for time to play with and explore technology was a theme in the responses of four of the 15 interviewees regarding this topic. R2 not only wanted to play freely in new software, but be able to do so prior to it being used in a day-to-day school environment. R6 agreed, pointing to the need for technology-focused Professional Development (PD) to be given the same time and focus as current PD in Numeracy and Literacy. R5, one of the Administrators who responded, strongly supported the need for PD.

> If I could, I would have a PD day always to roll it out and allow for the *TechTeam* to work one-to-one in their team that day and allow us all to roll out. If I could do that and whenever we roll something new out, have a PD day.

R10, a staff respondent who is also a member of the staff *TechTeam,* noted the additional pressure of having to learn new software and then very quickly be a resource to teachers. R13 questioned the move from the Google Apps platform in her response to this question. She shared that she felt a perceived loss in functionality. R3's response tied in with R13's loss of functionality and efficiency, and added the idea of integration of a community of practice. R3 said that the level of efficiency in learning new technology was important and needed to be improved at CGS. "I think there has to be some sense of 'I'll teach you, but you please teach someone else.' I think that has to be part of how we learn, part of how we think of that culturally".

R14 shared that he would make it mandatory for students and teachers to learn about the socioeconomic model of technology, as well as some programming. "If you don't see this model, you don't understand why things are shaped as they are".

Technology Adoption

Question Four and its sub question focused on technology adoption and what factors determine how quickly adoption takes place. Three of the 15 respondents acknowledged that time played a factor. There were also three respondents who suggested that level of difficulty affected their adoption of new technology. An interesting area of discussion was with the question of ease of use and perceived usefulness

Considering some of the past responses, it was not surprising to see that *time* was a factor in how quickly technology was adopted. R9, R11, and R12 all highlighted the importance of having adequate time to explore new technology. R11, a Grade 4 respondent, spoke of not wanting to "rush through stuff". Not having enough time to fully explore and play with a new app would make adopting it difficult. R4 brought a unique perspective to this question, alluding to a need for confidence before wholeheartedly adopting new technology. R5 did not share the more cautious approach taken by R4. Instead, she shared that you need to learn it by living in it. "If you don't use the tech, you won't learn the tech".

R8 and R13 noted that the level of difficulty played a role in how fast their adoption of new technology occurred. Figuring out how to use LMS and successfully logging on and uploading content to the Portfolio site were given as examples. R13, for example, used *Scratch*, an introductory programming language, as an example of a technology tool that took a long time to figure out and use proficiently.

This contrasted the viewpoint of R2, who was more interested in a *practical level* of understanding, considering the lack of time and teaching workload that he was under. R14 looked at this question from the perspective of proprietary versus open source software. He shared that if the *outcome* is good, and you have access to the desired software then adoption of the new software will occur.

Five of the 15 respondents debated the perceived ease of use and usefulness of a technology tool, and responses were mixed. R8 responded by agreeing that if the tool was easy to use, it would likely be used, simply for ease of use. R1, a student, thought that ease of use and perceived usefulness was an adoption factor, noting that if a tool was difficult to use, but would be very useful, she was more likely to try and use it.

By contrast, three respondents, all teachers, disagreed and did not support the idea of ease of use and usability. R10 pointed to the need for the tool to be logical, and that it must make sense to what you are trying to accomplish. R14 did not accept the concept of ease of use or usability. R2 did not find this concept of ease of use persuasive in his practice, instead pointing to organizational obligation to use technology. R13 also opposed the idea of ease of use. This 12-year-old student respondent instead said that the more difficult the tech tool was to use, the more eager she was to use it.

Tech Assistance

Question Five looked at where and how respondents sought support if they had questions or concerns regarding technology. Overall, respondents indicated that access to tech support was readily available (10 of 15 interview respondents). Respondents did not always agree on what form technical assistance took for them when they had a technical problem.

For a number of respondents, searching Google for help with a technical problem was

reported to be a first step. This was the case for both student and staff respondents. R3 and R5, both administrators acknowledged that their positions in the organization tended to give them easy if not direct access to IT support. That said, both reported that they typically would ask for help from either students or office staff as a first step. R6 also pointed to the importance of digital literacy in understanding how online search engines work. He noted that using the correct search terms yielded very different results.

R6 and R7, both teachers, shared how valuable their fellow *TechTeam* colleagues were in solving technical issues. R6 shared that he wished that IT staff were able to be in his classroom more regularly. R7 reported that she had very direct access to her *TechTeam* representative. This was a position for student respondents as well. R11, a student, pointed out the fact that her access to the *Techsperts* representative in her class was very close, literally "sitting at the same table". SR1 shared that technology was supported well by accessible tech support. SR2 noted that the IT department specifically tried to ensure that laptops were always in good working order.

Two respondents contrasted the view of immediate or very quick access to tech assistance. R15 reported that she often had to wait to ask for help with her technology, particularly if she was asking her teacher. For R4, a teacher, if assistance was not immediately available for her students, she would have them work on paper until the issue on their iPad was resolved.

All 15 interview respondents reported that they looked to colleagues, classmates or family members for help with technical issues. Diversity was seen as respondents shared who their go-to people were for technical support. A feeling of reticence to ask for help was reported by R1. As her classroom's *TechGirl* representative, she didn't know who she would reach out to

for tech support herself

Six respondents, all either teachers or administrators reported that they used either their students or *TechTeam* representative when needing help with technical problems. R2 shared that students in his class were "born into this technology" and he observed that for the most part they have a "freedom to jump right in, it is part of their lifestyle". R6 agreed finding that his students in the last two years, Grade 8 and then Grade 5, were an enormous help as first line responders to his technical questions.

R7, a Grade 4 teacher, gave a strong example of the helpfulness of students and *Techsperts* in her class, and in particular one *Techspert* member who has pushed the use of technology in this classroom. "…she's so passionate about it that she teaches me a lot of tech stuff. So she's that one student in my class who's really pushed us tech-wise in our class, which is cool".

Two of the grade 4 respondents acknowledged that they had a number of people who they asked for tech support within their classrooms including *Techsperts*, teachers, and then the T*echTeam* rep for Grade 4. R8, R9, R13, and R14 had contrasting perspectives on who they would ask for help in their classroom, often providing a contrast view to the support for the role of *Techsperts* and *TechGirls* in the responses that have been documented thus far. R8 reported she would ask to go directly to the IT department "…because nobody really can help with things that I don't know". She did not see *TechGirls* in her class as able to assist when it came to technical issues. R13 reported she would ask a teacher or friends in her class, stating that she didn't really know who the *TechGirls* in her class were. R9's experience was very similar. She reported that there were no *TechGirls* assigned to her class. She said she relies on her classmates when she needs technical support.

R14 explained that he typically uses programs in his class that he "knows" so his needs for tech support may be different than other teachers or students. He did however acknowledge that students provided "no end" to shortcuts to ease his use of certain programs.

One interesting area of discussion was around the respondents' feelings when technology didn't work. Here, five of the 15 interview respondents suggested they felt frustrated or mad. "Mad. It's my laptop. If it's not going to work it's going to get me annoyed" said one respondent. Another added, "I start freaking out". SR5 and SR6 reported that technology could be liberating and completely frustrating. One respondent acknowledged being frustrated when her device ran out of battery, even though this was an issue of regular operation of the device.

Five of the interview respondents agreed that while technology challenges could cause frustration, they reported that they either attempted to dive in and fix the issue or changed strategies with what technology they were using at the time and moved forward. R15 and R10 took this perspective a step further, reporting a sense of excitement when they faced technical issues. From a teacher/administrator perspective, this arguably *less frustrated* perspective was based on seeing tech as supplementary to teaching (R2) and always having a backup plan (R14), and being energized and focused by going into "solve it, solve it" mode where a workaround was the primary focus (R5).

Time was reported as a critical determinant in what feelings respondents had when they faced technical issues. R6 stated he was often curious and looked at technical issues as an opportunity to learn and explore. Time however was a determining factor:

> If it's a problem or all of a sudden the operating system just ceases to work, I'm pretty tempted to just drop it and pick up a pencil and just say I'm not going to let this suck up time because as I said earlier time is of the essence in schools.

Of interest was R5's additional comment to this question as it challenged the notion of time and immediacy of everything working well:

> We want immediacy. So we want the *TechTeam* to all of a sudden come in and everything's fixed. We want to set new programs going and everything's great. No, let's take time. So when we think about what we do and we give it a year, all of a sudden it's part of practice. But we need to give it time.

14 of the 15 interview respondents reported that they had a process or order of operations when they faced a technical problem. These included *Googling* the problem, checking device or software settings, rebooting the device, asking a friend, asking anyone nearby, and for some, asking a *TechTeam* rep, *TechGirl* or *Techspert*. Each respondent's order was unique.

TechTeam/TechGirls/Techsperts

Question Six looked at how respondents saw how the *TechTeam/TechGirl/ Techspert* support teams may have impacted adoption and use of technology at CGS. Sub-questions asked respondents for examples of the potential impact on platforms such as LMS, Portfolio and Filr.

One third of the interview respondents reported that through the support of the various tech support teams, positive impact on use and adoption of technology had been experienced. R3 offered some very strong acknowledgement of the role that her Tech rep plays in her day-to-day work.

> Sometimes she'll <*TechTeam* rep> come in and I'll say, "I'm having this problem. Here's what I'm doing. Come and give me a clue." So she'll kind of watch me. She'll say, "Why don't you try that?" So it's kind of a tutoring and a coaching right in that moment. Yeah, it's very helpful.

R5, one of the staff respondents pointed to the evolution of the *TechTeam* this year and that

effects she has observed on various grade teams: "I'm seeing a relaxed tendency in the school around when tech doesn't work…what's going to be our plan B, that tells me we now have systems in place that make us feel supported and calm when tech doesn't work". R15's experience was also positive with the *Techsperts* in her class. She shared how they explore new technology and apps and "trail blaze", and then support their classmates in learning to use the technology or new apps. R13 agreed, saying that the *TechGirls* were a perfect fit to teach their classmates some of the simple tricks to using the technology as fully as possible.

Four respondents challenged the notion of positive impact by tech support teams. R2 found the *TechGirls* in his classroom to be largely ineffective. R10 with his role as *Techspert* leader found he used the *Techsperts* in his classroom in more of a supportive role to his own knowledge as opposed to tech leaders in the classroom. R14 reported that he either didn't use the platforms in question, or used tools he knew well enough to not need assistance.

R6 shared a perspective of very young *Techsperts*, particularly in Grade 4. He noted that 9 and 10 year old girls needed support from teachers in how to present the answers to tech questions to their classmates. The *Techsperts* may know how to solve the problem, but sharing the solution effectively with fellow classmates often needed significant support from teachers.

Respondents were largely supportive on whether the *TechTeam/TechGirls/ Techsperts* made learning technology easier. Nine of the 15 respondents pointed to the *TechTeam* and *TechGirls/Techsperts* program as making it easier to learn new tech at CGS. R5 referred to the "touch" of this kind of support program, where team members were able to assist others in a personal way, ensuring that they felt free to ask questions and not "feel stupid" when they ask those questions. She also noted that closing the gap between the best and weakest users of technology was a goal of this type of support model. R13, R8, and R9 all agreed, sharing that

this type of support model had benefitted each of them during this school year. R3 pointed out that she benefitted from this support because the person providing the support was much more of a risk taker or "experimenter". "I think learning any new tool or program or way of thinking or doing a task always works best when there's somebody that can support that".

R6, a teacher pointed to a deeper understanding of the philosophy behind why certain technology platforms are implemented at CGS. As an example, he said "So when we talk about housing Outlook in-house, it doesn't make it easier to use Outlook, but it makes it imperative to use Outlook over Gmail". He noted that the *TechTeam* has helped in his understanding of why that decision was made, and the rationale behind it. R10 and R11 also acknowledged that young *Techsperts* often needed support in how they communicated the new technology to their classmates.

R12 and R4 gave a positive acknowledgment to their experience with *Techsperts* at Bel Air. R12 shared that she "didn't realize a student could answer that question", referencing the knowledge that her local *Techsperts* had acquired on technology topics, and R4 pointed to step by step instructions on how to use LMS and iMovie.

R7 pointed to a critical role she saw the *TechTeam* playing, namely that of momentum builder for adopting new technology.

> Prior to the *TechTeam*, I would say that some of these things got rolled out and kind of put on the back burner and forgot about a lot. And so then things didn't get adopted or a sort of like last minute always…But having the *TechTeam* really drives us to adopt new technology and to be a part of it which is good.

A final point of discussion arose around how respondents were made to feel when they asked for technical support from the *TechTeam/TechGirls/Techsperts*. Eight respondents

reported that they were made to feel welcome when asking question or simply asking for help. There were no distinctions made between any of the three distinct support teams being studied. R7 noted, “My teammates who are very passionate about tech have never made me feel anything but very supported, like they have a ton of time. They drop everything and help us with the tech, which is nice”. R2 responded unequivocally that he was made to feel “completely comfortable”, despite the fact he often felt a little embarrassed and apologetic for not knowing how to “troubleshoot more”. R15 said, “They don't make me feel dumb. They make me feel good”. R10 reported that there were no “feelings” associated with her asking for assistance. R1 felt somewhat embarrassed as she felt she should know more considering she was a *TechGirls* member.

Chapter 5: Analysis

This chapter examines the findings of this research study by taking a step back and analyzing how these data, with connections to the literature reviewed in Chapter 2 of this thesis, may help in answering the key research question: How will a proposed *TechTeam* technology support model impact new technology adoption by Calgary Girls' School in 2014-2015?

Through the thematic analysis of the findings of this research study, a number of strong themes emerged that are explored in this chapter. These four themes include: multiple tech support options; perceived ease of use and perceived usefulness of technology; the importance of time in technology adoption; and digital literacy. At the end of this chapter I discuss the themes more broadly within the three theoretical frameworks used in this research. My data suggests that the theory of Community of Practice (CoP), the Technology Acceptance Model (TAM), and SAMR (Substitution, Augmentation, Modification, and Redefinition) provide useful frameworks for the adoption and use of technology in school, in this case the Calgary Girls' School. There was strong support for Communities of Practice as a tech support model, particularly in respondents' support of the TechTeam/TechGirls/Techsperts initiatives. Many respondents also felt that TAM, most notably technology solutions that had perceived ease of use and perceived usefulness for the user did impact their willingness to try these tech tools. A number of respondents did not agree with TAM, suggesting that logical choice was a better indicator of whether a technology tool should be used. And finally, SAMR was supported as a goal to achieve, and a helpful measure of how technology was being used. Interestingly, however, there was little support in the data for current use at CGS emerging beyond the substitution level of the SAMR model. These theoretical issues will be discussed further at the end of this chapter.

Multiple Tech Support Options

This research shows numerous examples of how respondents, both students and staff have found the work of the *TechTeam/TechGirls/Techsperts* to effectively support their use and adoption of technology. Respondents reported that technical support came in various forms. Numerous respondents noted the immediacy of having technical questions answered by a *TechTeam/TechGirls/Techspert* member as very beneficial. Accessibility, both in time as well as distance was a positive experience for both staff and student respondents. My data supports the notion that the better the technical support given to teachers, the less time would be spent trying to fix the technology (Buabeng-Andoh, 2012). My data suggest, in fact, that providing multiple tech support options increases the quality of the tech support.

All 15 interview respondents acknowledged that they would look to someone with "resident expert" skills or understanding of technology to assist them when needed. Respondents reported benefitting from tech support in different ways. One respondent, R3, admitted that she was not a resident expert with technology stating, "I use the technology to support the processes and things that I need to do. It's not my best skill". She noted that having an in-office tech support person that fulfilled the role of resident expert was helpful because that support individual was more of an "experimenter", offering a sense of confidence to the respondent as they tried new technology solutions. R7, a teacher acknowledged the positive impact her *TechTeam* representative made on her use of technology.

> I check on my *TechTeam* member frequently, daily actually, during class even sometimes like he's just so available, which is helpful that I'm not losing that list of, I have this question, this question, this question waiting to talk to you, or you're a busy person, like with the teach and things, I'm not waiting for someone from tech to come to me. I can go right there and my question's usually answered very quickly.

R12 noted the impact of the tech support framework in her willingness and level of comfort to try new technology tools. "I like trying new things as long as I've got kind of supportive people around me".

Analysis of a question asking interview respondents to think specifically of the staff *TechTeam* and student *TechGirls/Techsperts*, and how they may have impacted their use of new technology platforms at CGS revealed strong support for multiple tech support options. R1, who is a *TechGirls* rep for her grade, acknowledged the potential confusion of a new helpdesk area in the Lakeview campus school. At the time of this interview, this area, called the *TechDeck,* was still under construction. Framing the question with the *TechDeck* as a contextual focus, she replied,

> They might be confused about it because it's something new. But if it's like the tech girls for help, that would be convenient for them because it's just like, "Oh, my computer's not turning on, I'll just go over there and ask them."

The *ease of access* to helpdesk resources, in particular may play a positive role in the adoption of technology platforms at CGS. If by making use of these tech support teams technology tools are easier to use by way of easy to access multiple tech support options, perhaps users will be more open to adopting these tools.

The Tech support program was also seen to support migration to technology tools by grade-level teaching teams. Some grade-level teams migrated to a new technology platform like LMS, while others did not. One administrator respondent noted that having a tech leader (*TechTeam* rep) on a particular grade team was the key to success for migrating that team to LMS. The modeling and training that was provided within the grade-level team was key to the entire grade-level team using the LMS platform successfully. I would propose that this example

was one of the clearest in showing how with *TechTeam* collegial support provided in a variety of ways and formats, a reticent group of teachers began to successfully use a key technology platform.

Students' learning how to use the technology and then teaching others is also another important area where we see tech support at CGS. R8, for example, shared some insight on her experience as a new student at CGS, and how once she received help from *TechGirls*, she was able to pass that on to others:

> It's been easier. I remember when I first came here, I didn't know how to use LMS and then some girls in my class helped me to use it. I found that it was easy and then I was helping other people who needed help with it too.

This acknowledgment of once being supported being able to share that knowledge with others' supports the concept of building the "collective knowledge" that is a fundamental part of how Communities of Practice are meant to work (Wenger et al., 2002, p.14).

From these data it is clear that while multiple tech support options are an integral part of adoption and ease of use at CGS, there are challenges that need to be addressed. In particular the stress of the responsibility of being a "Tech Expert" placed on the younger students needs to be considered when developing teams of young Techsperts. Concentrated efforts need to be made to develop the communication skills of these young *Techsperts* to support their use and understanding of the complex technical processes and languages used to provide useful tech support to their classmates.

Perceived Ease of Use and Perceived Usefulness of Technology

The concepts of perceived ease of use (PEU) and perceived usefulness (PU) of technology emerged as central themes in the data in responses made by both students and staff.

From the perspective of the research overall, the concepts of PEU and PU were found in numerous respondents' comments. Yi et al. (2006) proposed that a foundational element of perceived usefulness is to build support amongst users that the technology being offered is better than the current practice or what is currently being used. This was supported by comments from both students and staff. For example, when asked how she felt when a new technology was announced, R1 noted that she felt excited, particularly if the new technology worked better or was easier to use: "We're like, "Hey, we're getting this new thing and it's going to be easier." I was excited because it's new, it's fun". When analyzing this response, I propose that if the new technology is seen as *better* or *more useful* to the user, this fact may aid in better adoption and use of the technology.

Another example of PU is when R6 referenced openness to new technology if it was deemed the right choice by administration. She shared:

> I think that also depends though on solid leadership, that's so you're getting led down the right path. I think that our school is an excellent example of how that leadership can define some very important philosophical boundaries to what we're working with. So in that paradigm, if I trust my leaders to lead me in the right direction, I'm generally pretty excited about it because it does open potential.

This response by R6 can be seen as an additional factor that may affect a user's openness to adopt new technology, particularly affecting perceived usefulness. If school leadership has deemed a technology tool useful and worthy of adoption, some users may find this increases the perceived usefulness of the technology tool, thus strengthening the reason for adopting it.

Several respondents also provided insights into PEU. They shared that they often asked themselves if a new technology tool would be easy to use, and if it could be used for a specific

task that they needed to complete. Technology needed to make one's job easier, and this benefit needed to be seen quickly, regardless of how difficult the tech tool might be to learn. *Worthwhile* use of the technology was also important, differentiating a "worthwhile" tool from one that might be used simply because it was present and available. Some respondents, however, suggested that the real reason a technology tool was adopted and used were for much more simplistic or superficial reasons such as the sensation the user gets from the look and feel of the hardware or software. Easy-to-use tech tools such as many cloud storage solutions may be tempting to adopt for ease of use reasons, but in reality be insecure and inappropriate tools for keeping data safe.

Time

Another theme that emerged from the data was the importance of time required to embrace new technologies. 13 out of the 15 respondents, in fact, strongly supported the concept that time was a key factor that lead to frustration when using new technology, or technology that was new to the user. R1's report of a teacher writing across the 60 inch display with a whiteboard marker because it was on the middle of the whiteboard can be seen as an indication of a lack of appropriate and timely professional development (PD) and inclusive pedagogy on how to integrate the display and mirroring technology into daily lessons.

Students also need time to learn how to use technology, especially if they are members of the *TechGirls/Techsperts* team. While the literature (Baytak et al., 2011) presupposes that students who were part of a technology club were likely "good at technology use" (p.139); this is not the case with either the *TechTeam* or the *TechGirls* team at the Lakeview campus. R1, who is a member of *TechGirls*, for example, acknowledged that she was not quick to latch on to things and that there were many others that were faster. And R2 spoke of his *TechTeam* representative, saying

> But of course she's learning as she goes too as the school year goes by. She's there quickly, like she'll actually come in if I email her during class at the students' tech time. She comes in like within minutes at times and does what she can to support so that part is great.

My data strongly suggest that having the time to learn how to use the technology is an essential factor to support the ease of use and adoption. Providing adequate time to learn is especially important when many of the *Techsperts* at CGS are not necessarily tech experts. This theme dovetails nicely with the next theme on digital literacy as it is clear from my data that time is required to fully support and develop sustainable digital literacy at CGS.

Digital Literacy

Another theme that emerged from the data was the importance placed on digital literacy by many respondents. This idea briefly summarized as how understanding how a specific technology works, can help one use the technology more effectively. As the data explored in the previous chapter highlighted, digital literacy was seen as a strong contributor to respondents' willingness to use and integrate technology on a daily basis. Tutorials were a response topic where the idea of digital literacy was strongly embraced. Teachers who responded both as interviewees as well as survey respondents expressed a deep need for detailed tutorials when being on-boarded as new teachers to CGS. They felt that the tutorials would bridge a gap in understanding of what technology was being used, and also why and how it was to be used, the latter connecting strongly into digital literacy.

Digital literacy was also described as a way of being able to trust the technology being used to a greater extent as well as build a greater sense of confidence in users' use of technology on a daily basis. As a result, I propose that digital literacy ties informally into supporting technology use on a wide scale at CGS. For instance, if a user understands how a software

platform such as LMS works, and as a result, why it is used and supported, may allow that user to have a greater degree of trust in the direction of technology at CGS generally. Conversely, for some users, digital literacy may not outweigh their more complex issues with technology use such as issues of intellectual property or digital rights ownership are concerned. For most of the respondents, I would argue that an increased level of digital literacy could be seen to positively support an increased and better day-to-day use of technology.

Theoretical Analysis

At its very foundation, this research discovered that successful technology integration and adoption does occur generally, and specifically, with the support of a tech team support model in an all-girls elementary and middle school. Within CGS there are a variety of effective tech support options including: *TechTeam/TechGirls/Techsperts*; IT; teachers and staff. This research supported the concept of multiple options. This was highlighted by comments such as R3's report that she utilized a staff member in her office for help with day to day tech problems, and R10 how noted that she would always ask her *TechTeam* rep for help. What was clear throughout was that when and why a certain option was chosen varied widely. For example, some respondents tended to follow a troubleshooting order where they would first Google the problem and try to fix it themselves. Following that if unsuccessful some would reach out to *TechTeam/TechGirls/Techsperts* in their class or grade level while others would contact the IT department immediately. The research also supports and builds on Community of Practice Theory, the Technology Acceptance Model, and most surprisingly the SAMR model. These are all discussed in detail below.

Community of Practice Theory. A theory for Community of Practice (CoP) was supported where respondents noted the impact of technical assistance offered by the *TechTeam*,

or *TechGirls*/*Techsperts*. The *TechTeam* at CGS consists of teachers and the *TechGirls/Techsperts*, which are made up of students from the Lakeview and Bel Aire campuses respectively, and are designed on the philosophy of a Community of Practice (Lave & Wenger, 1991). To review, "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2011, p.1). Huh et al. (2009) found the concept of *knowledgeable peers* may be helpful in support of technology adoption. This was a fundamental concept in the formation of all three tech support teams (*TechTeam/TechGirls/Techsperts*) and was well supported by interview responses from all 15 respondents. These three tech support teams can be seen as one option within the multiple tech support options. Formal CoP included help from the IT Department, *TechTeam/TechGirls/Techsperts*, and respondents reported informal CoP emerging from regular classmates who were not *TechGirls/Techsperts*, their teachers, and sometimes parents or siblings at home.

This research supports the principles of CoP and, in fact, there are a number of examples where communities of practice are evident. The first was noted earlier in this chapter in the section regarding support for multiple tech options. What was evident through the research is that communities did form and can be seen in the comment from R12 whose experience with *Techsperts* in her own class was very positive. With some sense of surprise she stated that "I didn't realize that students could answer that question", referring to the knowledge some of the *Techsperts* displayed when answering questions from classmates. CoPs are also evident in a response from R9, who reported that although she did not have *TechGirls* in her own classroom, she would access classrooms who did have a *TechGirls* CoP in place and get help there. A third CoP that is evident is a more informally organized CoP. Eight of the interview

respondents reported that they preferred learning on their own at some point in the process of learning new technology.

Despite the seemingly strong support for these eight respondents not supporting the CoP theoretical framework, I argue instead that these responses support the addition of a new dimension of the CoP model, namely an individual-style CoP. I argue this foundationally because all 15-interview respondents reported that their general use of technology had been improved and increased by the presence of the community of practice-based *TechTeam/TechGirl/Techsperts* support teams, despite the fact that they also reported a preference to learning on their own. I also propose that because CGS is a 1-1 device school, individual learners have more choice as to how they learn new technology tools, and in this way can co-exist together in a larger CoP community regardless of their initial preferences for how they learn the new technology. This can be seen in the response of R6 for example, who reported that he prefers to work on his own until the technology is "broken" at which time he looks for assistance. R9 also acknowledged that learning is best done individually, after acquiring some shared knowledge.

A fourth CoP that was observed was very informal in nature and seemed to spring up where respondents would ask random students for help, or siblings and parents outside of the school environment. This was seen in responses from R5, who reported that she often asked students around her office or in the hallways for help. R4's comments about how her Mom helps her test new technology like an iPad 4 before they purchase it also supported this more informal CoP.

Fuller (2000) found increased computer usage by students in environments where teachers and the ICT coordinator were in collaboration. Due to my role as Director of

Technology (ICT coordinator) and leader of the *TechTeam* and *TechGirls* at the Lakeview campus, support for Fuller's (2000) assertion may be easy to infer. The literature review mentioned the Baytak et al. (2011) study of students who were part of a technology club and acknowledged that the students involved were likely "good at technology use" (p.139). This is not the case with either the *TechTeam* or the *TechGirls* team at the Lakeview campus. A gap in the literature was noted in Chapter two of this thesis around the effect collegial tech support might have on the experience of new technology and its adoption. The research has shown strong support for collegial tech support in the form of the *TechGirls*, *TechTeam*, and *Techsperts* support initiatives. All 15 of the 15 interview respondents confirmed that they used and benefitted from CoP-based tech support throughout the school year. As has been noted, the look and feel of this tech support was different between respondents, but clearly shown. Both a formal support from members of the three support teams as well as more informal collegial support from classmates, colleagues as well as family members was reported.

The TAM Model. The concepts of perceived ease of use and perceived usefulness of technology emerged as central themes in the data in responses made by both students and staff. These themes support elements of the Technology Acceptance Model (TAM); in particular how perceptions of usefulness affected respondents' interest in trying new technology.

TAM comes from the work of Davis (1985) and suggests that behavioral intention (BI) towards technology is affected by three main variables: a) *perceived ease of use*, (PEU); b) *perceived usefulness* (PU); and c) *system usage* (SU) (Im, Kim, & Han, 2008, p.1). This research focused primarily on collecting data on the first two variables: perceived ease of use and perceived usefulness. However, system usage was also formally noted during interviews but was not part of the interview guide questions. System usage was inferred as either happening, in the

case of those respondents who were utilizing the technology they were given, or happening to a lesser degree with respondent who reported that due to a variety of reasons, they were not fully utilizing the technology given them. If a respondent did not fully utilize mirroring to the Apple TV for example, a lower system usage for that technology was noted.

An excellent example was given by R6 as he talked about using technology in certain situations, and asking himself whether the situation benefited by use of the technology or not. He noted:

> Sometimes sure, you can get an iPad to ask you a bunch of math questions, but also you can sit down and flip some playing cards and get virtually the same thing but almost even more real experience because those numbers are right in front of you. You've got counters or you can do whatever you want. So it has to either benefit my workflow or do something that it's really hard to do without the technology.

This response from R6 also supported the TAM construct of perceived usefulness; where if the iPad or technology tool could potentially give the user the ability to do something they could not do without the use of such a tool. SR3 suggested that teachers make use of unique and new software or online programs to create assignments.

Research is critical of the effective use of technology by teachers (Aldunate & Nussbaum, 2013; Tondeur et al., 2013). Keengwe et al. (2008) focused on teacher attitudes, finding that they play an important role in how technology and integration are measured. I asked questions like “How comfortable are you in trying new technology or software programs?” and “How do you feel when a new technology is announced and implemented in your classroom?” to students and staff to collect data on the degree of willingness to try new software; and also to collect data on the attitudes and feelings associated with learning a new technology or software.

Responses were varied amongst the respondents. Often respondents who were willing to try new technology were also more positive or open with feelings and attitudes to learning a new technology or software platform. A number of respondents expressed this as a willingness to "dive right in" and try new technology. Others described feelings of anxiousness and frustration when having to learn and use new technology. Understanding teacher "motivations, perceptions and beliefs about learning and technology" (Keengwe et al. p.436) was also found to be the case in a number of staff responses, who all reported concerns about various parts of the integration and adoption of technology. These respondents voiced concerns such as questions regarding some of the philosophies behind why we were using technology so heavily, and the impact it might have on personal and collegial relationships. A concern was also raised around some of the technology being taught and if it was in line with curricular expectations. Two students voiced concerns about the excessive use of technology in their own schooling experience, both acknowledging that their use in class and at home bordered on excessive. These responses show a need for an evaluation of all aspects of technology at CGS to ensure that there is a constant, iterative review of what role technology plays in learning.

The SAMR Model. An interesting outcome of this research is the data support for the SAMR model or ladder, based on the work of Puentedura (2013). Technology used to support learning may do so by climbing a four rung ladder, beginning with Substitution (S), Augmentation (A), Modification (M), and finally reaching the Redefinition (R) stage. Conversely, the SAMR model can also be used to grade the current use of technology. Using technology to move from simply substituting the technology for normal teaching practice to reaching the ultimate goal of redefinition, where the technology allows the student to perform new task that had previously been inconceivable is the goal of the SAMR model. Respondents,

mostly staff members, acknowledged their exposure to this model from PD opportunities over the last few years, and felt that measuring technology use and its effectiveness in teaching and learning was becoming more relevant to them in their practice.

Both teachers and students shared that currently, some technology or teacher attitudes made it difficult to advance up the rungs of the SAMR ladder. A lack of immediate support on iPads in the classroom was seen by one respondent as threatening their use until support was available. One student reported that she preferred to use the whiteboards in her classroom instead of mirroring her computer to the display mounted on the whiteboard. I argue that the latter would show a degree of employing technology at least at the substitution (S) level. When I questioned her about how her teacher used the display in the middle of the whiteboards, she reported that:

> We haven't really been using it much different than we would a projector because we can't really write anything on the TV. I remember last year, the teachers would use white board markers on the TV which I thought was kind of weird, but they did.

Although this specific example came from last school year, from a more general perspective, it serves as an excellent example of technology in place in classrooms that has not been fully adopted, either by students or teachers. This reality for some teachers and students at CGS can also be found in the literature. Im et al. (2008) pointed out the importance of emphasizing the ease of use of technology that may be perceived as risky or difficult to use. Teachers and students like R1 shared in her example, may have perceived that the displays placed in the middle of the whiteboards were difficult to use, and combined with a lack of PD and thoughtful post-deployment training, chose not to use the new technology.

While the substitution level of the SAMR model was referenced, there was a notable

absence of respondent feedback regarding the augmentation, modification and redefinition levels, and whether CGS was reaching the more advanced uses of technology for learning. A few respondents noted that they wanted technology to allow them to create and innovate at these higher levels, but no respondent claimed that this was formally taking place. I argue that both a lack of time as well as low levels of digital literacy amongst users play a role in being *stuck* at the level of substitution.

Summary

Analysis of the data collected shows interesting links back to the literature reviewed. Regarding decision making around what technologies would be used and for what specific outcomes, the work of Tondeur et al. (2013), Bates (2011), Vanderlinde and van Braak (2010) all pointed to the importance of teachers and administrators being involved around the decision making table. A number of responses spoke to and supported this idea. Notably, R14 voiced strong opinions about not feeling like he had been included in decisions regarding software and software platforms. As a consequence, he described feeling a sense of "obligation" to use software mandated for use by CGS. R2 also described this obligation.

Yi et al. (2006) found that if administrators and top managers were committed to new technology and its innovative use, their example positively impacted the ease of use beliefs of others. This was supported in the research by comments from R5, who saw that her example of using new technology and being one of the early adopters was critical in setting this positive example amongst staff. Hew and Bush (2007) found that government curriculum was increasingly mandating the use of technology. Respondents in this research also supported this idea. R3, pointed to concerns around some of what she thought might be technology use that may not support the curriculum, or may not be defined well enough at this stage.

I also worry about if there are some things that we may be focusing on that are not good

use of our time. I've heard some discussion around teaching children coding, I don't know why we would do that. It's not clear to me why we would do that. So I think we have to ask those questions and I think we have to have a broad understanding of why.

Mobility of the technology and how that may impact student learning cited by Pegrum (2013) and Looi et al. (2010) was supported by student respondents such as R9, who pointed to the continuity of her learning on a laptop, being able to work at school and easily transfer that work home with her. She compared her brother's situation, where he did not have a laptop and had more difficult time with continuity on projects and assignments. Pedagogy that was not inclusive of technology, and had not been modified to include it was also a significant finding (Keengwe, 2008; Pegrum, 2013).

The themes that emerged during the analysis did not address all of the sub-questions that were originally asked. The data did not speak to sub-questions two, three, and five as strongly as I would have hoped. These sub-questions will remain candidates for future research.

The current research ultimately has findings that can benefit the larger research and education community. Because Calgary Girls' School is a public school, it is proposed that the findings of this research could be applied to any publically funded school, as well as to private and alternative schools. Of note is the strong support for collegial tech support teams. As mentioned earlier in this chapter, a review of the literature found a lack of specific studies around the effect of collegial technical support in schools. There was also little found on student led collegial support, particularly when involving students in the kindergarten to Grade 12 (K-12) level. It is hoped that the findings from this research can be applied to similar environments where more traditional technical support environments exist. Schools, for example, that share a single IT support person who may only be onsite one or two days a week could readily benefit

from the *TechTeam/TechGirls/Techsperts* model of support as on-the-ground technical assistance could be made available when IT support personnel are not available. In the Calgary Girls' School example, IT support personnel were typically only onsite at the Bel Aire campus one to two days per week. Outside of those days, the *TechTeam/Techsperts* were the first line of support to all students and staff at the Bel Aire campus. It is also hoped that a more in-house approach to basic user technical support can increase the availability and timely access of tech support to users. A number of staff respondents reported positively regarding how quickly they could get help from their *TechTeam* representative during the average school day. In some cases, the respondent (R7) reported that at times, she would trade classrooms with her *TechTeam* colleague so that he could fix a technical issue her students were having while she took over teaching his students during his brief absence from the classroom. The use of easy to use tutorials on how to use common software programs and technology tools may also fill a gap caused by a lack of onsite personnel available on a daily basis. SR7, SR9, and SR10, all self-reported teachers, were among respondents who suggested better tutorials and PD materials would help their daily use of technology.

Chapter 6: Conclusion and Recommendations

This chapter provides conclusions and recommendations derived from the findings and analysis of the data collected. A review of the study and future research implications will also be discussed.

At the conclusion of the data gathering and thematic analysis, there were a number of themes that emerged that carry with them practical implications: multiple tech support options; perceived ease of use and perceived usefulness of technology; time; and digital literacy.

To review, the main research question for this study was: How will a proposed *TechTeam* technology support model impact new technology adoption by Calgary Girls' School in 2014-2015? As has been shown in both the findings and analysis chapters, positive responses support the finding that the *TechTeam/TechGirls/Techsperts* support teams positively supported the daily use and adoption of new technology at CGS during the 2014-2015 school year. All of the 15 interview respondents reported that they used the CoP-based tech support teams at some form in their day-to-day use of technology at CGS.

Since the *TechTeam/TechGirls/Techsperts* are based on the Community of Practice theoretical framework, CoP was also strongly supported in respondent feedback. Examples were seen of formal Communities of Practice, namely the three support teams mentioned above, as well as more informal examples of CoP in action.

Support for the Technology Acceptance Model theoretical framework was also shown in interview responses. Respondents were generally more eager to try a new technology tool or software program if they perceived a benefit to their daily practice as well as if appeared relatively easy to use. There were respondents on both sides of this concept, some preferring to use more logical tools despite them being more difficult to use as opposed to seemingly simpler

tools but tools that lacked sophistication and power.

Recommendations

Three major practical recommendations flow from the analysis of the data collected for this research: tech-training opportunities; use of video technology; and onboarding materials.

Tech-Training Opportunities. Time was a strongly contested theme throughout the research coming from all respondents. A recommendation moving forward is that with the implementation of any substantive software or software platform, an exhaustive tech-training component be developed that accompanies these changes. Student and staff respondents felt that to date, not enough communication and structured guidance had been given when new software is released for their use. Calgary Girls' School's migration from Google Apps to Microsoft Exchange for email as well as the Learning Management System (Moodle) were given as examples by multiple respondents. These tech-training resources could take the form of organized training sessions, where *TechTeam* members could lead small groups of staff or students in step-by-step training. In addition to *live* training, tutorials could be created that would provide step-by-step instructions using real examples, as well as screen-capture video tutorials that are mentioned in greater detail below. The gift of time mentioned by many of the respondents may ultimately push users to climb the SAMR ladder past the substitution rung, as well as allowing for increasing capacity in digital literacy, both significant elements noted in the data.

Use of Video Technology. A practical component connected to the first recommendation is the extensive use of video screen captures to build understanding of core functionality of a new tech tool. Tutorials of this nature were mentioned by respondents to address the need for both professional development and increased digital literacy. Authorship of these tutorials

should not be the sole responsibility of the IT department, but rather a shared collaboration of all three groups of the tech support program; *TechTeam*, *TechGirls* and *Techsperts*. Users will benefit from a shared IT/teacher/student perspective in the creation of these resources. These resources should be made available in an easy to use online format where users could access and view the screen-capture tutorials at their convenience.

Onboarding Materials: Grades 4-6 and New Staff. A third recommendation with ties to recommendations one and two is careful planning, creation and distribution of onboarding materials for grade 4 and 6 students as well as new staff. It is hoped that this would provide better support to students who are new to the iPad and MacBook Air platforms, and teachers new to CGS, regardless of whether they start in September or during the school year. Without implementing these suggested changes I would propose that there would continue to be a sense of frustration amongst new users as well as a limitation to how quickly new users adopt the technology tools and platforms at CGS.

Limitations of the Research

Looking at the current research experience as a whole, there are several areas that I would want to improve in future research studies of this type. It was hoped that the opportunity for any student or staff member to anonymously give feedback on their experience with technology at CGS would provide additional information helpful to this study. While respondents (N=75) who contributed to the single question survey did provide some unique perspectives (N=18), the number who did not finish the survey was higher than hoped (N=57). The high number of participants who began the survey but did not finish may be due in part to confusion about how to properly finish the survey once they had responded to the question. A screen capture tutorial for all respondents as a first step in participating in the online survey would provide easy

instructions and hopefully would increase the number of respondents who successfully finished the single question survey.

I would also work to better insulate the interview location and time for interviews to take place. Because this research took place during the school day, various locations for the interviews were used. This was done to ease logistics and timing for student and staff participants. On a number of occasions however, interviews were interrupted either by noise (morning announcements) or by students needing something from the teacher or classroom. This caused confusion and disruption in conversation and train of thought. The order of the interview questions were changed in a few cases, and in two particular cases, questions were missed. In the future, I would attempt to organize the interview environment in a more predictable way.

It is hoped that this research will be of benefit to organizations, both within and outside the K-12 education space. Because this research was undertaken at a publicly funded school, I propose that the multiple technology support models at CGS, which were studied in this research could be integrated into any other public school, private school, or business organization.

Future Areas of Research

There are a number of future research ideas that stem from the current study. A similar study could be conducted in two years' time at CGS, with the goal of measuring the continued effect of the multiple technology support model offered at CGS during this study. This would allow for data to be collected with a more longitudinal focus. I would also propose undertaking this research at a private school to see if results would be similar, and if not, what the possible differences would be. Another environment of great interest would be a business environment, perhaps a company with a similar sized workforce to that of CGS, approximately 650 users. I would also propose coding the data more specifically, grouping respondents into role based

groups such as administrators, teachers, and students. This, combined with a mixed qualitative/quantitative methodology could lend to some notable statistical results.

Personal Reflections

It was with great anticipation as well as apprehension that this research study was undertaken. Coming from a background of quantitative research, I was excited to use a qualitative method in this study. Old habits die hard and I found myself struggling at times to transition to a more qualitative way of thinking, asking question, and interpreting data. Engaging in this research in my own workplace amongst enthusiastic students, teachers and staff was simply a pleasure. My favorite part of the study was the semi-structured interviews. Time seemed to fly as I asked questions and sat back to take in all that each participant shared, engaging in conversation as deeply as possible with each respondent. The journey that this project has taken me on has included almost every feeling imaginable, but it is with a truly grateful spirit that I near its' completion.

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Appendix 1: Interview Guide

Interview Guide: T*echTeam* Technology Support Model And New Technology Adoption at Calgary Girls' School

OBJECTIVE OF INTERVIEW:
The objective of the interview is to gain insights into the three broad research questions listed below:
(1) How will a proposed *TechTeam* technology support model impact new technology adoption and integration by Calgary Girls' School in 2014-2015?
(2) Does more timely response to questions of a *tech support* or *helpdesk* nature support faster integration and adoption of new technology?
(3) Does peer technology assistance allow for the user of the technology to have a greater degree of comfort in both sharing their question as well as asking for assistance in the first place?

Data collected from these interviews will be included, where appropriate, into a thesis paper and will disseminate the results and findings in the following ways; (1) to identify factors affecting the adoption of new technology at the Calgary Girl's School, (2) provide insights on student and staff experiences with adoption of new technology in learning spaces, (3) establish a working document that can guide future technology planning and deployment strategies at Calgary Girl's School and (4) share findings with colleagues and the greater education community.

CONFIDENTIALITY
All statements made will be non-attributable unless at the discrete request of the interview participant. The information you provide will be summarized, in anonymous format, in the body of the final report. At no time will any specific comments be attributed to any individual unless your specific agreement has been obtained beforehand. All documentation will be kept strictly confidential. No data or information will be kept on any participant who wishes to withdraw from the study. Participants will be invited and are free to contact the researcher at any time during the study to inform of their withdrawal from the research study.

QUESTIONS

Do you have any questions regarding this research project before we begin?

1. ***Demographic Questions***
   - ***a.*** What grade homeroom are you in or do you teach?
   - ***b.*** How many years have you attended or taught at Calgary Girls' School?
   - ***c.*** How old are you? (student)
   - ***d.*** How many years have you been using computer or tablet technology?

2. ***Introducing New Technology in Schools***
   - ***a.*** What aspects of using technology in school do you enjoy most?
   - ***b.*** How comfortable are you in trying new things?
   - ***c.*** How comfortable are you in trying new technology or software programs?

d. How do you feel when a new technology is announced and implemented in your classroom?

3. ***Learning New Technologies***
    - ***a.*** Do you learn better on your own or in a group?
    - ***b.*** How do you learn a new software program?
    - ***c.*** What makes it most difficult to learn new software programs?
    - ***d.*** How does knowing how technology works help you in your teaching or learning?
    - ***e.*** What techniques help you to best learn new technology skills? For example working 1-1 with trainer/watching tutorials.
    - ***f.*** If you could fix one thing in the process of having to learn a new technology at Calgary Girls' School, what would it be?

4. ***Technology Adoption***
    - ***a.*** What factors determine how quickly you adopt a new technology tool?

5. ***Tech Assistance***
    - ***a.*** How easy is it for you to get help when you have a technical question?
    - ***b.*** Who in your class helps you when you need technical assistance?
    - ***c.*** What feelings do you have when you experience a technical problem with your computer or iPad?
    - ***d.*** What is your process (order) when you face a technical issue or question?

6. ***Tech Team/Tech Girls Team***
    - ***a.*** How have technology projects or new platforms like LMS, iMovie, Portfolio or Filr been improved with the use of the tech team and tech girls?
    - ***b.*** Has the 'tech team' made it easier to learn new technology at Calgary Girls' School? If so how? If not, why?
    - ***c.*** How are you made to feel when you ask for tech support from a tech team member or tech girl?

Appendix 2: Parent Consent Letter

RESEARCH CONSENT FORM

Dear parent,
My name is Joel Melashenko and this research project is part of the requirement for a Masters of Arts in Learning and Technology at Royal Roads University. My credentials with Royal Roads University can be established by telephoning or emailing Dr. Jo Axe at xxxxxxxxx or xxxx@xxxxxxxxxx.
This document constitutes an agreement for your daughter to participate in my research project, the objective of which to: (1) To identify factors affecting the adoption and integration of new technology. (2) To provide insights on student and staff experiences with adoption of new technology in learning spaces. (3) To establish a working document that addresses all aspects of successful technology deployment and integration. (4) To share findings with colleagues and the greater education community. The Calgary Girls' School will be sponsoring this research to take place on its Bel Aire and Lakeview campuses.

We are inviting students, teachers, and administrators to be part of this study, and your daughter has expressed an interest in participating. The research will consist of semi-structured interviews and an analysis of organizational documents. Relevant documents such as IT project planning proposals, multi-year technology plans, and the school's Annual Educational Review (AERR) will be examined and analyzed. Past and present administrative policies of the school concerning technology, its use, and its potential impact will also analyzed. Anonymous feedback from staff and students about their experience with technology adoption will also be analyzed. The interviews, document analysis and anonymous feedback will be gathered during November and December 2014 and is expected to conclude by January 15, 2015. The foreseen questions will refer to participants' experience with using new technology in their learning environment. In addition to submitting my final report to Royal Roads University in partial fulfillment for a Masters of Arts in Learning and Technology, I will also be sharing my research findings with Calgary Girls' School. I may also use research findings to inform journal articles and organizational planning documents that may be shared with other organizations.

There is not expected to be any conflict of interest that might affect this study. We have created a unique tech support model that attempts to help both teachers and students. These support teams are known as the tech team (comprised of teachers) and tech girls (comprised of students). This research will look at whether this model is assistive in students and staff integrating technology in their daily practice and learning. Although as the Director of Technology, I am ultimately responsible for technology deployments, this study is not about whether the deployment should happen or not (which may be a conflict) but rather how well our support model is supporting previous and current deployments.

Information will be recorded in hand-written or typed format. Each interview will also be digitally recorded, and I will remind your daughter that her interview will be recorded prior to beginning the interview. The interviews will be transcribed and where appropriate, summarized, in anonymous format, in the body of the final report. At no time will anyone but the researcher have access to participant responses. At no time will any specific comments be attributed to any

individual unless specific agreement has been obtained beforehand. All documentation will be kept strictly confidential. All data will be kept on encrypted drives or devices in multiple physical locations for backup and protection, and be encrypted in all locations. Only the researcher will have access to this data. Raw data will be destroyed upon the formal completion of the study, once the thesis has been formally accepted. If your daughter chooses to withdraw from the study, she is able to do so by simply communicating her desire to me, at any time during the study. If this occurs, I will contact you to inform you of her request to withdraw from the study. All raw data pertaining to the withdrawn participant will be destroyed at the time of withdrawal from the study

Upon completion of the thesis study, all participants will be presented with a CoPy of the study.

You are not compelled to allow your daughter to participate in this research project. If you do choose to allow her to participate, you are free to withdraw at any time without prejudice. Similarly, if you choose not to allow your daughter to participate in this research project, this information will also be maintained in confidence.

By signing this letter, you give free and informed consent for your daughter to participate in this project. Please chat with your daughter about the issues of confidentiality, participation, and data retention covered in this agreement. If your daughter wishes to participate, please have her sign below.

Student Name: (Please Print) _____

Student Signature: _____

Parent Name: (Please Print) _____

Parent Signature: _____

Date: _____