Development of Teacher Expertise with Interactive Whiteboards: A Collaborative Inquiry using Grounded Theory

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Abstract

With the advent of any new pedagogical innovation, adequate training for teachers is crucial to ensure that its educational potential is maximized in the classroom. This thesis examines the question, what is the most effective method of moving teachers along the trajectory from novice to expert? To delve into this question, a collaborative inquiry was conducted in which grounded theory and action research were combined in a reciprocal partnership. This four month research study was designed, first of all, to conduct a trial of an ongoing professional development model that allowed for sufficient practice through a collaborative, supportive and self-reflective environment; and, secondly, to investigate the development of teacher expertise in pedagogical technology.

Keywords: Action research; collaborative inquiry; expertise; grounded theory; pedagogical technology; professional development

Dedication

This thesis is dedicated to my husband, Peter, and my children, Arianna and Cameron. Without their unconditional love and support, this thesis would not have been possible.

This work is also dedicated to my parents; my mother, Florence, for seeing the value and the importance of pedagogical technology; and my father, John, for instilling in his children a pride of accomplishment and a solid work ethic.

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Table of Contents

List of Tables

List of Figures

List of Acronyms

SFU Simon Fraser University

Glossary

Interactive white boards	An interactive whiteboard is a modern day “chalkboard”. It is a large screen that is connected to a computer and a projector. The images displayed on the board can be manipulated in a variety of ways. The items can be dragged, clicked or copied by a teacher and/or students. Notes written directly on the board can also be transformed into digital text and saved as a file. An interactive whiteboard is a teaching tool that adds interactivity and collaboration between the teacher and students.[1]
SMART Boards	SMART Boards were first created in 1991 by SMART Technologies. This type of interactive whiteboards was designed to give “touch control of computer applications and the ability to write over standard Windows applications. These boards are often used in conjunction with SMART Notebook software.[2]
Vocational teacher	A teacher who feels ‘called to teach’ and who is open to change and growth and is adaptable when responding to changing circumstances.

[1] http://www.bbcactive.com/BBCActiveIdeasandResources/Whatisaninteractivewhiteboard.aspx

[2] http://smarttech.com/About+SMART/About+SMART/Innovation/Beginnings+of+an+industry

Preface

My educational goals and career serve as an extension of who I am and Whom I serve. I seek to make a positive impact on others and to bring something of lasting value to the educational system as a whole.

The world is teeming with possibilities. Creating an atmosphere for lifelong learning, curiosity and exploration is crucial to fully understanding our place within this world. I seek to motivate others to love learning and to seek personal growth. Through my skills as a teacher and a facilitator, I create space and time for effective collaboration and positive interactions with colleagues.

As my passion is to develop space and time for teachers to grow professionally, it is my hope that this thesis will stimulate a love of learning and will generate opportunities for effective professional development that result in real change in each teacher's classroom.

1. Introduction

This thesis focuses on a research study of a school-based professional development program for elementary teachers in the use of SMART Boards. The study explores theoretical and empirical research literature concerning various models of professional development and educational change. This provides a context and a framework to analyze a set of workshops I conducted in a small Christian school in a large Western Canadian urban centre where I work as a Grade Three teacher.

As teachers within the culture of formal education, we must acknowledge that there are many notions of what constitutes professional learning or professional development and that there are numerous ways to support teachers in their learning. We must be humble in our approach as we recognize that there are many paths to guide teachers along the continuum of professional learning. This thesis is presented as an exploration of how we might support teachers in doing the very best job they can, especially in light of a world of technological change and pedagogical shifts.

This thesis focuses on a research study of a school-based professional development program for elementary teachers in the use of SMART Boards. The study explores theoretical and empirical research literature concerning various models of professional development and educational change. This provides a context and a framework to analyze a set of workshops I conducted in a small Christian school in a large Western Canadian urban centre where I work as a Grade Three teacher.

1.1. Called to Teach

Teachers in faith-based schools would often describe their decision to become teachers as a response to a higher ‘calling’. Their purpose is to educate the children of the next generation while ensuring the transmission of faith traditions from one generation to the next. In my opinion, this sense of ‘calling’ is synonymous with

'vocation'. 'Vocation', as defined by Hansen (1995), is "work that is fulfilling and meaningful to the individual, such that it helps provide a sense of self, of personal identity" (p. 2). In other words, *who one is* merges with *what one does*. To see teaching as a vocation not only defines how one views the career of a teacher but also begins to shape one's identity as a teacher. Through shared knowledge, experiences, trials and tribulations, a 'culture' of teachers emerges as teachers identify themselves as part of the larger professional body of educators. 'Cultures', according to McDermott and Varenne (1995), are "the well-bound containers of coherence that mark off different kinds of people living in their various ways, each kind separated from the others by a particular version of coherence, a particular way of making sense and meaning" (p. 325). As with any culture, these authors propose that "culture is not so much a product of *sharing* as a product of people *hammering each other into shape* with the well-structured tools already available" (p. 326). Within the realm of education, part of this "hammering" process is participation in 'professional development.' As with any culture, norms are established that "define what [the teachers] should work on, work for, in what way, and with what consequences; being in a culture is a great occasion for developing abilities, or at least for having many people think they have abilities" (pp. 331-332).

Within the culture of educators, teachers are lifelong learners. This stance acknowledges that a teacher is not and cannot be an expert in every area. Previously, "there has been a prevalent conception of the self (grand or humble, master or slave) as predefined, fixed, separate. Today, we are far more likely, in the mode of Dewey and existentialist thinkers, to think of selves as always in the making…[or to] think of human beings in terms of open possibility, in terms of freedom and the power to choose" (Greene, 1993, p. 213). Although the term 'vocational teacher' often refers to a teacher in trades education, Hansen (1995) uses the term 'vocational teacher' as one who is open to change and growth and is adaptable and able to "respond to one's circumstances—to the changing needs of students, [and] to the changing shape of knowledge" (p. 5). In other words, a 'vocational teacher' is synonymous with a 'teacher who is called to teach'. In addition to the above mentioned criteria, Hansen states that a 'vocational teacher' is "the architect of one's classroom world" (p. 5) and looks for the best way to shape the learning for his/her students. To analyze the most effective way to connect the learner and the material, the 'vocational teacher' adopts a posture of a self-

reflective critic and a lifelong learner. Such a teacher recognizes that he or she is continually developing and will never fully arrive as an expert teacher. There is always something new to learn and to discover.

Kincheloe (2008) corroborates the importance of how teachers view themselves as learners. In fact,

> the ways teachers come to see themselves as learners, in particular, the ways they conceptualize what they need to learn, where they need to learn it, and how the process should take place shape their teacher persona. Such a persona cannot be separated from the various forms of knowledge delineated here and the larger notion of "professional awareness." (p. 115)

This increasing awareness of "the forces that shape identity and consciousness" is crucial in "becoming a critical complex practitioner [that] necessitates personal transformation" (p. 115).

1.2. The Changing Curriculum

To best meet the changing needs of our students, teachers also need to consider the changing curriculum. Greene (1993), reiterates that

> we need to conceive the disciplines provisionally, always open to revision. They provide, after all, perspective on the lived world; or, as others see them, they offer entry points to the great conversation that has been going on over time [and] must be responsive to changing interpretations of what it is to exist in the contemporary world. (p. 217)

To equip teachers to enter these curriculum conversations and to prepare their students to face these evolving changes, teachers are encouraged to leave the sanctuary of their own classroom and participate in professional development. Kincheloe (2008) urges that such critical dialogue among "teacher education students and practicing teachers" is necessary "to gain a more complex conceptual understanding of the multiple contexts in which education takes place and the plethora of forces shaping the process" (p. 111).

1.3. The Impact of Vulnerability

To leave one's sanctuary requires courage and a willingness to be vulnerable. To maximize any professional learning opportunity, therefore, teachers must be willing to acknowledge their own inadequacies and reflect on what knowledge, skills or abilities are lacking. As stated by Weasmer, Woods, and Coburn (2008), "teachers often find the inspiration, information, and assistance necessary to improve their teaching through professional development" (p. 29). This recognition of one's need for continued learning is optimal to successfully deal with change (Weasmer et al., 2008). However, this idea of revealing one's weaknesses can be a frightening experience. For those teachers who struggle with feelings of inadequacy and worry that their deficits outweigh their strengths or for those who struggle with the "imposter syndrome," they may be less likely to attend structured professional development. Pedler (2011) describes this "imposter syndrome" as the "condition where people find it hard to believe that they deserve any credit for what they may have achieved and, whatever their outward appearances, remain internally convinced that they are frauds" (p. 90). Overcoming such a belief can be paralyzing, thus preventing full participation in formalized professional development.

1.4. Self-Reflectivity: Automatic or Developed?

Delpit (1988) takes this notion of vulnerability one step further. She suggests that to be truly self-reflective, we cannot divorce our sense of self from our personal beliefs and cultural background since "we do not really see through our eyes or hear through our ears, but through our beliefs" (p. 297). This process of "turning yourself inside out, giving up your own sense of who you are, and being willing to see yourself in the unflattering light of another's angry gaze" (Delpit, 1988, p. 297) is an important and critical step in truly meeting the needs of the students who occupy the desks in one's classroom. Although Delpit argues that it is difficult to define "which characteristics make for a good teacher [because] it is impossible to create a model for the good teacher without taking issues of culture and community context into account" (p. 291), she too proposes that an effective teacher is self-reflective.

As a ‘vocational teacher’ and a member of the culture of education, is one automatically self-reflective and passionate about learning? Or do these traits develop over the course of one’s teaching career? For the past five years, in addition to teaching elementary school part-time, I spent twenty percent of my work week coordinating and planning all the details for a two-day conference for 1,200 to 2,000 teachers and support staff from the Christian schools in British Columbia and Western Washington. It was an enriching experience to step out of the day to day ‘world of eight-year-olds’ and work collaboratively with a committee of ten other teachers. Planning the convention was professionally challenging as it allowed time to toss about ideas related to changes in education and how to prepare teachers for these changes. Although it was rewarding and personally fulfilling to watch the convention unfold after a year of effort, there was one aspect that I couldn’t help but notice. Invariably, a number of teachers chose to congregate in the hallways or outside on the lawn when a large number of workshop sessions were being offered. Knowing that school boards were paying a considerable amount of money from tight budgets to pay the conference fees, and in some cases, travel and lodging costs, the committee discussed whether we should be concerned with this pattern. We questioned the motivations behind these teachers’ decision to choose alternate ways to spend their conference time. Was the need to “decompress” with colleagues overriding their need for more formally organized professional development? Were conversations with colleagues more beneficial than a formal workshop? Were the teachers struggling with feelings of inadequacies and were afraid to participate? As the Convention Planning Committee, we wrestled with ways to improve the convention to meet the varied needs of the participants.

We recognized the desire for collegial conversations and sought to build opportunities into the convention for more informal, unstructured time for colleagues to meet as grade level or subject-specific teachers. It was agreed that conversations with colleagues were inherently valuable and could offer a less intimidating format. We recognized the need to sit and chat rather than to attend the workshops. In his article, “Love and Despair in Teaching,” Liston (2000) cites the views of Oakeshott, that “it is conversation that is at the center of learning and our engagement with this world” (p. 90). Oakeshott further describes how “we are born heirs to an inheritance, one that we can acquire only through learning” (cited in Liston, 2000, p. 90) and how “one of the means

of learning is conversation" (p. 90). Conversations with colleagues stimulate teachers to look beyond the urgency of the day-to-day tasks and to explore educational goals and implications of what one teaches and how one teaches. Conferences and professional development opportunities provide time away from the classroom to engage in real conversations with colleagues. In recognizing the value of conversations, a variety of methods such as conversation circles or informal sharing sessions were tried over a four-year period.

1.5. Mitigating Factors

The question still remains why some teachers are eager to participate in this "hammering" process of shaping oneself while others oppose it. This led me to consider whether it is only this particular conference that encounters this problem among teachers or whether this is a widespread trend among teachers. What factors have diminished teachers' motivation in participating in structured professional development? Could these factors be mitigated such that we encourage full participation in available professional development opportunities? What is an effective model of professional learning that will encourage positive changes in one's classroom and teaching practice?

Considerable research has been undertaken to explore why some teachers choose not to engage in professional development. According to Casey, Deno and Marston (1988), "persuading teachers to incorporate new or different instructional methods into their teaching practices as a result of research or training has been a persistent problem" (p. 123). Supovitz and Zief (2000) sought to find out why teachers choose not to pursue professional development. They too seem puzzled by the incongruences of a teacher's goal to pursue learning and a lack of participation in professional development. In fact, "it is often difficult to get more than fifty percent of teachers to participate in voluntary professional development sessions" (Supovitz & Zief, 2000, p. 1). Hunzicker (2004) describes this lack of motivation to adopt change as "usually a temporary condition caused by one of three factors: negative associations related to past experiences, distracting environmental or situational conditions; or

negative beliefs about their ability to use particular knowledge or skills in the future" (p. 45).

1.5.1. Beliefs and Attitudes

In other words, one's beliefs and attitudes can be key factors in determining if a teacher participates willingly in in-service training and, subsequently, considers a new instructional method. As cited by Casey et al. (1988), "Zahorik argued that teachers' preferences strongly influence how and what they teach, and that these preferences are based on personal values or an ideal teaching style and on the teacher's abilities and skills rather than on empirical evidence" (p. 123). If a teacher does not see inherent value in the new instructional method, he or she will not be motivated to engage in the formalized professional development offered. When designing professional development or in-service training, this factor must be addressed. According to Casey et al. (1988), a teacher would only consider implementing a new strategy if it was perceived as effective, efficient and in line with his or her own theoretical orientation (pp. 123-124). A teacher's beliefs and attitudes may be also influenced by the unspoken culture of one's school. Through casual observations, it seemed that those who repeatedly declined attending workshops during the conference tended to be from one or two specific schools. As a result of these casual observations, one may question the pervading beliefs at those schools. Is professional development valued or considered to be a waste of time? From where do these attitudes stem? Do the administrators and school boards value professional development or are they unaware of the attitudes of their staff? Supovitz and Zief (2000) reiterate the importance of school culture in promoting professional development. In their research, they found that "schools that had higher partnership participation rates tended to be schools where leaders (both teachers and administrators) demonstrated extraordinary commitment to the reforms" (p. 3). The culture of the school can positively or negatively affect how the teachers view professional development.

1.5.2. Career Stages

Weasmer, Woods and Coburn (2008) take a slightly different approach when exploring why teachers do not participate in professional development. According to a

model proposed by Fessler and Christensen, as cited by Weasmer et al. (2008), a teacher moves through the following stages: “Pre-Service, Induction, Competency Building, Enthusiastic and Growing, Career Frustration, Stable and Stagnant, Career Wind-Down, and Career Exit” (p. 22). Fessler and Christensen’s (1992) model is based on the premise that external environmental factors, specifically the personal environment and the organizational environment, influence the teacher’s career cycle. Because these variables are constantly changing, “the career cycle itself progresses through stages not in a lock-step, linear fashion, but rather in a dynamic manner reflecting responses to the personal and organizational environmental factors” (p.35). As suggested by Fessler and Christensen (1992), a teacher’s inclination towards professional development is largely determined by the external factors influencing his or her career stage, rather than his or her beliefs.

At the beginning of one’s career, the Induction or Novice teacher is understandably concerned with survival and is not yet capable of exploring innovations. As a teacher gains experience and confidence, he or she moves towards the Enthusiastic and Growing stage, and it is in this stage that teachers actively “embrace innovative practices as a means to improve their teaching and thus enhance their students’ learning” (pp. 22-23). Educators who are enthusiastic and eager to learn are motivated by a “determination to remain on the cutting edge” (pp. 25-26). Although I personally know many teachers in this Enthusiastic and Growing stage who are hungry for professional development, the majority of teachers who abstained from attending workshops tended to be those in the middle to late stage of their careers. Perhaps, as suggested by Supovitz and Zief (2000), “older teachers especially recognize the cyclical nature of reform. Why jump on this bandwagon if there is the potential for it to roll out of town with the next reform cycle?” (p. 3). Tyack and Cuban (1995) describe this phenomena as “a distracting merry-go-round of attempted change” in which “old reform proposals keep recycling as innovators reinvent them” (p. 41). Veteran teachers tire of this cycle which seems to lead nowhere and denies the possibility of progress (Tyack & Cuban, 1995). This leads to the question: how does one encourage *all* educators, regardless of their career stage, to participate actively in professional learning?

1.5.3. The Impact of Time

In addition to the career stage and personal beliefs of a teacher, his or her receptivity towards professional development is also greatly impacted by time. When introduced to new pedagogy, teachers need time to receive adequate training and to master the skills required for their successful implementation. Effective change is not an isolated event, but a process of moving along a continuum from novice to expert. This process takes time, especially during the first three years of any major change (Weasmer et al., 2008). The barrier of time was also recognized by Supovitz and Zief (2000). In their interviews with non-participants, it became evident that "they hesitated to commit any time to professional development beyond the teaching day or year. All of the interviewed teachers who were not within five years of retirement had children at home. Half these teachers said family commitments were a barrier to choosing professional development opportunities outside the school day" (pp. 1-2). Even though teachers may be motivated to participate, family commitments may limit a teacher's ability to attend sustained professional development outside of the regular school day. Because time is such a precious and limited commodity within a teacher's day, it must be specifically carved out by providing release time during the school day or by offering stipends when professional development must be held outside a teacher's normal work schedule (Weasmer et al., 2008). Kincheloe (2008), in fact, argues "that school districts and state departments of education must develop incentives for educators to immerse themselves in the complex task of acquiring, practicing, and teaching these high-level abilities" (p. 120). This gift of time by the administration in the form of release time, flexible schedules and paid leave serves to validate the importance of professional development.

1.5.4. Personal Disposition

In addition to one's career stage and time availability, personal disposition can also have an impact on one's motivation to attend professional development. As discussed earlier, a certain degree of vulnerability is needed when seeking professional development. To embrace new pedagogy, one needs to be self-reflective and able to recognize a potential deficit in one's current practice. This is often difficult to encourage as the "traditional culture of teaching is insulated; one's struggles and shortcomings are often kept behind the closed classroom door" (Supovitz & Zief, 2000, p. 2). Professional

development opportunities may have the potential to “make participants’ practices more public . . . and to [expose] weaknesses in their content knowledge and understanding” (Supovitz & Zief, 2000, p. 2). As a result, teachers may be more likely to avoid structured professional development.

1.5.5. Relevance

Another key motivating feature of professional development is the relevance to one’s teaching practice. When results verify that the particular new innovation or skills presented within the professional development sessions have a positive impact on student learning and performance, teachers are much more inclined to participate (Weasmer et al., 2008). Unfortunately, many training sessions or professional development opportunities are “conducted in isolation from the actual classroom and without students” (Casey, 1988, p. 124). Such sessions are ineffective and “not well suited to bring about changes in teachers’ attitudes and beliefs about practice” (p. 124). Furthermore, teachers have strong convictions about the effectiveness of various techniques and hesitate to consider alternative approaches (Casey, 1988). Because of the huge time investment in changing one’s teaching practice, teachers are reluctant to stray from their familiar way of teaching.

When considering the relevance of professional development, teachers not only analyze the content, but also carefully consider the very structure and format of the professional development in question. Teachers recognize the changing face of education as the traditional classroom with rows of desks facing a chalkboard is being replaced with movable tables, interactive whiteboards and laptops, project-based learning, differentiated lessons and more authentic assessment. Experienced teachers recognize the limitations of single “one-off” workshops and are reluctant to participate in professional development that will not result in real change in their teaching (DeSantis, 2012; Liljedah, 2014; Lydon and King, 2009).

1.6. Summary

In planning effective professional development that inspires teachers, it is important to take into consideration the mitigating factors that may inhibit participation. Such factors include the career stages and the dispositions of the teachers. In addition, administrators and policy makers must recognize the value of a teacher's time and the immense time and effort required to implement an innovation or shift in one's teaching practice. Finally, professional development must be relevant to the context of the teacher and must promote student success and learning. Greene (1993) proposes that

> we require curriculum that can help provoke persons to reach past themselves and to become. We want to see them in their multiplicity linking arms, becoming recognized. We want them in their ongoing quests for what it means to be human to be free to move. We want them—and we want to enable them—to exist. (p. 220)

Why limit this to our students? Greene's statement implies that "we all need to recognize each other in our striving, our becoming, our inventing of the possible" (Greene, 1993, p. 219). So, let's stretch each other, as 'vocational teachers' called to teach, to reach beyond ourselves and to rise above merely *existing* as a teacher.

Because each teacher faces his or her own unique circumstances and personal challenges, there is no easy answer to the professional development dilemma. But one must not give up simply because there are no easy answers. Research in this area is critical. The potential impact of stimulating teachers to "reach past themselves" (Green, 1993) spans many generations to come.

Although each factor previously mentioned is important when planning effective professional development, this study will be limited to the structure of the professional development experience. Through this study, I will explore how to create professional development experiences that are relevant, engaging and ultimately leading to change in a teacher's practice.

2. Literature Review: Effective Professional Development Models

2.1. The Critical Role of the Teacher

This section (2.1-2.5) was published in the SFU EdReview Journal as: DeWith, Y. (2014). Preparing for the Changing Faces of Education: Effective Professional Development Models. SFU Ed Review, 1, 1-10.

The importance of the teacher's role within the changing faces of education cannot be overlooked. According to Ememe, Aitokhuehi, Jegede and Ojo-Ajibare (2013), "education is a fundamental element of change and the pivot of development and the teacher is a major determinant of success or otherwise in the education sector" (p. 277). Teachers are crucial to bring about successful changes within the educational system. However, because "development is not static, and change is a continuous phenomenon, the knowledge needed to bring about change or adapt to the change in order to bring about the desired development cannot be static" (Ememe et al, 2013, p. 277). Since knowledge evolves as new concepts, issues and ideas arise, the ongoing professional development of teachers is imperative.

Schwab (1983) acknowledges the critical role of the teacher. In considering any curriculum changes or teaching practices, he gives two reasons why the teacher must be consulted. The first, he argues, is that the teacher knows the children best.

> The children of the school as learners: their behavior and misbehavior in classrooms: what they take as "fair" or "unfair" in the course of teaching-learning: what rouses hopes, fears, and despairs with respect to learning: what the children are inclined to learn: what they disdain and what they see as relevant to their present or future lives, are better known by no one than the teacher. It is he who tries to teach them. It is she who lives with them for the better part of the day and the better part of the year. (Schwab, 1983, p. 245)

According to Schwab's argument, teachers take time to know their students well. Although this is certainly the 'best case scenario', it is perhaps unrealistic to believe that teachers, despite their best intentions, know the hopes, fears and learning interests of all their students.

The second reason for insisting that the teacher be consulted is that "teachers will not and cannot be merely told what to do" (p. 245). Schwab explains that

> teachers are not, however, assembly line operators, and will not so behave. Further, they have no need, except in rare instances, to fall back on defiance as a way of not heeding. There are a thousand ingenious ways in which commands on what and how to teach can, will, and must be modified or circumvented in the actual moments of teaching. Teachers practise an art. Moments of choice of what to do, how to do it, with whom and at what pace, arise hundreds of times a school day, and arise differently every day and with every group of students. No command or instruction can be so formulated as to control that kind of artistic judgment and behavior, with its demand for frequent, instant choices of ways to meet an ever varying situation. Therefore, teachers must be involved in debate, deliberation, and decision about what and how to teach (Schwab, 1983, p. 245).

2.2. Questions to Consider

Within the field of education, questions surrounding professional development are numerous. Questions such as 'What constitutes professional development?'; 'What models of professional development are available?'; 'What makes one model more effective than another?'; 'Who determines when and how often a teacher should participate in some form of professional development?'; 'How much should be spent on professional development?'; and 'What is the most cost effective means for professional development?' circulate among policy makers, administrators and educators. Each has his or her own agenda: policy makers see professional development as a means to introduce new innovations and shape the curriculum; administrators are concerned with the skill level of teachers; and teachers focus on the practical nature of professional development and its direct relevance to classroom practice.

Even the term 'professional development' conjures up its own set of questions. Is further training through professional development required because of a teacher's lack

of abilities, because of innovations introduced by policy makers or because of changes within the framework of education as a result of the ever-changing society in which we live? In other words, what is the purpose of professional development? Two possible purposes to consider may be to '*fix* the teacher' or to '*enlighten* the teacher'.

In considering the purpose to *fix* the teacher, the term 'professional development' implies a deficit in a teacher's abilities. Arguably, some teachers may self-identify a deficit in their abilities due to inadequate preparation in Teacher Education Programs. Taylor describes how the 'black-box' approach to professional learning is "to find gaps in teachers' knowledge and practice and then up-skill teachers in order to fill these gaps" (Taylor, 2013, p.10). This approach is based on a "deficit model of learning, which relies on an expert depositing knowledge into learners, who need to know" (p.10). Because the learning happens with little dialogue, teachers rely passively on others to transmit knowledge. Unfortunately, such an approach minimizes the intellectual capabilities of the teachers and assumes teachers need '*developing.*' Instead of the term 'professional development,' a better term to use may be 'professional learning.' 'Professional learning' recognizes the teacher's abilities and encourages ongoing learning through debate and problem solving (Taylor, 2013). The position of the learner changes from a "receiver of knowledge to [an] active participant in its creation" (Taylor, 2013, p. 10). Furthermore, as teachers engage in the learning process, they are "finding new ways to think and *be* a teacher [which] creates energy and encourages teachers to experiment more in their teaching practice" (p.14).

2.3. Purpose of Professional Development

The purpose of professional development or professional learning is not to *fix* the teacher but to *enlighten* the teacher about educational changes. One such change is the role of education. Previously, the role of education was for teachers to transmit knowledge and for students to regurgitate facts. To ensure greater student achievement and increased student motivation, current research proposes a new mode of teaching that is more student-centered and which includes project-based learning and experiential activities. The role of education is now to equip students with key competencies such as problem solving, critical thinking, inquiry, collaboration, and technological literacy (BC's

Education Plan, 2013). The area of technology also demonstrates how education has changed over time. Blackboards, for example, have been replaced with interactive whiteboards, projectors and 1:1 device classrooms. Since education is not stagnant, teachers must keep apprised of the changes. In addition, because teachers are in positions of influence and have a huge impact on society as they mould and shape the lives of children, it is imperative for teachers to stay current in the field of education while striving to find creative ways to engage the next generation. In fact, the very strength of a country's educational system is determined by the quality of its teachers (Ememe et al. 2013). So, if the purpose of professional development is to *enlighten* teachers, what is the best way to prepare teachers for changes in the educational system?

2.4. Professional Development Models

Traditionally, "the most widespread professional learning for teachers has been seminars and workshops; one-off events with universal content, targeted at a generic audience and focused on the technical or practical aspects of teaching" (Taylor, 2013, p.10). Such lectures and one-off workshops tend to be passive, decontextualized and devoid of collaboration with colleagues (Opfer & Pedder, 2010). In addition, short-term, one-off workshops are ineffective at bringing about real changes in teaching practice as there is no continuity, follow-up or ongoing feedback (Ememe et al. 2013; Lydon & King, 2009). Because of the ineffectiveness of such a model, "teachers are loathe to participate in anything that smacks of the one-day workshops offered by outside 'experts' who know (and care) little about the particular and specific contexts of a given school" (Lydon & King, 2009, p. 66). The traditional model of professional development is no longer working. "Education reform," as stated by Psalla (2013), "will, thus, require teachers to rethink classroom practice and collaborate in ways they may have never before. In addition, there is a growing consensus that traditional forms of teacher development are inadequate for addressing teachers' issues and for confronting the challenges teachers face in their everyday practice" (p. 26). Clearly, a new model of professional development is needed.

The question then remains: What is an effective method of professional development that will encourage participation and result in the growth of a teacher's

skills as an educator? To delve into this further, one must first identify the qualities of effective professional development and then explore possible models that embody these qualities.

Professional development must be relevant to the classroom context. Opfer and Pedder (2010) recommend that professional development "needs to involve teachers in more active forms of learning with a clear link to classroom teaching and learning" (p. 428). Ideally, to encourage real change in one's teaching practice, professional development should be continuous, long-term, and sustained (Opfer & Pedder, 2010). It should also be a constructive and supportive space that fosters teachers' drive to improve learning and instruction (Vetter, 2012). Schwab (1973) refers to the importance of coordinating five bodies of experience when devising new curriculum or deliberating changes in education. He reiterates the importance of the context in which the learning will take place. Understanding the milieus of the child, and in this case the teacher, is paramount to adapting to changes in education for the benefit of the children (Schwab, 1973).

Mielke and Frontier (2012) suggest "creating a system that helps teachers generates continual, accurate feedback that can enable them to improve" (p. 13). There seems to be a consensus among researchers that "effective continuing professional development programs for teachers should therefore be a well-structured, well-coordinated and detailed program that will focus on specific areas of need of the practicing teacher" (Ememe et al, 2013, p. 278). The content of the program should "include methods of teaching, student assessment, use of educational technology for instruction, co-operative learning in the classroom and in-depth study of the subject area among others" (p. 278).

2.4.1. In-service Training

Four models to deliver effective professional development that is sustained, collaborative, relevant and supportive will be considered. First, in reviewing Joyce and Shower's model (1993; 1988) of in-service training for teachers (as cited in Leblanc, 1996), the authors identified a number of teacher training components that contribute to the transfer of knowledge or skills into actual classroom practice:

1. Presentation of theory or description of skill or strategy;
2. Modeling or demonstration of skills or models of teaching;
3. Practice in simulated and classroom settings;
4. Structured, open-ended feedback (provision of information about performance);
5. Coaching for application (hands on, in-class assistance with the transfer of skills and strategies in the classroom) (p. 27).

Through their study, the authors "concluded that for maximum effectiveness of most training activities, it would be wise to include several or all the components listed" (p. 27). Moreover,

> …where continuous professional development is long term, further needs are met: critical friendship (sharing and building knowledge and skills in a supporting but challenging environment), 'vision' needs (being enabled to relate practice to theory), skill development needs, intellectual needs (e.g., engaging in systematic reading) and personal needs (increased self-esteem). (Lydon & King, 2009, p. 65)

2.4.2. Building Efficacy through Sustained, Purposeful Training

Second, DeSantis (2012) proposes a similar model that "should (1) build efficacy by scaffolding the instruction of new tasks, (2) establish long-term collaborative partnerships among teachers, and (3) include positive supervision that encourages teacher self-reflection and measures student engagement" (p. 51). He further argues that to build efficacy, the commonly used model of single workshop format leaves teachers without support as they attempt to add these newly acquired skills into their classroom instruction (p. 52). He asserts the importance of introducing concepts one at a time to increase a teacher's confidence while decreasing feelings of being overwhelmed (p. 52). According to DeSantis (2012), the key is to design professional development that allows for sustained, purposeful training while providing sufficient opportunities for self-reflection.

2.4.3. Relevant Skills-Based Training

Third, Lydon and King (2009) highlight the relevance of the professional development. They suggest that the training must "provide new knowledge, ideas and

skills relevant to the needs of the teacher [and be] delivered in a manner appropriate to the content, by a skilled practitioner" (p. 67). It is not enough for the content to be relevant; for maximum effectiveness, the training must be presented by someone who is keenly aware of the needs of the teachers. In addition, the best training occurs when innovations are supported by school management and when teachers have time and space away from the pressures of the classroom to experiment, reflect, and explore with colleagues (Lydon & King, 2009).

Although each of the first three models has slight variations and emphasis, common elements emerge. When skills taught by an experienced presenter in small, manageable chunks in an atmosphere that values collaboration, self-reflection, practice time and constructive feedback, a change in the teacher's ability level and confidence are most likely to occur. Additionally, effective professional development will result in a greater chance that the new innovation, technology or curriculum will be adopted.

2.4.4. Action Research

The fourth model to consider is action research. Action research also embodies the qualities suggested by the current literature for effective professional development, but tends to be more teacher-driven or teacher-initiated than the first three models. As demonstrated through research, change is most likely when it is initiated by the teacher in a 'bottom-up' approach, as opposed to required and demanded in a 'top-down' approach. Tyack and Cuban (1995) reiterate that when educational reformers "focus on ways to improve instruction from the inside out rather than the top down" (p. 134), more lasting change results.

Empowerment

Although action research initially became popular through the work of Lewin, as cited by Klein, (2012) "and his articulation of the action research process (planning, acting, observing, and reflecting) and Corey's seminal work that helped to mainstream action research into the field of education" (p.1), it is making a significant resurgence. The motivation for participating in action research is driven by teachers' desire to "improve the quality of teaching and learning as well as the conditions under which teachers and students work in schools" (Altricher, Feldman, Posch & Somekh, 2008,

p.4). Action research is professional development that begins at the bottom-level: the teachers. It is recognized that the "practitioners are in the best position to engage in inquiry about their practice" (Klein, 2012, p.3). Because action research begins with the teachers, they feel a sense of ownership and pride as they seek to improve the quality of their own teaching. The sense of empowerment, when teachers are given the opportunity to "objectively analyze and understand their own practice and have a clear vision of where they can improve" (Mielke & Frontier, 2012, p. 13), is a powerful motivator for the adult learner to journey on the continuum towards expertise. The strategy within action research of "asking teachers what bothers them the most and to begin reforms there" (Tyack & Cuban, 1995, p. 139) can be an effective vehicle for encouraging educational reform. In addition, because action research "is typically conducted in natural settings (schools, communities, and organizations) where a researcher is concerned about a particular issue of practice" (Klein, 2012, p. 3) the professional development is contextualized. Furthermore, action research "is intended to support teachers, and groups of teachers, in coping with the challenges and problems of practice and carrying through innovations in a reflective way" (Altricher et al., 2008, p.4). What makes this model of professional development unique is that

> these teachers are 'normal' teachers who reflect on their practice to strengthen and develop its positive features. They are not prepared to accept blindly the problems they face from day to day, but instead they reflect upon them and search for solutions and improvements. They are committed to building on their strengths and to overcoming their weaknesses. They wish to experiment with new ideas and strategies, rather than letting their practice petrify (Altricher et al., 2008, p.4).

Action research is not a prescriptive method of techniques and "how-to's," but a "continuing effort to closely interlink, relate and confront action and reflection, to reflect upon one's conscious and unconscious doings in order to develop one's actions, and to act reflectively in order to develop one's knowledge" (Altricher et al., 2008, p. 6).

Self-Reflection

This element of self-reflection, common in action research, is a critical element in developing one's skills. Unfortunately, self-reflection is often missing in many professional development experiences. One suggested tool for self-reflection is diary

keeping. Psalla's (2013) describes how "diary keeping prompted the teacher to reflect on issues and concerns that were previously unarticulated or have never been carefully considered" (p.30). For Psalla, diary keeping "illuminated the teacher's insights about her own teaching, fostered reflection on her own teaching practices and helped her uncover significant variables that would otherwise have gone unnoticed. The teacher diary documented her professional growth and her struggle to become a better educator (p.34). Simply thinking on one's teaching practices, however, will not bring about much real change in one's practice. According to Hamilton (2012), "there must also be purpose and subsequent action associated with reflection which includes deliberation as well as making choices and decisions about possible courses of action" (p. 46). This process of reflecting on what works in the classroom and why is an excellent starting point to setting personal goals for one's own improvement.

Self-reflection can be taken one step further to include peer collaboration. Reflection, in combination with "collegiality, collaboration and critical dialogue with peers" (Hamilton, 2012, p. 56) can be very beneficial in changing one's teaching and learning practices. This idea of constructive feedback or critical dialogue is another significant element often lacking in traditional modes of professional development. Although classroom observations were traditionally used for evaluative judgments of staff, they can become a useful method of stimulating growth in teachers. Previously, observations were conducted by administrators and were based on a prescribed list for the purpose of identifying what the teacher is doing right or wrong (Psalla, 2013). Peer-observations, on the other hand, can be an excellent method to provide valuable feedback. Following a case study of English teachers in Greece, Psalla noted that peer observations "provided [the participating teachers] with a richer understanding of teaching and enabled them to come up with more effective solutions to improve their classes" (Psalla, 2013, p. 34). Psalla (2013) recommends that for maximum effectiveness, peer-observations should include a pre-observation and post-observation meeting between two teachers who welcome collaboration and have established a trusting, non-judgmental relationship (p. 34).

Observation

The notion of peer-to-peer observations as a form of professional development is gaining popularity as researchers recognize the value of embedding professional development within the teacher's own school context. The difference in embedded professional development is the change in emphasis from an expert swooping in to 'develop' the teachers in a situation removed or extracted from their day-to-day context to one that "emphasizes localized professional learning opportunities…[that] exist in nested systems of schooling, contexts, and teaching" (Hamilton, 2012, p.43). Collaboration among colleagues within one's school is in direct contrast with traditional forms of professional development in which the 'expert' relays the information to a passive, unknowledgeable audience. The vertical lines of a hierarchy of knowledge are replaced with horizontal lines of communication among peers of equal status. As Schwab reiterates, "let us establish from the beginning the place of the scholarly member as only one among many and not the 'first among peers'" (Schwab, 1973, p. 512). The status of the observer is that of an equal, as opposed to that of an authoritarian.

In one study conducted by Hamilton, high school teachers were expected to set a goal for themselves and then choose three teachers to help meet this goal through peer observations. The process of setting goals was motivating and the time spent observing peers "enabled teachers to watch and learn from real-time, real-life teaching, unscripted and live learning from each other" (Hamilton, 2012, p. 51). In fact, "when a person identifies a specific goal and seeks out colleague experts connected to that goal, an observer may very well walk away from a peer observation with additional ideas and strategies they can apply in their own classroom" (p. 54). Schwab (1973) views this process of observation and evaluation as "an evaluation procedure in which the evaluator joins the experimental teacher in the classroom situation in which the materials are tested. Teacher and evaluator engage in an alert, sensitive watch to identify reactions and responses of children as they deal with the materials being evaluated, with a special eye for reactions and responses unanticipated in the stated intention" (p. 513). In such a process, the opinions of both the evaluator and the experimental teacher are valid and deemed necessary. Although this sounds idyllic, Hamilton cautions that this

model of peer-to-peer observation as the sole method of professional development is not without its limitations.

Hamilton (2012) describes the need for establishing a "long-term plan to develop and maintain teacher-learning communities' experiences" (p.56). Without such a plan, sustained ongoing collaboration between peers is unlikely due to the constraints of time and schedules. Another limitation of the peer-to-peer observation model stems from the participant's right to choose whom they will observe. In his research study (2012), Hamilton found that some participants admitted "that they observed their friends and those colleagues with whom they were already familiar because it was comfortable and convenient" (p. 56) and not those from whom they would learn the most. The model would need modifications "to encourage teachers to observe colleagues they do not know as well" and "to provide opportunities to observe colleagues who teach at the same times as their peers" (p.56).

2.5. The Constancy of Change in Education

Changes within the educational system are constant. Peddiwell (1939) reflects on the constancy of change in education. He strongly urges an ever-changing curriculum to meet the changing needs and demands of the community. He states that "it is to be supposed that all would have gone well forever with this good educational system if conditions of life in that community had remained forever the same" (Peddiwell, 1939, p. 33). Education is constantly changing and evolving as new research, innovations, technologies, issues and ideas come to light. "Change, however, is not easy; most people, including teachers, are afraid of change and tend to do things the way they always have" (Kurt, 2013, p. 568). To face these changes, stakeholders and policy makers must recognize that "well-designed professional development is a powerful catalyst encouraging teacher change" (Noack, Mulholland & Warren, 2013, p. 450).

Providing support that is authentic, motivating and effective is critical to preparing teachers for the constant changes within education. It is imperative for schools to "foster an atmosphere that views "terms like *practice, growth, improvement, learning*, and *effort* as assets to embrace rather than as liabilities to avoid" (Mielke & Frontier, 2012, p. 12).

It is equally important for teachers to value the process of professional learning and to continuously seek opportunities for growth. Through various experiences, deliberate practice, peer observations, reflection and constructive feedback, teachers will be better prepared to face the many changes in education. As a result of effective professional development, teachers need not be afraid of change but can revel in the excitement of how educational reforms and innovations can impact the next generation of students.

2.6. An Example of Change: Technology in Education

2.6.1. Teacher Expertise

The question of developing teacher expertise in a specific domain is an important one with respect to classroom education. Ericsson (2006), a leader in the area of developing expertise, defines this notion of expertise as "a sequence of mastered challenges with increasing levels of difficulty in specific areas of functioning" (p. 706). Although he refers to 'expert' and 'novice' as positions on a continuum of task difficulty, he cautions that 'expert' is not limited to the "pinnacle of performance" (p. 706). In considering research on teacher expertise, one may ask, "What specific qualities does an expert possess?" and "What factors contribute to the development of expertise within a specified domain?"

Palmer, Stough and Burdenski (2005) report that experts actually think and behave differently as compared to their novice counterparts (p. 14). According to Berliner, (as cited in Palmer et al., 2005), these experts are "able to access their knowledge in an efficient, fluid manner in order to address novel problems" (p. 15) as a result of countless hours of experience within a specific domain. Tsui (2009) reiterates that "constant engagement in experimentation and exploration, in problematizing the unproblematic and in responding to and looking for challenges" (p. 437) increases one's competence significantly. It is argued, however, that experience or practice alone does not result in expert status. Ericsson, Krampe and Tesch-Romer (as cited in Palmer et al., 2005) postulate the importance of deliberate practice, defined as "engagement in tasks that are at an appropriate level of difficulty and that provide the individual with multiple opportunities for the repetition of the tasks, as well as informative feedback on the

performance of these tasks so that errors may be corrected" (p. 15). In other words, the expert teacher engages in purposefully chosen tasks, calculated to improve performance.

Along with experience and deliberate practice, teacher attitude also seems to play an integral role in the development of expertise. Experts within a specific domain possess a desire for mastery (Palmer et al., 2005) that leads the individual to engage in the practice actively and purposefully (Sternberg, 1998). Furthermore, teachers who embrace an improvement plan and recognize that learning a new instructional strategy or tool may take many hours are much more likely to reach the level of expert (Mielke & Frontier, 2012). The process of becoming an expert teacher can be viewed "not as a gift bestowed on a chosen few, but a journey through a challenging, thorny pathway that requires constant pruning" (p. 12).

This idea of constant pruning or corrective feedback is another important factor to consider in developing expertise (Palmer et al., 2005). Corrective feedback, along with personal reflection, is highly effective in developing experts in a specific domain. This ability to reflect and reframe one's understanding is critical to the development of professional knowledge within a domain (Tsui, 2009).

2.6.2. Expert Teachers in Technology

It is widely accepted that quality teachers possess sufficient general pedagogical knowledge, subject matter knowledge and pedagogical content knowledge (Guerrero, 2005). However, Guerrero suggests that the domain that encompasses technology-specific aspects is sorely missing. She states that **"**while existing literature touches on areas of teacher knowledge ranging from learners to curriculum to instructional practices, nowhere do the increasingly available and widely used elements of educational technology get addressed" (p. 256).

Teachers with expertise in the use of information technology are currently in very high demand. With the brisk pace of technological change both within and outside the classroom, ongoing training for educators is required to develop such expertise. Since the technology curve seems to double every eighteen months (Reed-Swale, 2009), one

cannot assume that all teachers are familiar and comfortable with the new technology available for use in the classroom. In fact, Hicks (2011) asserts that the very nature of a teacher's job description has changed and now includes a "new job requirement – one must be tech savvy" (p. 188). However, it is not enough for teachers simply to learn the skills necessary to use the technology. It is imperative for them to "learn the skills needed to use technology as an integral and effective part of their instruction" (Guerrero, 2005, p. 258). In addition, "if the goal is for teachers to use the learning environment in non-traditional ways, to join new technology with new pedagogy or to develop collaborative knowledge building, reaching the goal requires twenty-first-century competence to be developed in the teacher" (Sipila, 2013, p. 14). In order to provide teachers with the skills necessary in embedding new technologies such as interactive whiteboards, new approaches to teacher training must be provided.

An example of the difficulties that can arise when teachers are not provided with adequate teacher training to develop technology-specific knowledge occurred in my own school. In 2008, the school building was demolished. Following eighteen months of construction, the elementary school was re-opened, complete with brand new amenities and state-of-the-art technologies. The teachers entered their new classrooms with both excitement and trepidation. Questions ensued as to how to use these new SMART Boards and how to incorporate them into their lessons. A few teachers embraced the SMART Boards willingly and engaged in deliberate practice to hone their skills. However, others simply could not face the substantial task of learning something new.

Situations such as these are not unique to this school. To keep up with increasing technological advances around the globe, more and more schools have attempted to embrace new technology, such as interactive whiteboards. However, because of cost limitations and lack of teacher training, the adoption of interactive whiteboards is often ineffective. Despite a large volume of research on how technology use in the classroom can positively influence student learning, it is not uncommon to have interactive whiteboards sitting unused due to lack of local experts within the school.

2.6.3. The Increasing Need for Technology-Specific Training

With the rapid changes within education, professional development of teachers within the realm of technology-specific knowledge must be an important focus within every educational system. According to Guerrero (2005), "when used in pedagogically appropriate ways that encourage inquiry, reasoning, contextualized learning and sense-making, technology has the potential to substantially improve student learning" (p. 258). To take full advantage of the rich learning environment provided by the integration of technology in the classroom, training in the technology-specific knowledge domain is urgently needed. According to Psalla (2013),

> education reform will, thus, require teachers to rethink classroom practice and collaborate in ways they may have never before. In addition, there is a growing consensus that traditional forms of teacher development are inadequate for addressing teachers' issues and for confronting the challenges teachers face in their everyday practice. (p. 26)

Unfortunately, in some cases, teachers are explicitly mandated to incorporate digital technology in their teaching practices without adequate training. As Yeung et al. (2012) argue,

> requiring teachers to comply with rules in using digital technology is unlikely to work as policy makers might have assumed. Instead of setting explicit requirements for teachers to follow, a more productive approach may be to enhance their competence so that they value the effectiveness of digital technology and are confident to apply it in classroom learning activities. (p. 869)

As discussed previously, the single, one-off workshops do little to develop expertise in teachers. Expertise in any area requires active participation through deliberate practice within a specific domain. In the case of technology specific knowledge, the teachers must have ample opportunities to explore and to try the new technology through a series of tasks. Demanding the implementation of technology without sufficient training does little to inspire educators to incorporate technology within their daily instruction. A more effective method, as Yeung et al (2012) suggest, is for schools to create an environment conducive to learning that "can nurture teachers'

positive attitudes towards digital technology applications and cultivate their digital technology competence" (p. 869).

In addition, to increase teacher competence and to bolster teacher support, teachers must become involved in the decision-making process regarding technology as the "leadership principals give their teachers is one of the most important factors affecting the effectiveness of technology in classrooms" (Jones, 2001) p. 59). This sense of empowerment can be a significant motivator for the adult learner.

To summarize, expert teachers in a specific domain are experienced, motivated to practice their craft deliberately, and reflective on the corrective feedback received. To increase the likelihood of the teacher participants developing expertise in their use of interactive whiteboards, the professional development experience proposed in this study allows for engagement with the technology, sufficient time to practice deliberately, personal reflection, observation of colleagues, and corrective feedback from a mentor or a coach.

3. Research Study: Methodology and Method

3.1. Research Methodology: Collaborative Inquiry

3.1.1. Grounded Theory

When a new innovation is introduced in education, the need for adequate professional development is critical to ensure its successful adoption. As the recent literature suggests, effective professional development presents skills incrementally via a trained practitioner and allows for collaboration, self-reflection, observation and practice. How can such a model gain enough momentum to combat the oft-used model of the single, one-off workshop?

Developing teacher expertise in the area of technology is an increasingly relevant topic in education. Although considerable literature has been written regarding expertise, most studies focus on the analysis of superior performance rather than on the development of expertise (Tsui, 2009). Ericsson, as cited by Tsui (2009), "has lamented the lack of systematic study of experts' development and the anecdotal nature of the evidence used in the literature on expertise" (p.423).

Grounded theory is an excellent choice of methodology to develop a model on how a teacher develops expertise in a given area. Charmaz (as cited by Rand, 2013) states that grounded theory "serves as both a way to learn about the worlds we study and a method for developing theories to understand them" (p. 230). Grounded theory is "geared towards constructing (rather than discovering) descriptive and explanatory theories" (p.230) while "providing a meaningful guide to action" (p. 231). Its goal is to investigate and generalize, rather than to form a universal predication to describe phenomena (Rand, 2013). This aspect of generalization is particularly important for this study as there are so many external variables that impact the effectiveness of professional development. Because variables such as time limitations, family

commitments, technology accessibility, and funding limitations can potentially hinder the progress of professional development, I felt it was crucial to form a generalized approach instead of a “one size fits all recommendation.”

Glaser and Strauss first developed grounded theory in 1967. Based on their work in sociology, they argued that the current methodologies were lacking as the theories developed were difficult to understand for practitioners, discounted the importance of human behaviour and social environment, and did not allow social work practitioners to apply theories in real-world situations (Oktay, 2012). "They argued for a new way to develop theory where theory would be based on empirical observation" and would be “applicable to real-world situations" (Oktay, 2012, p.14). When Glaser and Strauss first developed grounded theory, they “envisioned a collaborative theory in practise settings” (Oktay, 2012, p. 5).

Grounded theory is based on a combination of 'pragmatism' and 'symbolic interactionism.' Pragmatism emphasizes “doing what works instead of following theoretical principles” and that “unpractical ideas are to be rejected" (Oktay, 2012, p. 10). According to Mead, (as cited by Oktay, 2012) symbolic interactionism “viewed human beings as taking actions that are based on meanings shaped through social interactions" (p.10). It is fully understood that the "nature of reality is dynamic, not static [and that] the self constantly changes as the individual interprets through social interactions, takes actions and evaluates the consequences” (p. 12). The key emphasis of symbolic interactionism theory is social process and the “interaction between the individual and the environment” (p. 12). Through the work of Glaser and Strauss, other researchers such as Blumer began to seek acceptance for qualitative methods like observations and interviews.

The key components of grounded theory methodology, as identified by Glaser and Strauss, are constant comparison analysis, theoretical sensitivity, theoretical sampling, and theoretical saturation (Glaser & Strauss, 1967; Oktay, 2012). Comparative analysis is a “strategic method for generating theory” (Glaser & Strauss, 1967, p. 21). Through this process “one generates conceptual categories or their properties from evidence; then the evidence from which the category emerged is used to illustrate the concept” (p. 23). They caution, however, that the purpose of using comparative analysis

is not to “debunk, disprove, or discount the work of colleagues” (p. 22). Theoretical sensitivity, as described by Oktay (2012), is the "ability of the researcher to be analytic, that is to see what is being studied in theoretical terms and go beyond the entities themselves and to identify characteristics of these entities" (p.16). Theoretical sensitivity, as stated by Glaser and Strauss (1967), involves the researcher’s “personal and temperamental bent” and “the sociologist’s ability to have theoretical insight into his area of research, combined with an ability to make something of his insights” (p. 46). Theoretical sampling refers to the necessity to change the sample of the study as the theory is developing (Oktay, 2012). “Since the theory evolves as the study progresses, the sampling strategy changes over the course of the study” (Oktay, 2012, p. 16). The basic questions in theoretical sampling, as stated by Glaser and Strauss (1967), are “What groups or subgroups does one turn to next in data collection?” and “For what theoretical purpose?” (p.47). Theoretical saturation refers to “the criterion for judging when to stop sampling the different groups pertinent to category” (Glaser and Strauss, 1967, p. 61). This is the point at which “no new concepts are emerging, and the theory is supported by the data” (Oktay, 2012, p. 17). Although this sounds like an impossible task, Glaser and Strauss indicate (as cited by Oktay, 2012) “that not all categories and concepts need to be developed to a point of saturation” (p. 17).

In grounded theory methodology, data collection differs from the rigidity of quantitative research in that an “accurate description and verification are not so crucial when one’s purpose is to generate theory. This is especially true because evidence and testing never destroy a theory (of any generality), they only modify it” (Glaser & Strauss, 1999, p. 28). In collecting useful data, therefore, a researcher “must be flexible in his methods and in his means for collecting data from group to group” (p. 66). This flexibility opens up a whole realm of data collection methods to the researcher including action research. An example of a data collection method is the use of memo writing and field notes following the conversations in the sharing sessions. The notes are analyzed to establish as many categories as possible. In subsequent sessions, the incidents will be integrated further into the existing categories and then undergo a delimiting process in which the theory and the categories will be reduced to streamline the data (Glaser & Strauss, 1999). One benefit of grounded theory is the allowance for possible shifts in participants’ perspectives as they continue through the various professional

development experiences. In addition, grounded theory enables the researcher to incorporate new themes that may evolve through the process (Barbour, 2008).

Grounded theory shares similarities with Schwab's deliberation method. Like grounded theory, Schwab stresses the limitations of theory and emphasizes the need to delve into the practical. Although Schwab recognizes theory as an important underpinning of curriculum discussions, he introduces the arts of the practical which highlights the practice of teaching and learning with real children in real classrooms by real teachers (Schwab, 1973).

Within the process of deliberation, representatives of the four commonplaces (teacher, student, subject-matter, and milieu) collaborate to investigate a problem that emerged in relation to the curriculum. Through careful consideration of the data, solutions are constructed and alternative actions and their consequences are deliberated (Schwab, 1973; 1983).

To further this process of "debate, deliberation, and decision about what and how to teach" (Schwab, 1983, p. 245), the formation of a curricular group is recommended. Within such a curricular group, as recommended by Schwab (1983), the teachers, the principal, the students and a schoolboard or community member all play an equally important role.

The researcher in grounded theory and in action research, takes on a role within this curricular group similar to what Schwab (1983) describes as 'Chairperson'. In such a role, I searched for curricular problems through "visitation of classrooms" (p.256), reading "education journals" (p. 257), conducting classroom trials (p. 254) and facilitating collaborative conversations (p.257).

3.1.2. Action Research Theory

Lewin (as cited in Masters, 1995) proposed a theory of action research in the 1940's in which "he argued that in order to understand and change certain social practices, social scientists have to include practitioners from the real social world in all phases of inquiry" (p. 1). The use of action research has increased in educational research and can be a valuable method of building teacher competency. A component of

this research study will follow the methodological framework of action research. During the initial workshop session, participants will develop questions and topics to guide their learning and practice time. This will then become one of the focal points of their diary entries during the "classroom phase." At the conclusion of each workshop session, participants will generate guiding questions for self-reflection within their own classrooms as well as potential topics for the following workshop group sessions. The participants will also generate criteria to evaluate the effectiveness of their SMART Board lessons. Based on these discussions, the researcher will tailor the following sessions around the suggested topics and questions.

The primary goals of action research as "intended to support teachers, and groups of teachers, in coping with the challenges and problems of practice and carrying through innovations in a reflective way" (Altricher et al., 2008, p. 4) resonate with me as I also seek to improve my own skills in teaching with a SMART Board. I will be acting as collaborator and facilitator as I consider myself one of

> these 'normal' teachers, who reflect on their practice to strengthen and develop its positive features. They are not prepared to accept blindly the problems they face from day to day, but instead they reflect upon them and search for solutions and improvements. They are committed to building on their strengths and to overcoming their weaknesses. (p. 4)

Moreover, the teachers who choose to participate in this voluntary study "wish to experiment with new ideas and strategies rather than letting their practice petrify" (p. 4).

This invitation to include the teachers in the formation of enquiry questions is also emphasized in Schwab's deliberation model (1983). As teachers are given a voice within the development of curriculum, they are less likely to "feel decisions as impositions" (p. 245) and are empowered to play a vital role in curriculum development or changes.

Action research was chosen for the 'classroom phase' as it affords opportunities for learning since "the premise underlying action research in education is that practitioners are in the best position to engage in inquiry about their practice (Klein, 2012, p. 3). It is noted that action research may "include multiple methods for gathering and analyzing data . . . such as interviews, questionnaires, and so forth" (p. 5). Peer-observation and diary keeping, as offered by Psalla (2013), "help teachers increase their

awareness of their teaching practices, promote their critical thinking, exchange ideas and collaborate for the benefit of the students" (p. 35). Regardless of the specific methods for data collection and analysis, "the desire to change practice [through action research] begins with self-awareness and a deliberate process of reflection and question posing" (Klein, 2012, p. 6).

As educational action research begins with practical questions arising out of one's practice in the classroom, the initial questionnaire and focus group asks open-ended questions regarding the biggest hindrances preventing the participants from moving forward in their skill level with SMART Board technology and suggestions as to how to move beyond these barriers. According to Sagor (as cited by Klein, 2012), this process of reviewing "current practices; [the] identification of a topic, issue or concern and the development of questions that can guide inquiry, planning, action, making adjustments, evaluation, and making informed actions" (p. 4) is a key feature in all action research models. The data is thematically coded to identify common themes which then further influence the direction of the workshop sessions and guiding questions. The spiraling nature of action research is evident through the process of reflection and the subsequent modifications to the actions taken. The data collected through the action research in the workshop and classroom phases and the data collected through the constant comparison method in the focus group phases will be continuously analyzed in a systematic way to allow generalizations to emerge.

As with any research, it is important for the researcher to consider and acknowledge potential bias in the research process regarding gender, socio-economic status and power relations. In action research, the researcher often collaborates with the participants and is actively 'learning' alongside the participants. Reflexivity through a careful exploration of feelings, attitudes and beliefs is important throughout the entire action research process. The motivations and desires of the researcher should be conveyed through honest and authentic interactions with the participants (Klein, 2012).

3.1.3. Collaborative Inquiry: A Partnership of Grounded Theory and Action Research

A collaborative inquiry, as proposed, is a reciprocal partnership of action research and grounded theory. Through action research, the collaboration between the researcher and the participants provides the means to analyze the effectiveness of a multi-session workshop format in combination with face-to-face collaboration and self-reflection as one means for professional development. The use of grounded theory aids the researcher in generating a theory of how expertise develops in educators as they move along the continuum from 'beginner' to 'expert.' As described by Rand (2013), action research and grounded theory share many similarities and complement each other. Both "make (analytical) sense of particularistic complexities; focus on empirical realities and social processes; [include] rich description, insight and elaboration resultant from questioning and reflection; emphasize action and process; surface subjectivity; [contain] families of methods; [expose] emergent (inductive) outcomes; turns personal understanding into shared knowledge; and are geared towards the interrelationship between theory and practice; and are pragmatically oriented" (Rand, 2013, p.233). Grounded theory, in effect, is a qualitative research method that "works from the data up, rather than starting with an existing theoretical framework" (Klein, 2012, p.34). In a similar manner, action research in education can be used as a 'bottom-up' approach to professional development that begins where it matters most: with the teachers and the students.

Grounded theory and action research both recognize the importance of the participant in the research process. The influence of teachers is pivotal in bringing about any change within the educational system. After all, it is the teachers who are on the 'front lines' of education and who see the immediate benefits or drawbacks of any proposed changes. Action research strategies "are process-oriented, systematic, reflective, and geared towards improvement" (Rand, 2013, p. 231). These strategies run parallel with the premise of grounded theory in that "humans actively construct their own meaning (new knowledge)" (p. 231). In further considering the developmental focus of action research and grounded theory, Rand (2013) describes how action research "is geared towards self-development [whereas] cognitive grounded theory is geared towards the development of meaning" (p. 232). She goes on to state how the

"combination of the two promises a powerful synergy to the field of practice/practitioner-focused research" (p. 232). Thus, the combination of grounded theory and action research allow for collaborative, reflective inquiry into changes within education.

As suggested by Rand (2013), action research "acts as a bridge between the world of action and the world of learning" (p. 232). Grounded theory is necessary to explore 'what is going on' and to identify idiosyncrasies within a given context. These idiosyncrasies, in turn, prompt researchers to take this knowledge a step further and to bring about some real change in the world. To use another word picture, grounded theory can be described as the head knowledge that explores the 'what' and the 'why' behind the participant's thinking; whereas, action research involves the hands and feet of the 'doing' or the practical aspects of 'how' this knowledge translates into one's practice. Both aspects are necessary and equally important in order to encourage real change.

3.1.4. Biases

Potential biases may be in operation during the course of this research study, as in any other. One of the challenges when conducting a grounded theory study is the difficulty of the researcher to set aside his or her preconceived notions and allow the data to dictate the emerging theory. For this reason, it is imperative that the researcher maintains an open mind towards the data and does not jump to any conclusions.

As the researcher, I was positioned within the familiar context of my own Grade Three classroom. In addition, several of the participants were colleagues. Because of the possibility for bias in familiar situations, it was critical that I maintain an impartial view of the participants. However, as a result of my position as a colleague, the potential influences of power relations were minimized because I was not in a position of authority over the participants.

Socio-economic class may affect the availability of professional development opportunities within educational settings. This particular study was conducted in a middle-class independent school. As a result of the financial stability of the school, the research study benefited from the support of the administration towards the professional

growth of the teachers and from access to sufficient technology. It is recognized that similar opportunities for professional development and availability to adequate technology may not be afforded in all educational contexts.

One of the tenets of action research is that the action researcher is "placed within the centre of an enquiry" (Bognar, 2013, p. 6). The researcher becomes personally invested and deeply engaged in the study. Throughout the course of this study, I take on various roles, such as Presenter, Coach, Researcher, and Learner. Within each role, there is a potential for bias as well as the potential for tension between roles. As Presenter, I need to teach the concepts and skills in using the SMART Board while still collecting the data needed. To aid in this process, the Information Technology manager at the school volunteered to audio and video record all the workshop sessions. In this way, I could transcribe the data at a later time without the distraction of presenting a workshop. As a coach, I developed a friendly relationship with the participants. As such, I may find it difficult to remain impartial. To counter this, interviews were audio-recorded for transcription and analysis. In addition, as a coach, I observed each participant in his or her own classroom setting. As most of the students in the various classes are familiar to me, it was important for me to remain as unobtrusive as possible during the observations. During the Workshop Phases of the research study, I also took on the role of Learner or Colleague. Because it appeared at times that I, as Learner, was inexperienced with the SMART Board and did not seem to know how to enact a particular skill, there was the temptation to leave these details out of the workshop. However, I deliberately included these details in my transcriptions as it demonstrates that learning is an ongoing process and is never complete. As Learner, I took part in the practice sessions and, at times, discovered new things along with the participants. I also consciously included these details in my transcriptions for analysis.

The participants also vacillated between several roles during the course of the research study. This concept of roles within the professional growth of a teacher is discussed in detail by Fessler and Christensen (1992) in reference to the competency-building stage of a teacher's career. In this stage, a teacher commonly takes on the roles of "teacher as learner, knowledge producer, coach, teacher educator, mentor, and leader" (p.104). As learner, the teachers were "developing an expertise, or learning a role, either for use in the classroom or to transmit to other staff members" (p.104). As

knowledge producers, the teachers were involved in “collaboration with other experienced professional staff members in writing new curricula or developing new teacher units” (p.105). Through peer supervision, mentorship was encouraged as teachers “joined together and served as coaches for one another” (p.105).

3.1.5. Validity

To ensure the validity of qualitative research, it is important to intentionally employ validation strategies. One strategy used was to ask the participants to review and correct the data findings and reflections (ie. member checking). In addition, considerable time was spent ‘in the field’ which further increased the validity of the data. Through the process of member checking and triangulating the data, the rigor of the data collection was increased.

Following a careful analysis of studies that used grounded theory, action research or a combination of the two, I chose a combination of these recognized approaches to qualitative inquiry. By mimicking the procedures followed, the rigor of this study was enhanced.

3.1.6. Data Collection and Preparation

To collect the data, a variety of collection procedures such as questionnaires, e-mail conversations, journal notes, field notes, observations, and recorded video and audio files were used. The video and audio files were transcribed word for word and made available to the participants for further validation. When designating codes and themes, I located evidence within several sources to corroborate the themes. This triangulating of information further provided validity to the findings.

3.2. Research Study: Method

3.2.1. Purpose

When introducing a new technology or innovation into the classroom, the professional development of educators can take many forms, such as two-hour workshops, all-day seminars, or in-service within one's school. The purpose of this study is two-fold: to determine the effectiveness of a proposed professional development model, and to investigate the development of teacher expertise in pedagogical technology. The introduction of interactive whiteboards or SMART Boards was used for demonstration purposes as the focus of the study.

Although interactive whiteboard technology was first introduced to the classroom twenty years ago, many teachers are fearful and reluctant users of this technology. Gaining proficiency with SMART Board technology can be seen as a trajectory from 'beginner' to 'expert.'

After an extensive web search for professional development on interactive whiteboards, it was abundantly clear that training for teachers in this technology-specific aspect is sorely lacking. Although the Professional Development & Community Engagement branch within the Faculty of Education at the University of British Columbia offered a two-day workshop for teachers in 2011 and 2012, nothing was available in 2013. The Faculty of Education at Simon Fraser University, the British Columbia Federation of Teachers and the local colleges did not have any advertised professional development on interactive whiteboards available in this time frame that would be open to the general population of educators.

To encourage teachers in the development of skills, Lydon and King (2009) suggest that a professional development model must:

> provide new knowledge, ideas and skills relevant to the needs of the teacher [and be] delivered in a manner appropriate to the content, by a skilled practitioner. It is collaborative and sustained, and provides teachers with opportunities for discussion and exploration with colleagues. It involves experimentation and reflection, away from the pressures of the classroom. It is likely to be most effective when coaching

> is implemented, and when innovations are supported by school management. (p. 67)

Therefore, this research study combines a multi-session workshop format, face-to-face and e-mail collaboration, observation and reflection to move teachers along the trajectory of learning towards the goal of embedding SMART Board technology more effectively into their day-to-day classroom practice.

Although this particular study focuses on pedagogical technology, a careful analysis of the data will provide a model for effective professional development that can be translated into other instructional areas and into other contexts.

3.2.2. Recruitment

For the dual purpose of providing lesson ideas for incorporating SMART Board technology into the elementary classroom and for the recruitment of interested teachers, I offered a ninety-minute SMART Board workshop on October 10, 2013. The workshop was held at a teachers' convention co-sponsored by the Christian Teachers Association of BC and Northwest Christian Schools International. Because I am an elementary teacher and am most familiar with how to incorporate SMART Board lessons into the learning at this level, the target level of recruitment was elementary school.

The description in the Convention Handbook advertised the following:

> Come and discover ways to incorporate the SMART Board in your primary classroom! This Hands-On- Learning session will arm you with tips, tools and techniques that are available to you, as well as various lesson ideas Yvonne uses in her grade three class. You will then have ample opportunity to "play" and discover how you can use the SMART Board in your own classroom. (CTABC Convention Handbook, October 2013)

Twenty three participants attended the ninety-minute introductory workshop. I had requested several SMART Boards for use during this session as it was intended to be a "hands-on" workshop. Upon arrival, I was disappointed to see only one small portable SMART Board in the designated room. Unfortunately, due to technology limitations, the format of the workshop became more 'demonstration' based with few

opportunities for the attendees to practice the skills. Despite the lack of SMART Boards for participants to use for practice, I did receive many positive comments. Participants were excited with the information presented.

Following the workshop, I collegially invited attendees to volunteer to participate in a questionnaire (see Appendix B). Due to conflicting schedules with another workshop, five participants left early. Out of the twenty-three teachers, eight signed and returned an Informed Consent form and the corresponding Questionnaire.

The brief questionnaire aimed to collect feedback on the comfort level of the educators in using the SMART Board, their access to a SMART Board and how they gained the skills needed to use SMART Boards effectively. By exploring how these educators moved further along the trajectory of expertise, I sought to propose helpful professional development opportunities that would enable educators to move further forward on this continuum of expertise.

The following descriptors were used on the questionnaire.

- No Experience: You are aware of the technology but have not had the opportunity to try it out
- Beginner: You've just started to learn about this technology but your understanding is limited
- Novice: You've used this technology (i.e., SMART Boards) often and you are thinking about how to develop your skills further
- Accomplished: You often think about opportunities to use this technology and you practice your skills. You consistently use this technology. (i.e., SMART Boards)
- Expert: You consider yourself a master in using this technology and you are a role model to others

Table 3.1. Exploring Professional Development: Competency Levels with Technology, October 2013

	General Experience Level with Computers and Technology	Competency With SMART Boards (Interactive White Boards)
	Participants (*n*=8)	Participants (*n*=8)
Category	**n**	**n**
No Experience	0	2
Beginning	3	5
Novice	5	1
Accomplished	0	0
Expert	0	0

Although the majority of participants rated themselves as Novice computer 'users,' their confidence level and/or skill level with SMART Boards was lower. It is interesting to note that all participants had some previous experience with computers; however, two participants had no experience with interactive whiteboards.

Participants were asked to identify what types of activities they would find helpful to develop skills in using SMART Boards. As shown in the table below, participants most valued workshops, collaboration and time to practice.

Table 3.2. Helpful Experiences to Develop SMART Board Skills

	Helpful Experiences in Developing Skills with SMART Board Technology
	Participants (*n*=8)
Category	**n**
Workshop on the basics of how to operate a SMART Board	5
Professional Learning Community	1
Online, ongoing support	0
Time devoted to 'playing and experimenting'	5
Informal collaboration among colleagues	5
Accessing software on home computer	0

Note. Participants were not limited to only one factor but chose all factors that encouraged development in their skill level.

Two open-ended questions were included in the initial questionnaire administered in October, 2013. The first open-ended question asked participants to indicate what hindrances prevented them from moving forward on the continuum of skill level with SMART Board technology. The following comments were generated on the questionnaire:

- Available technology in my school
- Fear of losing “stuff” online
- Fear!
- Finding what you can use
- Frustration -- when it doesn’t work
- I don’t take enough time to try things out and sometimes don’t think of using it
- Just not having enough workshop opportunities
- Limited time for prep
- Slow laptop/technology which results in frustration
- Time required to set up the portable SMART Board
- Too often computers/SMART Boards don’t respond
- When I don’t use what I know, I forget it

Based on the comments provided, it is clear that these teachers feel frustrated and overwhelmed when trying to learn and apply new technology in their classrooms.

The second open-ended question asked for suggestions as to how to move beyond these barriers. The following suggestions were offered by the participants:

- Good equipment
- Have more staff learn the benefits of using a SMART Board
- Having the ability to create files at home, save and open at school
- I love the blog idea where teachers could share awesome SMART Board resources
- Making time to explore and experiment
- More trial and error
- Practice

- Pro-D

Based on these responses, it seemed that these few teachers were motived to learn and eager to move forward in their skill development. However, limited time, lack of professional development, and availability of equipment were hurdles for them.

At the end of the questionnaire, participants were invited to provide their contact information (e-mail) to indicate their interest in follow-up sessions on how to use SMART Boards in the classroom. Out of the eight teachers who signed the Informed Consent and returned their questionnaires, five teachers supplied their e-mail contact information. Unfortunately, one of these teachers resided in northern British Columbia. She specifically asked me if I was willing to fly up north to train the teachers at her school. Although conducting training in northern schools would have added depth to the research, time constraints and funding limitations prevented me from doing so.

In February, 2014 I contacted the five interested teachers. However, because I wanted to offer these follow up sessions to as many teachers as possible, I also promoted the upcoming series of workshops through the Christian Teachers Association of BC and through my own school. In total, nine teachers participated in this research study, three of whom indicated their interest at the October, 2013 Convention Workshop.

Confidentiality and Informed Consent

Prior to participating in the research study, participants were informed of the procedures, possible risks and benefits. Participants were informed that they may withdraw at any point of the study with no adverse effects or consequence. In addition, they were assured of the confidentiality of their identity as pseudonyms would be used throughout the study. (see Appendix A)

3.2.3. Approval

The initial phase of the study received approval from the Office of Research Ethics at Simon Fraser University on October 9, 2013. In addition, permission to recruit immediately following my workshop was obtained from the Executive Director of Christian Teachers' Association of British Columbia. Prior to data collection, approval

from each participant's school administrator was obtained. Approval for the subsequent phase of the study was approved by the Simon Fraser University Office of Research Ethics on March 3, 2014. Amendments to the study were approved on June 12, 2014.

3.2.4. Three Phases

This collaborative inquiry is divided into the 'workshop phase,' the 'classroom phase,' and the 'focus group phase.' Through a continuous analysis of the data in each phase of the study, the proposed model of professional development will be evaluated and a model of developing expertise in educators will emerge using a grounded theoretical approach.

Workshop Phase

The series of workshops were offered on four evenings in successive months, as it is widely recognized that one-day training sessions are ineffective in actualizing implementation within one's classroom. The dates for the sessions were negotiated by the participants to find suitable times to accommodate everyone's busy schedules. Evenings were preferable since after-school hours posed limitations due to child-care responsibilities, travel time and limited access to the nine SMART Boards in the designated host school. The content of the workshops progressed along the expertise continuum. During the first workshop session, I held an informal conversation at John Knox Christian School, using a format based on a focus group structure. Questions were posed to the participants to clarify the starting point of the action research, to identify what the participants were hoping to learn from the workshops and to develop an action plan for the collaborative learning of SMART Board technology (see Appendix C). The first session also focused on the basic functions of the SMART Board to develop an awareness of what the technology offers, as well as an introduction of how to incorporate the technology into a variety of mathematics lessons. The goals of the second session were to review the core functions, to discuss troubleshooting and to introduce how to use the technology into Language Arts lessons. The third session included advanced features of the software and the web-accessible lessons. The goal of the fourth session was to teach participants how to incorporate all the features learned

so far to create their own lessons. Throughout the sessions, there were ample opportunities for self-reflection, collaboration and discussion.

In addition to the four 3-hour workshop sessions, I provided my e-mail address so that participants could ask questions, seek feedback and share ideas with the group. During the month between each workshop session, the participants were encouraged to keep a diary to reflect on their use of the SMART Board in their own classrooms.

Focus Group Phase

This phase of the study is based on the grounded theory paradigm, which is defined as "the discovery of theory from data systematically obtained from social research" (Glaser & Strauss, 1999, p. 2). However, strict adherence to grounded theory is not entirely practical when using focus groups. To maximize the effectiveness and efficiency of focus groups, Barbour (2007) suggests the use of "a pragmatic version of grounded theory, which recognizes the need for some statement of focus and intent" (pp. 119-120). Thus, as group facilitator, I approached the group discussions with a basic outline of key questions and then allowed the conversation to flow to topics of most interest and value to the participants but I anticipated that the nature of the discussions would change as participants moved on the continuum from 'beginner' to 'accomplished. (see Appendix C)

At the beginning and ending of each workshop session, participants were guided in a discussion with the intent of using "group interaction to generate data" (Barbour & Kitzinger, 1999, p. 4) and to "explore people's experiences, opinions, wishes and concerns" (p. 5). These sessions were recorded and then later transcribed. The transcriptions were then coded using NVivo 10. I anticipated that the nature of the discussions would change as participants moved on the continuum from 'beginner' to 'accomplished'.

Although I collected data in this phase through memos, notes and observations, it was important to be flexible and open to the ideas and categories that were generated through the sharing sessions. These notes and observations were then compared against one another in a fluid, nonlinear way. With the use of this constant comparison method, "keeping track of one's ideas increased the probability that the theory will be

well integrated and clear, since the analyst is forced to make theoretical sense of each comparison" (Glaser & Strauss, 1999, p. 230).

In regard to the use of focus groups and data collected through participants' diaries, I

> acknowledged that truth can – and, indeed, perhaps should – be perceived as relative. Rather than seeking to record one definitive view, qualitative research recognizes the existence of 'multiple voices' and often seeks to capture these, by, for example, illuminating the differing concerns and assumptions of professionals and the laity. (Barbour, 2007, p. 33)

In addition, "close analysis of focus group discussions may highlight inconsistencies and contradictions" (p. 31). This allowed the researcher to investigate not only *what* the participants think, but *why* they think as they do.

Classroom Phase

During the classroom phase, an interpretivist qualitative approach was used to observe and monitor changes in the teachers' familiarity and comfort level with interactive whiteboards. Through participation in the action research, the participants built on their strengths in a variety of ways while overcoming their weaknesses in this aspect of pedagogical technology knowledge. Through collaborative inquiry, the participants worked alongside the researcher to evaluate the effectiveness of a multi-session workshop format of professional development, and to formulate a theory as to how one's expertise in a specific area develops.

It was my intent to provide the participating teachers with the opportunity to observe another participant in action in his/her classroom. Following the observation, it would have been ideal for them to meet for a sharing session as 'teacher' and 'peer observer' to discuss the details of the lesson such as why the teacher used a particular lesson, how he or she felt about it, what he or she noticed about the lesson and how the level of expertise is developing. Despite several attempts at garnering financial support for release time (Teacher on Call substitution costs), the funding did not come through. As a result, the teachers were not able to observe one another in their classrooms. If this study was repeated in the future, this would be a valuable component to include.

Because the teachers were not able to observe one another in a real classroom setting, I looked for creative ways to mimic this experience. During my own classroom lessons, I videotaped small snippets of my own lessons to show the participants a “real life example” of SMART Board lessons. At the request of one of the participants in the study, I donned the role of ‘Teacher’ and ‘taught’ the participants in a mock lesson during the fourth workshop session. Although the teachers were not able to formally observe one another, collaborative conversations between participants occurred informally in the hallways, staffroom and in classrooms during break time. During these conversations, participants brainstormed ways to incorporate the skills into their own lessons and helped one another meet with success.

As part of the classroom phase, I, as coach, visited each participant’s classroom during the course of the study. The classroom observations lasted approximately thirty minutes and were followed by an interview after school between the teacher and myself. In the classroom observations, data was collected through observation notes and semi-structured interviews. During these interviews, I also had the opportunity to teach or re-teach specific skills to target areas of weakness, further developing the level of expertise. Having the opportunity to visit other classes and to observe colleagues in action is a rare privilege as this is not a usual practice in schools due to financial and time limitations. Visiting various classes to collect data for my Masters was an enriching experience that became part of my own professional development.

A third opportunity for learning in this phase was through self-reflection. During the weeks between workshop sessions, participants were encouraged to record their observations in a diary format. Diaries, as described by Altricher et al. (2008) “allow for the recording of data through participatory observation, conversations, interviews, ideas, insights and personal reflections (p. 12). A sample chart was provided as an example of how to track one’s use of the SMART Board and for recording personal observations (see Appendix D). However, participants were encouraged to record their reflections and personal learning in the method that would be most helpful for them.

During the month between the sessions, participants were encouraged to practice the skills learned at the workshop. Their own classroom became their “trial and error” platform as they attempted to put their new skills into practice. At the onset of each

subsequent workshop session, participants met for a sharing session (focus group format). Participants shared what lessons they had tried, including their successes and failures. Information gathered from the sharing sessions in the workshop phase were then used to guide the classroom observations, to monitor the changes in the teacher's growing level of expertise and to guide the skills presented at the next workshop. Furthermore, during the sharing sessions, ideas were generated as to what was most helpful and what more is needed in developing expertise in a specific knowledge domain. Through such a collaborate assessment, I attempted to uncover what the teachers were thinking and doing, rather than strictly recording what was observed.

According to Altricher et al. (2008), "triangulation [usually] consists of a combination of observation and interview, whereby data on a particular situation are collected from three perspectives" (p.113). In this phase, the three corners of triangulation are the perspective of the participant (by interview and self-reflections in diary format), the perspective of the researcher (through observation within the participant's own classroom) and, where possible, the perspective of the other participants through collaborative observation. Triangulation was achieved in the following ways: I visited each participant twice during the course of the study to observe and record how and when the SMART Board was used and what barriers the teacher encountered that could then be a topic of a lesson at the following group workshop; participant's recorded their observations in the diary provided and the participants shared information through collaborative conversations throughout the study.

3.2.5. The Roles of the Researcher

During the course of the research study, I deliberately assumed different roles. In the Workshop Phase, I took on the roles of Presenter and Learner. In the literature on models of professional development, the importance of a Skilled Practitioner is discussed as a key factor when designing professional development (Lydon & King, 2009). However, I am aware of the large gap that often occurs between a skilled practitioner in technology and his or her ability to explain the information in a way that is accessible to the audience. Since I am not an expert in the area of SMART Board technology and am continuously learning new skills, I explicitly explained that I am a Learner rather than a Skilled Practitioner. When I experienced technical difficulties while

demonstrating a new skill or I could not seem to get the software to cooperate, the Workshop seemed less intimidating and less daunting for the participants. A sense of relief and an almost palpable sigh was heard several times over the course of the four months when I also experienced technical difficulties. In fact, some of the participants teased and commented that they were curious to see how I would deal with technical difficulties.

Another role I assumed during the research study is that of coach. Within educational settings, the use of a coach or a mentor is an increasingly common strategy to address the professional growth of teachers and to positively impact student achievement. The term 'coach' and 'mentor' is often interchangeable throughout the literature as both mentors and instructional coaches provide guidance and on-site training. One significant difference between the two terms seems to lie in the experience levels of the parties involved. With mentoring, there is often a hierarchical distinction between the experience levels of the mentor and the mentee. However, instructional coaching seems more likely to occur between people of similar experience levels and includes instructional modeling and a feedback loop (Stock & Duncan, 2010). For the purpose of this study, the term 'coach' will be used to signify that there is a varied range of experience levels between the participants and the researcher and to demonstrate the use of modeling and feedback.

I offered assistance via e-mail or through informal, unstructured practice time during breaks or after school hours. While visiting classrooms and observing the participants teaching a lesson using the SMART Board in the Classroom Phase, I deliberately positioned myself as Coach. Too often, observation within the school setting is used as a means of evaluation by someone in a position of authority. This practice of observation strictly for evaluative purposes imposes a sense of dread among teachers. To combat this, I reiterated several times that I was visiting classrooms to help participants develop their SMART Board skills and to collect data for my Masters' research. During Session One, I announced that I would like to come and observe each participant in the coming month. A look of panic swept over the faces of the participants. Because of their hesitancy, I reframed my original plan and did not insist on observing each participant during the first month. In Session Two, I again sought permission to observe the teachers using the SMART Board in their own classrooms. Again, I was met

with feelings of fear and apprehension. In Session Three, the subject of observation was mentioned again. By this third month, the participants now felt comfortable enough to allow me to observe a lesson. After three sessions, with a month long break in between to practice, the participants had gained enough confidence in their SMART Board skills.

Throughout the course of the study, I also take on the role of Researcher. As Researcher, I approached each workshop session, classroom visit and sharing session as a means to gather pertinent data for the study including memos, field notes, observations, and semi-structured interviews. In addition, each of the four sessions was recorded by web camera and audio recording. I later transcribed these recordings.

3.3. Procedure

3.3.1. Introducing the Participants

Nine participants initially signed up to attend the four workshop sessions spanning from March to June. Although the study sample was small, there was a considerable range in participants' age, number of years teaching and computer skill level. For the purpose of confidentiality, pseudonyms were assigned to the participants and will be used throughout the research study and the discussion of results.

Table 3.3. Demographic Information

Number of Years Teaching	Participant's Pseudonym	Gender	Current Position
1-5 years	Jonas	Male	Grade four teacher
1-5 years	Sophia	Female	Grade three teacher
6-10 years	Sarah	Female	Kindergarten teacher
6-10 years	Traci	Female	Grade three teacher
11-15 years	Isaac	Male	Grade five teacher
11-15 years	Jenny	Female	Education assistant and Project Director for a School in China
16-20 years	Whitney	Female	Grade five teacher and vice principal
21-25 years	Danielle	Female	Grade three teacher and music teacher
30+ years	Summer	Female	Grade four teacher

Out of the nine participants, two are male and seven are female. This is quite typical of the gender ratios found in elementary schools. In fact, as noted on the Service Canada website, which was updated in 2013, 12.7% of elementary teachers were male and 87.3% of elementary teachers were female.[1]

3.3.2. Pre-Assessment Questionnaire

After our initial introductions, I invited participants to complete a brief pre-assessment questionnaire to get a sense of their current skill levels with computers and with SMART Board technology (see Appendix B). In addition, I was curious to explore what type of experiences helped participants learn new skills in the past and what type of hindrances or barriers have prevented participants from progressing in pedagogical

[1] http://www.servicecanada.gc.ca/eng/qc/job_futures/statistics/4142.shtml#stats

technology skills. Two participants were absent for Session One but completed the pre-assessment questionnaires prior to attending Session Two.

Table 3.4 Exploring Professional Development: Competency Levels with Technology, March 2014

	General Experience Level with Computers and Technology	Competency With SMART Boards (Interactive Whiteboards)
	Participants (*n*=9)	Participants (*n*=9)
Category	**n**	**n**
No Experience	3	3
Beginning	1	4
Novice	3	2
Accomplished	2	0
Expert	0	0

Table 3.5 Helpful Experiences to Develop SMART Board Skills

	Helpful Experiences in Developing Skills with SMART Board Technology
	Participants (*n*=8)
Category	**n**
Workshop on the basics of how to operate a SMART Board	5
Professional Learning Community	2
Online, ongoing support	0
Time devoted to 'playing and experimenting'	4
Informal collaboration among colleagues	4
Accessing software on home computer	0
Other	4

Note. Participants were not limited to only one factor but chose all factors that encouraged development in their skill level.

Those who checked off “Other” experiences wrote the following as influential in developing their SMART Board skills:

- ½ day workshop during Bachelor of Education in 2010
- A bit of experimentation on my own
- Social media and SMART technology “commons” area and Pinterest
- Student feedback

It is interesting to note that these comments were generated by those who rated themselves as accomplished in their familiarity with computers.

In a closer analysis of the tables above, three out of nine participants identified themselves as having little or no experience with SMART Boards. Workshops, time for practice and collaboration with colleagues were identified as helpful experiences to increase one’s confidence with SMART Board technology.

As part of the initial questionnaire, I asked two open-ended questions. The first open-ended question invited participants to comment on the biggest hindrances preventing them from moving forward on the continuum of skill level with SMART Board technology. The following comments were generated on the pre-assessment questionnaire in Session 1:

- Difficult to incorporate something totally new into an already full day/classroom
- Dislike of technology/discomfort with technology
- Fear
- Hating to have the Information Technology staff to go over things again
- I haven’t taken the time to learn enough about it to feel comfortable using it with my students
- Keeping a fine line between “screen time” and purposeful viewing
- Lack of accessibility of SMART Notebook software
- Lack of familiarity with SMART Notebook software
- Lack of integration for students with special needs
- Lack of opportunity
- Lack of time to experiment with it
- Lack of time to learn and prepare lessons

- Making SMART Board use “seamless” and “intuitive” to use it as a more effective medium of teaching, rather than just a gimmick
- No time to get comfortable
- Time for planning the meaningful incorporation of SMART Board technology into lesson plans

During the initial focus group session, I asked the question, “what types of barriers do you face with the SMART Board or what kinds of problems have you found when using the SMART Board?” Two of the six participants in attendance verbally shared their thoughts, while others nodded in nonverbal agreement. Both of the participants who spoke made specific reference to their prior difficulties with the SMART Board technology. These passages were coded for ‘Fear of Technology/Technology Issues’. The passage below, as quoted from Isaac, was chosen because it was judged to be the most representative of the feelings expressed.

> I just kind of got frustrated with the SMART Notebook software. It is not that it is bad, but when I started using it, it just seemed too difficult to figure out how it all fit together. So, I put it aside and quit using it.

Common themes emerged through the comments of the participants. Lack of time and opportunity, accessibility of technology, discomfort and fear seemed to play large roles in holding teachers back from effectively integrating SMART Board technology into their classroom practice. Because the theme of barriers such as time limitations and technology issues came up frequently, ‘Fear of Technology or Technology Issues’ was identified as potentially significant.

In addition to the concerns regarding fear of technology, accessibility to technology and time limitations, a few participants were apprehensive to introduce more “screen time” into their classrooms. Before gaining a deeper understanding of interactive whiteboards, participants were wary of simply using technology for the sake of technology. It was acknowledged that children spend a considerable amount of their free time in front of various “screens.” Previous to these SMART Board sessions, a few participants had watched SMART Board demonstrations from sales people or Information Technology staff. As these presenters were not educators, the SMART Board technology was touted as “exciting”, “cool” and “fun.” Thus, some teachers were initially fearful of using the SMART Boards as a gimmick. However, it was interesting to

watch this perspective change through the progression of workshop sessions. Participants soon saw value and benefit from using SMART Board technology to create interactive lessons to effectively teach concepts.

The second open-ended question asked participants to offer any suggestions as to how to move beyond the above mentioned barriers. Suggestions offered included:

- A personal tutor would be nice, but probably impractical
- Be intentional when using the SMART Board to aid and illustrate, rather than "teaching to the Board"
- Being given the "gift of time" in these sessions
- Commitment to try out available SMART Boards at school with special needs' students
- Further practice and sharing ideas with colleagues
- Participate in workshops
- Take things slowly and try to implement sooner rather than later before forgetting what was learned
- Use the SMART Board more regularly

3.3.3. Session One: March 7, 2014

Focus Group Phase

To establish the mood that these sessions were not your typical professional development, three SMART Boards were set up and ready to go. The evening began with a Focus Group discussion over dinner. The participants were eager to begin their learning and were fully engaged during the Friday evening session.

During the focus group phase of the evening, participants shared stories and thoughts on the following topics:

- What motivated you to participate in these SMART Board workshops? Have you experienced any barriers or problems when using a SMART Board in your classroom?
- What positive and negative professional development experiences have you had during the course of your career so far?
- Have you heard of action research before? What do you know about action research? Have you had previous experience with action research? If so, please describe your experiences.

- What are you hoping to learn through the four workshop sessions?

When sharing experiences of negative and positive professional development, the participants were hesitant to speak. Two of the six participants shared. Jonas admitted that he didn't have a "large pool to draw from" as he was a relatively new teacher. Danielle's quote was coded under the parent node 'Qualities of Professional Development' and the child node 'Time for Practice'. The following quotation by Danielle described her feelings towards past professional development:

> I always think it is nice to go when you are expecting something that you can use in the following day or week in your classroom or something that tweaks the way you look at something. I think it is really disappointing when you come expecting that and then you sit there the whole time as somebody just drones on and on and on. You go, "okay, you are an educator and you are not following any of the teaching principles because you have lost your whole audience."

Although several of the teachers knew one another, it seemed fairly arduous to tease information out of the participants. It was difficult for me to surmise if this hesitancy was due to shyness or to the depletion of energy on a Friday evening after a long week of teaching.

Session One concluded with a Focus Group discussion to set personal learning goals, to generate ideas for further topics for follow-up sessions and to set a date for Session Two.

Workshop Phase

Although nine participants expressed an interest in attending the series of SMART Board sessions, due to medical complications, one was unable to attend the first session. In addition, one participant had prior commitments and was unable to attend. However, she did receive all of the workshop handouts from Session One and set a Personal Learning Goal the following week.

As Presenter, I demonstrated specific skills on the SMART Board and then paused to allow time for participants to "digest" the information and to practice collaboratively. The skills presented in Session One included the following:

- SMART Board Basic Tools
- Online Resources
- Math tools within the Gallery Essentials Component of the SMART Software

During the collaborative practice time, the activities were structured with clear instructions. For example, one practice activity was to create a five-page sequence using math tools he or she might use in the classroom. These five-page “lessons” were then presented to the collective group.

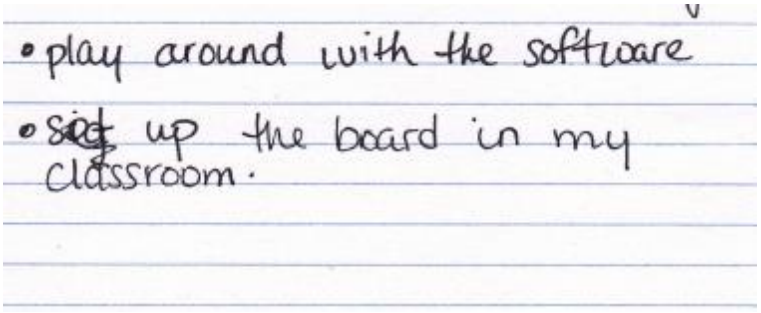
Setting Personal Learning Goals

Towards the end of the first evening, as Coach, I encouraged participants to write down a personal learning goal. The use of self-reflection through journaling or the use of a tracking sheet was explained as a helpful tool to track one’s learning goals and to reflect on one’s progress. As Coach, I then sent friendly e-mail notes throughout the coming month to remind participants of their own goals. The goals of all participants can be found in Table 4.1. However, to present an example of the potential growth in learning as evidenced in the Personal Learning Goals, I will track the goals of one participant in Figures 3.1, 3.2, and 3.3.

As Presenter, I verbalized my own goal to the group for Session Two in the following quotation:

> For the following session, I am open to whatever you want to learn. But, I thought maybe one sequential outline would be to move from subject to subject. So, we could then focus on Language Arts and then explore some tricks and tools of the SMART board. The following sessions, we will carry on from that. My goal for the very end is that you would be able to take any lesson that you currently use with a white board, chalkboard or an overhead and then adapt it for the SMART board. And, then be able to go beyond that so you can take any lesson and make it more engaging and interactive. So, my students are doing the learning and I am no longer standing at the front teaching. I want the kids to be involved in the learning.

Figure 3.1 Example of Sarah's goal card



3.3.4. Session Two: April 11, 2014

Focus Group Phase

The week prior to April 11, I sent several e-mails to remind participants of the upcoming session. Despite setting the date as a group on March 7 and sending out reminder e-mails, only seven participants were able to attend. Isaac and Whitney were absent due to an all-day class field trip to Victoria. Jonas regretfully was absent due to family commitments.

As in Session One, the workshop began with a Focus Group discussion over a warm dinner. Initially, the discussion centered on SMART Board lessons or activities that were tried during the past month in the Classroom Phase of the study. Participants shared what worked well and what challenges they experienced. After sharing updates on their personal learning goals, the discussion then turned towards the merits of using technology in the classroom.

Workshop Phase

To aid the participants in the development of their SMART Board skills, I first reviewed the key concepts covered in Session One. Following a review session and a question and answer period to clarify challenges the participants faced over the previous month, new skills were introduced. The skills introduced in Session Two included:

- Inserting a link to an attachment such as a Word document file, a video link or a website
- Using SMART Ink in Word

- Capturing images
- Language Arts activities to integrate into the classroom lessons
- An introduction to creating interactive lessons

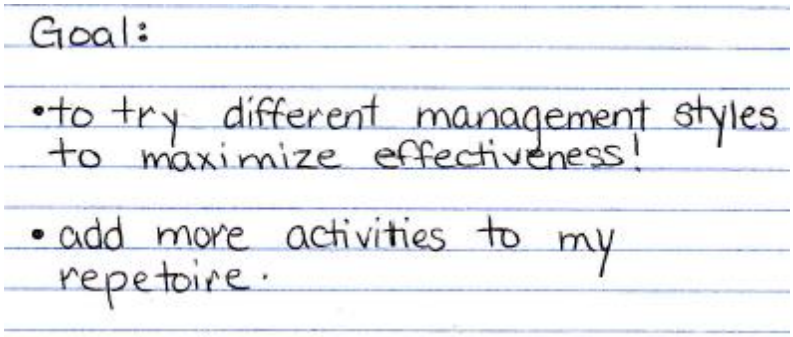
The workshop session was deliberately structured to allow for sufficient time to practice skills. As Presenter, I taught a few specific tools and techniques and then guided the participants through hands-on practice. Following the collaborative practice time, participants rejoined the whole group to share their created activities or discoveries. I then introduced progressively more difficult content before participants returned to the SMART Board for more collaborative practice time.

Setting Personal Learning Goals

As part of the study, my aim was to visit and observe each participant using the SMART Board in his or her own classroom. During the closing Focus Group, I again mentioned this part of the study. Unfortunately, participants did not feel ready at this point to be observed using the SMART Board in their classrooms.

As in Session One, I encouraged participants to write a personal learning goal and to reflect on their progress through a journal or a tracking sheet. Throughout the month following Session Two, I inquired informally or via e-mail communication as to how participants were progressing in their personal goals. The following image shows a sample goal from Session Two.

Figure 3.2 Sarah's second personal learning goal



Classroom Phase

I continued to encourage participants during the month via e-mail and informal conversations. I also met one-on-one with a few participants to help them trouble shoot or to reinforce the skills learned in Sessions One and Two.

3.3.5. Session Three: May 15, 2014

Focus Group Phase

Due to family commitments and time constraints, three participants were unable to attend. Unfortunately, these situations came up at the last minute and it was not feasible to reschedule.

Session Three began with a focus group discussion over dinner. As Presenter, I invited participants to describe a lesson using the SMART Board from the past month. Sharing lessons that worked well, as well as those that did not, increased the learning for all participants.

I then turned the conversation towards the personal learning goals from Session Two. Participants were encouraged to share about their progress and about what method of self-reflection were most helpful throughout the month.

Workshop Phase

Following the Focus Group discussion, I reviewed the more difficult skills that were introduced in Session Two. Keeping in mind the suggestions offered by the research to present skills in manageable chunks, I adapted the presentation of tools and techniques to cover the skills that participants mentioned as “challenges” in the Focus Group.

After time to practice these reviewed skills through a structured activity in collaborative groups, new skills were introduced. The following skills were modeled to the participants prior to group practice time:

- manipulating objects (grouping, cloning, and locking)
- adding interactivity (reveal; drag and drop)

- dual display and pin page tools
- video recording using SMART Software

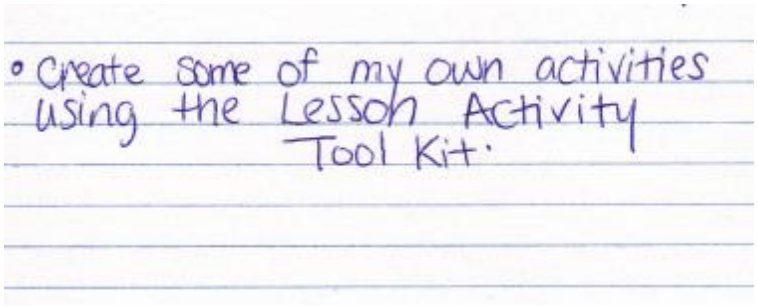
Throughout the modeling of new skills and the practice time, I encouraged the participants to think of how these skills could be applied to classroom lessons. Participants were encouraged to consider the direct relevance of these skills to their classroom and to share their ideas with the group.

In the role of Coach, I again mentioned the idea of visiting each classroom and observing a lesson using the SMART Board. Participants were now willing and dates were set for the following week.

Setting Personal Learning Goals

Towards the end of Session Three, participants were again instructed to identify a personal learning goal and to continue with their self-reflection.

Figure 3.3 Sarah's third learning goal



Classroom Phase

To increase the learning potential of the workshop sessions and to tailor skills to each participant's own learning goals, I spent time visiting each participant. The visits took place during the week of May 20. Each visit lasted approximately forty-five minutes and was followed by an interview later in the day. Positive comments and constructive feedback were written on the Observation Form and were later discussed during the follow-up interviews (see Appendix E). Because of the time constraints of a school schedule, most of the interviews took place during lunch break or after school. During the follow-up interview, I had the opportunity to re-teach specific skills or to introduce new skills relevant to the particular lesson. In addition, participants were asked several

questions related to the professional development model used in teaching the SMART Board skills (see Appendix F). Although participants initially seemed nervous to have me in the classroom, each participant did mention how beneficial this process was.

One of my other goals for the Classroom Phase was to provide the opportunity for participants to observe each other in a real classroom setting. Due to financial limitations and time constraints, this was not possible. However, to try to overcome the effects of this missed opportunity, I took short video clips of myself teaching lessons using the SMART Board. These video clips were then shown during Session Four.

3.3.6. Session Four: June 12, 2014

Focus Group Phase

All participants attended Session Four except Jonas, who had family commitments. To continue to develop collegial relationships, Session Four began with dinner and dessert. Over the meal, participants described successful and unsuccessful lessons they had tried over the past month. As participants shared challenges they had faced, others offered practical suggestions and possible solutions. These challenges and difficulties were later incorporated into my teaching during the Workshop Phase. Another topic for discussion was suggestions that would enable participants to continue their growth and learning in the coming school year.

As Coach, I inquired about the level of success in meeting their personal learning goals from Session Three and about the participants' self-reflections.

Workshop Phase

The Workshop portion of Session Four began with a review of key concepts from the earlier sessions, as well as times to practice these skills on the SMART Board. Collaborative groups were assigned a specific task to complete and then share with the larger group.

Following a review of skills previously covered, I showed a few video clips of how I use the SMART Board to teach a lesson in my own primary classroom. This then stimulated a 'brainstorming' discussion among the participants of how to incorporate the

SMART Board into their own classroom lessons. In Session Three, the participants requested that I model how I incorporate the use of the SMART Board within a whole lesson. This was a great suggestion that I had not previously thought to include in my presentation. So in Session Four, I modeled a mock lesson during the Workshop Phase in which the participants took the role of the elementary students and I took the role of the teacher. In this way, participants could visualize ways to incorporate the SMART Board effectively. Following this mock lesson, I introduced several new skills and encouraged the participants to practice in groups. Key skills taught in this session included:

- attaching sound
- animating objects
- spotlighting an object
- magnifying an area
- creating a lesson using several tools on SMART software

Classroom Phase

As Coach, I encouraged participants to continue to apply their skills by incorporating the SMART Board into their lessons. Although the school year was drawing to a close, I asked permission to visit and observe the participants as they taught a lesson using the SMART Board.

A schedule was set for observations and follow-up interviews to take place the following week. Due to the limited time left in the school year and the unpredictable nature of the last week of school, one participant requested permission to videotape her lesson and submit the file to me for feedback. Because this participant was out of town during the summer, a follow-up interview took place in August. Data was collected in this phase through observation notes, conversation highlights and interview questions.

Focus Group Phase

To close the research study, a final Focus Group discussion was held (see Appendix C).Topics for discussion included the following:

- Which aspects of the action research project were most helpful to embed SMART Board technology into your classroom teaching?
- What challenges did you experience during the project? What could have been done to make the experience a better learning experience for you?
- Has your teaching changed throughout the project? How? What factors have influenced your shifts in teaching?
- Do you have any recommendations for future projects, such as this one, that your school might initiate?

Participants shared their appreciation for the professional development opportunity. They expressed their enthusiasm in learning how to use their SMART Boards more effectively and how excited their students were with the increased use of pedagogical technology in the classroom.

During this final session, participants also completed a post assessment questionnaire and demographic survey (see Appendix G).

4. Discussion

To develop one's skills as a teacher and to keep apprised of the current research within education, ongoing professional development is necessary. However, the best ways to support teachers' professional learning and development are a matter of debate in the literature. The goal of this study was to explore a model of professional development that would inspire teachers and stimulate change in their teaching practice. As previously discussed, earlier research has demonstrated how the single, one-off workshop format is great to "whet the appetite" of teachers, but does little to cause long-term change in the classroom.

In developing this particular model for a professional development program to train teachers how to integrate SMART Board technology into their classrooms, several models were explored (DeSantis, 2012; Klein, 2012; LeBlanc, 1996; Lydon and King, 2009). The model that was then tested through field research combined the following elements:

- Presentation of knowledge by a skilled practitioner;
- Demonstration of skills that are directly relevant to the classroom;
- Sufficient time for deliberate practice in collaborative groups;
- Observation and feedback;
- Opportunities for mentoring when needed;
- Self-reflection through journaling and/or a tracking sheet.

These elements were combined to create a professional development model that extended over a four-month period. Data generated was analyzed to evaluate the effectiveness of the proposed model.

Figure 4.1 Word Frequency Query Based on Literature Articles

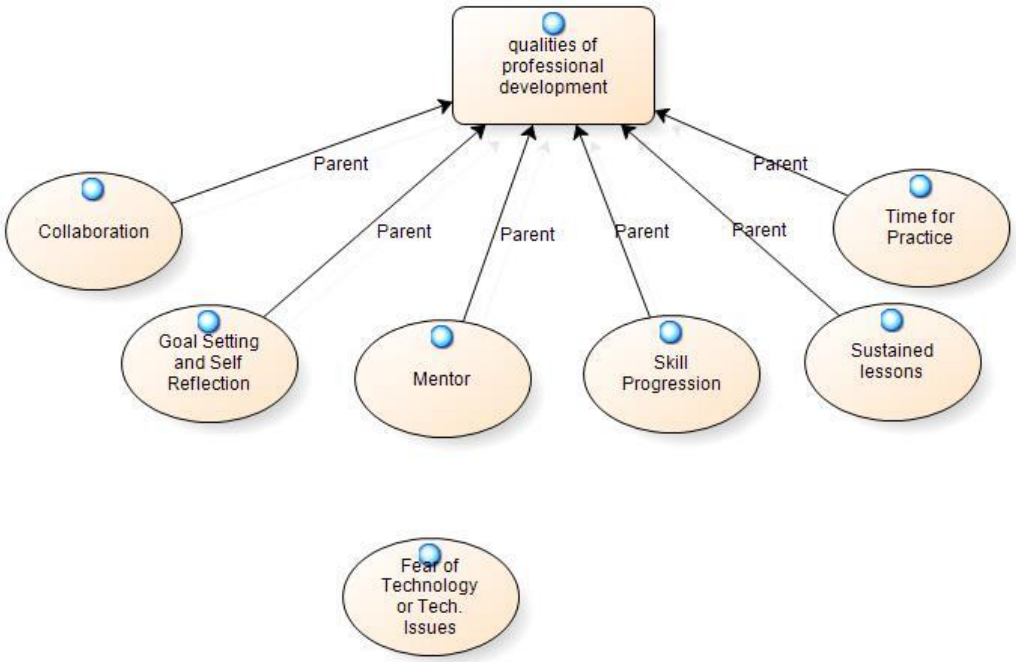
Through a closer look at the above word frequency cloud generated through NVIVO, the words “teachers” and “research” stand out prominently. This is the exact premise of Action Research as teachers are intricately involved in educational research. Further inspection also shows the importance of “teacher,” “teaching,” “professional development,” and “learning.” As shown in the word cloud, the concept of how professional development enhances one’s teaching and learning is clearly evident in the literature.

To look closely at the data generated through the use of field notes, participants’ notes, semi-structured focus groups, observations and interviews, the data was transcribed and then organized through NVIVO Qualitative Analysis Software. Based on the literature on professional development models, I initially created nodes for Collaboration, Time for Practice and Skill Progression (see Figure 4.2).

Figure 4.2 First Step of Coding

However, as I began coding, I noticed that many of these nodes were better described as child nodes under the parent node of 'Qualities of Professional Development.' In addition to the nodes depicted in Figure 4.2, 'Goal Setting and Self Reflection', 'Mentor' and 'Sustained Lessons' were then added as child nodes. In addition, because there was so much overlap, I recognized the need for a node that related to the general challenges faced by participants and the challenges specific to learning technology. As a result, the nodes 'Fear of Technology or Technology Issues' and 'Time Limitations' emerged (see Figure 4.3).

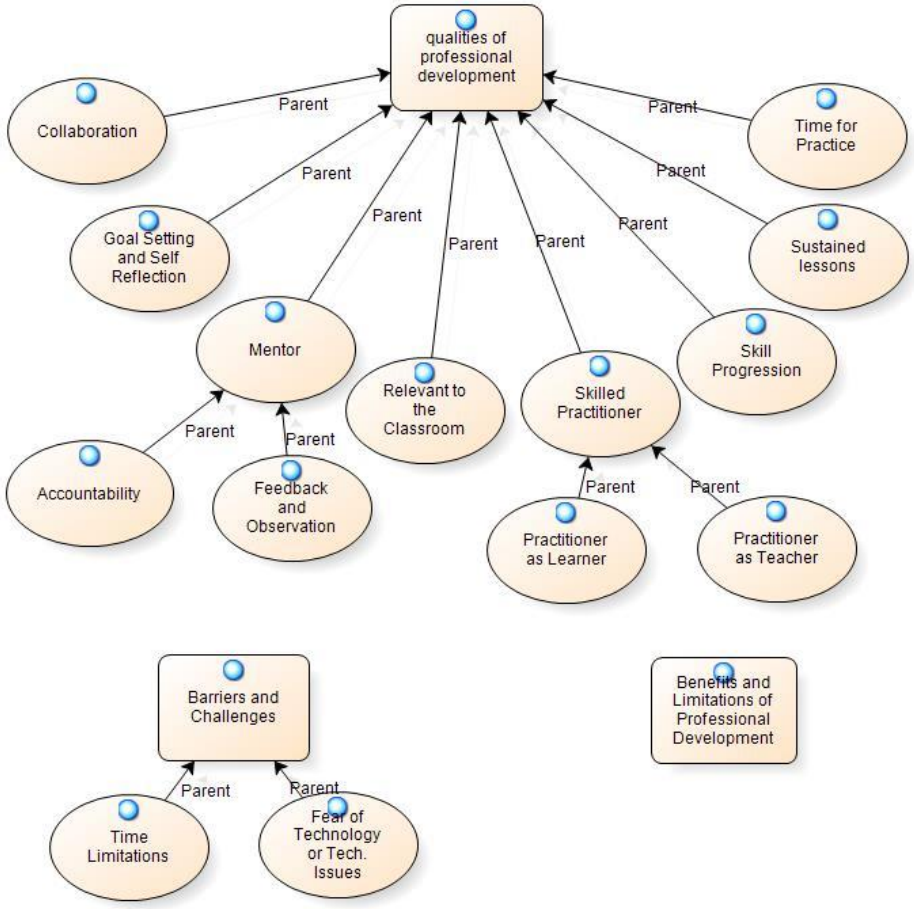
Figure 4.3 Second Step of Coding



As coding continued, I realized that other barriers and challenges were discussed, thus creating the need for a parent node called ‘Barriers and Challenges.’ This could then encompass the variety of challenges that emerged. The following were added as child nodes within ‘Barriers and Challenges’: ‘Time Limitations,’ which included factors such as ‘Family Commitments’, and ‘Fear of Technology or Technology Issues,’ which included factors such as limited access to technology, fears, and hardware/software issues. As the process of coding continued, it was also evident that new nodes were emerging under ‘Qualities of Professional Development.’ Nodes were created for ‘Skilled Practitioner.’ and ‘Relevant to the Classroom.’ Within the node of ‘Skilled Practitioner,’ two child nodes emerged through the data as the two roles of the skilled practitioner became evident. Thus, ‘Practitioner as Learner’ and ‘Practitioner as Teacher’ were created as child nodes. Within the node of Mentor, two child nodes also emerged. It became clear that the Mentor served two distinct functions: to hold participants accountable and to offer constructive feedback through observation (see Figure 4.4).

Each time a node was added, the data was analyzed again according to the emergent categories. I immersed myself in the data as I read through the transcripts in their entirety. In addition, I wrote notes and memos to record my observations throughout the process.

Figure 4.4 Third Step of Coding



4.1. Presentation of Skills

The deficit model or 'black-box' approach to professional development relies on an outside expert swooping in to deposit knowledge into the empty vessels of the workshop attendees (Taylor, 2013). The single, one-off workshop format is based on this model in which the presenter is usually an outside expert who is not familiar with the context of the attendees. He or she simply deposits information and then leaves with little opportunity for follow-up.

In this research study, it was important to avoid the traits of the deficit approach commonly seen in the single, one-off workshops. As the researcher, I also played the role of 'Presenter'. I was familiar with the context of the attendees and deliberately

positioned myself as a colleague, rather than as an outside expert. In addition, the notion of a 'skilled practitioner' is an interesting one to consider when applied to technology. Because of the rapid pace of change within technology, it is difficult for a presenter to know 'everything.' Although I did possess more skills than the participants in the area of SMART Board technology, I did not and could not know 'everything.'

Within the first Focus Group Phase of Session One, I gave the following disclaimer in the role of Presenter:

> I want to make sure that your Friday night is not a waste of time. I want this to be a time of learning and a time to practice and to have some fun. That is really my goal: that we have time to practice together and learn together. Let me tell you from the outset that I am not an expert; I am a learner. And, I am learning new things every day. Every day I try something and I think "oh, that is how it works. That is what that button does." It really is a time to play and grow your skills.

As Presenter, I described learning pedagogical technology as a journey similar to that of learning to drive a car. Although a new driver requires hours of instruction and practice, he or she is not an expert after passing the first driving test and receiving a 'New Driver' designation. Developing expertise in any area is a continuum of learning. I then invited the participants to join on this exciting continuum of learning as a journey together.

Several of the participants had expressed fear of technology and, in particular, SMART Boards. They seemed visibly relieved that I, as the Presenter, was not going to lecture as an Expert but was willing to be in a position of vulnerability and demonstrate that I was also still learning. This sense of vulnerability created a Community of Learning between the Presenter and the participants.

Reluctance to learn from an outside expert was expressed in an interview with Danielle. She stated that

> Our Information Technology guy just knows how to do these things. Maybe when people know how to do things really, really well, they are not necessarily the best at teaching that to somebody else.

The conversation continued, and Danielle again expressed her frustrations learning from an expert.

> Our IT guy had shown us some of these things. But, after one little lesson of him showing us these great things, then he would go away. I would come back a week later and I would think "I don't know how to do this." I don't even know where to start. His suggestion was just to play around with it. But, when you don't even know where to start, you don't really dare to play around with it. You don't know how to even play around with it.

Through the process of coding and analyzing the data, this theme of Skilled Practitioner was frequently discussed. In my field notes, I described my position as Presenter in the following manner:

> As I re-read all of the passages that I had coded under Skilled Practitioner, I saw a pattern emerging. The passages seemed to relate to one of two themes:
>
> Researcher as the practitioner: I am a co-learner. I positioned myself as 'still learning'. I find this stance less threatening to the participants and offer them a glimpse into how someone progresses along the continuum of novice to expert. It is a progression and I haven't fully arrived there either. This allows participants to implicitly see me as a learner. I demonstrate through my actions that it is okay not to know everything and I am not intimidated or afraid to show that I am still learning. Learning technology is a huge progression!
>
> Researcher as the teacher or instructor: I am able to explain the tools and techniques needed to operate the SMART board more effectively. I am able to structure the progression of skills needed and I am able to support my participants as learners on their own journey from novice to expert.

In summary, although it is important for the Presenter to have knowledge and skills, it is paramount for the Presenter to present skills in a manner that is relevant to the participants. In my opinion, it is more important for the Presenter to be real and authentic than to be an Expert. When designing a professional development model, it is equally important to recognize the knowledge and skills the attendees already possess. They are not an empty 'black-box' and must be validated for what they already know.

4.2. Demonstration of Relevant Skills in a Sequential Manner

In creating the series of workshops, I deliberately structured the skills in a sequential manner. As much of the information presented was new for several of the

participants, it was crucial to provide adequate scaffolding by reviewing the skills regularly and by presenting the skills in a logical order. Furthermore, as suggested by DeSantis (2012), professional development programs should “introduce new concepts one at a time and provide ample opportunities for teacher reflection” (p. 52).

The way the skills were presented was appreciated by the participants. Within the forty-four documents analyzed including classroom observation notes, email conversations, interviews, and workshop transcriptions, ninety-three references were made related to the progression of skills. The following quotes were chosen based on the percentage of coverage for this code as well as for their readability and relevance. The value of presenting skills in a sequential manner was evidenced in the following quotations:

- **First Interview with Danielle**: (17.24% of this passage coded for Skill Progression)

Danielle: What I really appreciated about your lessons is that you took everything step by step and you had really good progressions. So, we started out with introductory things and then had time to try it out and then each session we went a little bit further and tried out new things. It helped to solidify the learning and made us more confident. It helped to make it stick so when I finally had the SMART board up I know what to do with it. I didn't remember everything I learned but I had a good place to start and I felt so much better about using it. I really appreciated all of the step by step lessons.

- **Second Interview with Danielle**: (13.29% coded for Skill Progression)

Danielle: I told her [another colleague] that I really appreciated the pace that you took with us and gave us time to try it out and time to do it again if we needed to.

- **Focus Group, Session Two**: (23.91% coded for Skill Progression)

Summer: I am a new SMART Board user. In fact, when I went to use the portable, I didn't even know how to plug it in. So, I had to get help with that.

- **Focus Group, Session Four**: (2.88% coded for Skill Progression)

Danielle: I found it was helpful when you showed us, then walked us through it, and then let us go and try it. I did really find that helpful. Then the next session you reviewed it again in case we forgot which I have. It really reinforced that and now I can go ahead and do it.

- **First Interview with Isaac**: (27.44% coded for Skill Progression)

Yvonne: So, thinking about the SMART Board sessions that we've had so far, have you found it has changed how you teach in the classroom? Has it giving you some tools to go ahead with your learning?

Isaac: I think so. Unfortunately, there was a big gap because I missed the session and I didn't read the documents that you sent to me. It was a busy time. When I came to the next session, I realized I had the resources and it probably would have helped me to ask a few questions after reading them. And then when some things were a review for everyone else, I wasn't sure how to use some of those tools. For example, Jonas had done a lot of experimentation and he knew how to do a few extra things. I guess I have to get into the habit of trying more. The more I use it, the more I will become familiar with the tools.

To aid the participants through the process of learning SMART Board technology, it was important to present the skills in a sequential manner. It was interesting to notice how the conversations during the focus groups and the informal practice times changed over the course of the four-month period as participants' skill levels developed. In the beginning, the questions and comments tended to focus on the "how to" aspects of using the SMART Board. As the level of difficulty progressed, the conversations moved towards how to implement the technology into one's classroom.

The presentation of skills in a logical order helped to aid this progression from "operation" to "implementation." At this point, it was important for the Presenter to then demonstrate how the skills were directly relevant to classroom teaching practice.

In the first interview, Jonas described how his participation in the SMART Board series helped bridge the gap between the skills presented in a workshop and their relevance to his classroom.

- **First Interview with Jonas**:

Yvonne: You came into the SMART Board sessions quite tech-savvy already. Were there things that you were able to glean and pick up and learn through the process or did you find that you knew quite a lot already?

Jonas: I knew of a lot of the tools, but I guess for me, making the connection as to how to actually use it in classroom was important. For example, even something like using the highlighting function, just now it seems so obvious, but I didn't really think about it. Even something like grouping objects together, I have worked with graphic design

projects so I have grouped things together so I can move them here and keep them together. But the idea of having students move something or have a label stick to an object was one of those "why didn't I think of that?" kind of moment! I didn't learn the technology itself, but, wait a minute! I did learn some different techniques. What I really learned was how to apply it to my teaching and how to make it intuitive. I now could see how the SMART Board as a tool and I could think of how this could be beneficial for an actual lesson.

The value of integrating technology into one's classroom was also discussed during the Focus Group Phases and informal conversations among the participants. Initially, a few questioned the wisdom of introducing more "screen time" into primary classrooms. Sarah, a Kindergarten teacher, was hesitant to encourage her students to spend time viewing a screen. Although she was intrigued to know how to use a SMART Board, she needed 'proof' to see how SMART Boards could enhance her teaching and encourage interactivity. The following quotation from the Session Two Focus Group demonstrates a shift in her perception from Session One to Session Two.

- **Focus Group, Session Two**:

Sarah: I never used the SMART Board before. I had negative feelings towards them before Yvonne got me in here. I guess I just thought it was more screen time and as a primary teacher you hear so much about 'screen time'. I don't want to use more screen time. I think I am realizing that it is not the same thing as screen time because it is not moving. It is stationary and not flashing. That was a good thing to learn. I found the SMART Board in our Board room and added it to my classroom. I rearranged my whole classroom to fit it in and now it is there. My kids love it and are very excited about the fact that we are the only class in the school that has one. They are very concerned about me locking the classroom so no one steals it. So, that is a good thing, I guess.

So, we did a couple of lessons. For me, it is the management issue. They are so impatient and waiting for their turn. With twelve kids in the class, they don't get many turns. Probably, the coolest thing I did was a word study lesson where they can move words around like flashcards, almost, to build sentences. That was probably my best one.

Although the questions surrounding the purpose of pedagogical technology are valid, this issue was not the intended purpose of this study. However, through discussion among participants, it was agreed that any new educational resources must promote learning. Sipila (2013) reminds educators that

> It must also be remembered that it is the learner who should be everyone's main concern. Every change that we make in the context of learning should be made so that learning is promoted, both at individual and at systemic levels. ICT in education is not ultimately about what kind of technology is provided to teachers, it is about having the right kind of equipment on hand for the learner and providing him or her with pedagogically grounded learning methods and tools. (p. 14)

This sentiment was echoed Wallinger (1997). She cautions that "we must make it clear that technology is not the ultimate goal of our schools. Instead, technology is a tool that can help us achieve educational goals effectively" (p. 19).

Through demonstration and modeling of how the skills could be applied directly to the classroom, the participants began to appreciate the value of the SMART Board and the exciting ways in which it could enhance their teaching. As suggested by a study by Yeung et al. (2011), teachers' competence level with technology was closely related to their beliefs in the value of technology and its application to the classroom. As a result of recognition of the value of technology, the participants' motivation to continue forward on their journey of learning increased substantially.

It was interesting to note how the attitudes towards pedagogical technology changed through the course of the four-month period. In the beginning, participants were skeptical about the value of technology. During the final focus group discussion, all agreed on the educational value of integrating technology--in this case, SMART Boards--into their teaching practice. The conversation documented below highlights this change of perspective.

- **Final Focus Group, Session Four**: (12.17% coded for Relevant to the Classroom)

> **Sarah**: I think for me, it makes me think a lot about whether it [SMART Board] is a gimmick or whether or not it is enhancing my teaching. I am all excited about the attendance page. I am pretty sure that is just a gimmick! [laughter] But, I think I have been opened up to the world of what the SMART Board can do and how it can enhance lessons. I have tried it and found that. Whereas, I think if I had just gone to a one hour workshop you just get a lot of the gimmicky type of things. That is really those kind of bias I had towards SMART Boards, that it is just a gimmick. Now, I see how it can really enhance a lesson.
>
> **Yvonne**: Yes, that is a great point.

Isaac: I would definitely echo that. It was my attitude too. But, early on, I was just like "okay that is fun, but this is too much effort to go through just to have a geese fly out or whatever is fun like the randomizer." Well, I have dice and I have letters and I had their names on popsicle sticks to decide on whose turn it is. So, using the 'low-tech' things and not using the gimmick was just easier for me. All of the earlier examples I saw that stood out for me in the first workshops I went to was just the fun things I could do. The presenters just focused on the fun things but I didn't see it enhancing the educational value. It didn't seem worth my time. But, even when I practice some of these gimmicky things, I have now seen how some of them can work their way into a real lesson. Example, in the act of trying to put the donkey sound onto the picture, I have now learned how I can incorporate that into something more relevant.

Summer: I have seen Jonas showing clips to his students all of the time. I think when we are studying communities and habitats; it would be helpful to show them all of the different things that are on google are really great. It is better than even like how we used to show movies. This is little short clips that are right to the point of your lesson. I think that is not a gimmick. It will work well.

Yvonne: Right, you can incorporate it right where you are.

Danielle: I was just going to say the kids are so into technology that this really gets them excited as well. If they are interested to try it, they are learning. I found it interesting to watch you [Yvonne] demonstrate a phonics lesson. It makes me think that even the lessons that you just have to get through, that isn't really fun for the kids. You know, here is just another phonics page to do. Using the SMART Board just makes it a little bit more interesting and more hands-on. I have sixteen boys in my class and for several of them; phonics is the last thing on their mind, even when they are doing it. So, this is something that is hands-on and they can see right away if they did it or not. The only thing I find is that it takes too long for twenty-six kids to take a turn. That is the drawback. So, when the kids think 'I don't think I am getting a turn today', they start to turn off. You have to keep the lesson short and keep a list of whose turn is it next.

4.3. Time for Practice in Collaborative Groups

Two of the highlights of any professional development experience are having time to collaborate with colleagues and having time to practice the skills in a nonthreatening, inviting environment. The gift of time to explore, discuss and share ideas is an invaluable component of professional development. The spirit of collegiality was

evident throughout the evening sessions. The teachers especially enjoyed the opportunity to explore and experiment in a non-threatening environment.

The old adage that 'two heads are better than one' was certainly demonstrated through the practice times of the workshop sessions. Participants adopted a stance of vulnerability and a willingness to learn. As a result, the experience of collaboration was enriched. Each participant recognized the value of learning from one another and became aware of their own inadequacies in their SMART Board skills. Collaboration allowed for colleagues to brainstorm new ideas. Out of the thirty-five sources analyzed, eighty-five references were made to collaboration. The participants spoke often about the importance of learning from one another. The following relevant quotes exemplify the sentiments expressed.

- **First Interview with Isaac**:

Isaac: I think the collaborative approach is helpful. Trying out ideas together was a good format that you set up with the sessions. Even though we were at slightly different places, we were all trying to learn something. You would show us something and then we try it in practice. That format is pretty important for me to learn something new. I liked going back and forth between being in a group and then having time to go and practice. I liked practising right on the spot rather than waiting until a later time. I like the combination of having something immediate and then also having something for the long term.

- **First Interview with Jenny**:

Yvonne: What would you say has been one of the most helpful things that you have learned during the process of our SMART Board sessions?

Jenny: Not to be so intimidated by the SMART Board and to be more adventurous in trying things. I am generally the type of person that if I get stuck, I find someone to help me or I get rid of it. I don't really just explore myself. If I just asked someone, I can save a lot of time. Generally, I would not explore by myself but since I joined the class and there was a lot of exploring and 'hands on' and there was opportunity to practice. When I got stuck, there was somebody in my group who remembered how we did something. That really helped move me one step forward. Now when I look at a SMART Board, I don't think "hmm, no". I think "yes". I know I realize how fast I can make a lesson. This is what helped me to gain a lot of confidence and to see it as a useful tool.

Another valuable component of this professional development model was the time deliberately set aside to practice newly acquired skills. As discussed in Chapter Two, “Practice” was cited as a key element of successful professional development models (Altricher et al., 2008; DeSantis, 2012; Klein, 2012; LeBlanc, 1996; Lydon & King, 2009). This seems especially true when learning new technology. To develop self-efficacy with technology, the teachers must have frequent opportunities to master new skills (DeSantis, 2012; Hicks, 2011; Wallinger, 2012). Wallinger (2012) stresses that “teachers who do not put their new information to immediate use are likely to forget it or lose interest” (p. 18). To become proficient with new technology, teachers must have a significant amount of time for practice and learning. Hicks (2011) reminds teachers that they should “always remember that practice makes perfect. The more you use technology, the better you will be at using it and the more you will enjoy it” (p. 191).

Ericsson (2009) uses the term ‘deliberate practice’ to define the process by which expertise is reached. Specifically, ‘deliberate practice’ is designed to increase the current level of one’s performance (Ericsson, 2009). The gift of time for deliberate practice of these technological skills was mentioned often by the participants. Out of thirty-five sources, seventy-one references were coded for ‘Time for Practice’. Sophia and Summer, for example, described the importance of practice when learning new skills.

- **First Interview with Sophia**:

> **Yvonne**: In terms of professional development, what kinds of methods tend to work well for you in terms of furthering your learning or not necessarily only about SMART Boards, but any kind of professional development?
>
> **Sophia**: I think for me, as opposed to just sitting and listening, I do like it when there is interaction or group work or just time to talk to other teachers or other attendees. Or, like your workshop, where you actually get to go and practice after you listen to it. So, that helps me. Taking notes is great and I can usually go back after and figure it out. I find that does take twice as long or I find that I just never do it. I write it and then put it away. But, if you actually incorporate the discussion time or the practice time within the professional development program, then I find it is done right away. That works well for me.

- **First Interview with Summer**:

> **Yvonne**: In terms of the process of professional development, what do you find works for you? How do you learn best?
>
> **Summer**: I learn best by doing. If I do practice with you or with someone else, then I have to go and try it on my own. Then, I come back and see if I can do it again. I can't just watch someone do it and then know how to do it. It doesn't sink in, somehow.

In designing a professional development model, one must also consider the frequency of the practice sessions. For the purpose of this study, I purposely scheduled the sessions on a monthly basis to allow sufficient time to apply the newly acquired skills into their teaching and to reflect on the successful integration within the classroom. On the other hand, the professional development designer may choose to schedule blocks of time to occur more frequently to prevent "memory loss" between sessions.

One of the participants suggested that meeting more frequently may have helped build efficacy among the participants. However, scheduling practice sessions more frequently may not be feasible within a teacher's busy time table.

- **First Interview with Jenny**:

> I like to see what other people were creating and that was also very valuable online. I liked the fact that we had 'hands on' and we could show each other what we have done. I could see that there was a lot about the SMART Board that was untapped. I liked it that we had lessons once a month. Maybe once every two weeks so that would put more pressure on us to put things together and practice. For me that would have been more of a time commitment but I would learn a lot faster and get more done in a time period. In 4 months I would have 8 lessons instead of just 4. I am very keen to learn. I like learning and I want to be able to not be fearful of Technology. I want to use it for my advantage. These sessions really helped me do that with the SMART Board.

The amount of time required to master new skills varied among participants. Those with little or no prior experience with technology required more time for practice than the more 'tech-savvy' teachers. However, creating an atmosphere of collaboration encourages those with more experience to coach their colleagues. Sarah spoke about the use of her time within the practice components of the sessions.

- **Second Interview with Sarah**:

Yvonne: For the pre-assessment in terms of the SMART Board, you had rated yourself as "No Experience". After the workshop sessions, you described yourself as a "Novice" SMART Board user. Can you please tell me how you came to that conclusion?

Sarah: Kind of the same thing. I really had no experience before the workshops. When I was interacting with the group members, I had a level of confidence that others didn't have. Some had a level of fear and they really had to try it. I didn't really need to try it. I can appreciate how much time the others took to learn some of the skills. I probably could have handled less time for practice. It was totally fine because I used that time to converse with other teachers and hear their stories about how they were using the SMART Board.

When scheduling time for practice, a designer must consider the frequency of the practice times and the group dynamics (independent versus collaborative). Another factor to consider, however, is the tasks given and instructions provided. To maximize time spent in practice, the directions must be clear and target specific skills.

During one practice component in Workshop Session Three, Traci and Isaac expressed their confusion and frustration about the expectation of the practice session. Upon reflection, I realized that I had presented too many skills and had not given definite goals for each practice component.

- **Transcription of Workshop Session Three**:

Traci: Sorry, I know that is not what we are supposed to do, but I am confused.

Isaac: Practicing all of that is a little overwhelming for the moment.

4.4. Observation and Feedback

Observation and feedback are powerful tools to build expertise. When used as a tool for growth rather than for evaluation, the potential for learning is vast. Based on this premise, it was important to include observation and feedback into this proposed model for professional development.

My initial goal was to visit each classroom four times, once a month between each workshop session. The classroom observations would be followed by an interview

after school between the researcher and the teacher for constructive feedback. However, the classroom visits did not occur as planned. When the plan to visit classrooms was mentioned during the first two sessions, I was met with resistance from the participants. Although the participants were trying some of the SMART Board skills in their own classrooms, it appeared that they lacked sufficient confidence to be observed. In my field notes from Workshop Session One, I reported that "when I mentioned coming to visit and observe a lesson, the participants fell silent and looked afraid. It appeared they lacked the confidence and the skills necessary to put together a lesson".

When introducing the idea of observation as a means for growth, I tried to clearly outline the purpose to the participants. In Workshop Session Three, I stated "I was hoping to visit your classrooms at some point to help you out and observe a lesson. I am not there to evaluate you. There are no marks given. I want to support you in what you are trying. When I come in, feel free to tell me what you are trying and how I can help you" (Workshop Session Three Transcription, May 15, 2014). To alleviate the fears of the participants and to encourage them to see observation as a tool, it was important to share my intentions.

Although the participants were hesitant initially, they did permit me to come and visit after Sessions Three and Four. The participants found this to be a valuable learning experience. To enhance the learning experience, Sarah requested that I demonstrate how to teach a lesson using the SMART Board to her Kindergarten class. The following e-mail from Sarah expresses her appreciation.

- **E-mail Communication From Sarah** (May 23, 2014)

> Thank you for coming! I appreciated your input and I really enjoyed watching you teach. You have such a calm demeanor that was really wonderful to watch. The children really enjoyed your visit and G. was very sad to see that you weren't still here after music!

After each classroom visit, I met individually with each participant. Feedback was given through written notes of positive highlights and possible suggestions for improvement and through a face-to-face conversation. In reflecting on the feedback conversations, I indicated regret that I did not ask the teachers to comment on their

opinion on how their lesson went. The following memo written while coding demonstrates this sentiment.

- **Memo** (August 26, 2014)

  While coding the observation #1 notes, I regret that I didn't ask the teachers to self-reflect on their lesson. In the follow up conversation, I regret not asking "How do you think the lesson went?" "What smart board skills were you able to incorporate into your lesson?"

  I think this would have stimulated the participants to realize how much they were learning and progressing along the continuum.

Such a conversation may have stimulated the participants to realize how much they had learned and how far they had progressed along the continuum from ‘Beginner’ to ‘Expert’.

4.5. Coaching Opportunities

Mentoring or instructional coaching is a familiar strategy in the profession of education. Veteran teachers are often called upon to provide leadership to the novice teachers. With mentorship, both parties benefit: the veteran teachers hone their skills to effectively pass on their knowledge, while the novice teachers learn through the insight and experience of the veterans. The same benefits can be seen when used as part of a professional development model.

Within this study, I positioned myself as a Coach. This was a deliberate technique employed to help participants grow in their technological skills. In addition, peer coaching occurred incidentally through collaborative group activities and informal ‘staffroom’ conversations.

As Coach, I was available to answer questions and to trouble shoot during the interim period between sessions. Because I was a fellow colleague, ‘in the trenches’ so to speak, participants were not intimidated to ask questions and seek assistance. On several occasions, I, as a coach, assisted participants in setting up the SMART Board or in creating suitable lessons for the classroom. The opportunities for mentoring were

initiated most often by the participants. This allowed me to target specific skills geared to the individual participants.

As Coach, I replied to e-mail inquiries, demonstrated skills one on one within participants' classrooms and partook of informal 'hallway' conversations throughout the four-month period. The following citation from an e-mail provides insight as to the value of coaching.

- **Email Communication From Sophia** (May 9, 2014)

> The tips you've taught us have worked great! Again for me the only challenge is the time it takes to wheel the board over and set it up.
>
> Also, next week could you show me sometime how to lock the base of the board? I tried, but couldn't get the lever down and didn't want to break it so stopped trying.
>
> Thanks!

- **Email Response From Yvonne to Sophia** (May 9, 2014)

> Sure, I can quickly show you. Anytime! I wonder if you could leave the SMART board up and ready to use all the time. Where you have it in the corner is actually quite a good spot. You could move the table to the back of the room and then just call the class to sit on the floor in front of the board whenever you want to use it. Don't feel that you have to move it to the front of the room. I like calling the kids to sit in front so they are not "playing" with things in their desks and are focused on the lesson. Sometimes, they bring their pencils and notebook or paper to the "carpet" area.

Furthermore, in reply to questions about classroom management discussed during the Focus Group, I sent the following e-mail.

Email Communication from Yvonne to Sarah (May 8, 2014)

> I do find that having individual white boards for each student does help with engagement and attention. I also do find it works best when I call the class to the SMART board. I can then quickly see who is paying attention or playing with things in his/her desk. I was going to suggest another idea

> for you to try. How about this one?-create 12 numbered cards or large popsicle sticks with numbers written on it. You have a second set for yourself. When it is SMART Board time, you randomly give each child a popsicle stick or numbered card. You pull out a stick and read out the number. It is now that child's turn to come and do something. (ie.match one item...) Put your stick aside and draw the next number. The kids then know each will get a turn and their turn will be random. You just need to break down the activity into 12 mini bits of "something" so everyone has a chance. I wonder if that would work or if the kids would become too focused on "when is it my turn?"

With peer mentoring, the more proficient teachers in technology were able to offer further guidance to their colleagues. During the workshop sessions and during the interim periods between sessions, Novice or Beginner teachers were able to seek informal assistance from their peers. Participants mentioned the benefits of observing fellow teachers and asking questions. The peer mentors were also enriched by the experience of mentoring as it provided opportunities to solidify their own skills.

Peer mentors or instructional coaches need not be experts in the specific field of study. During the beginning sessions, the peer mentors tended to be those participants who had previous knowledge of general technological skills. However, the development of skills throughout the four-month period was exciting to watch. Danielle provided an excellent example of growth in pedagogical technology skills. Prior to the sessions, Danielle stated her hesitation and admitted that “I have to say that I haven’t really used my technology yet” (e-mail communication, Feb. 18, 2014). I replied with encouragement and stated, “I think it will be a great opportunity to learn from each other in a relaxed way with plenty of time to practice” (e-mail communication, Feb. 18, 2014). In the pre-assessment survey, Danielle identified herself as having ‘No Experience’ with SMART Boards. In a follow-up interview in September, 2014, Danielle shared that she was now taking on the role of instructional coach and was teaching her colleague how to use the interactive white board. Mentoring is a valuable process to stimulate growth in both the mentor or coach and the student.

4.6. Self-Reflection

Self-reflection is another valuable technique used to enhance the professional growth of educators and to develop expertise in specific areas. As cited by Bognar (2013), "Schön considered that this [self-reflection] is teaching in the form of reflection-in-action which involves thinking about "what we're doing as we do it, setting the problem of the situation anew, conducting an action experiment on the spot by which we seek to solve the new problems we've set" (p. 5). The intended purpose of self-reflection is to "change the situation for the better" (Bognar, 2013, p. 5). Self-reflection stimulates action based on the needs that arise, rather than on planned intentions.

In this study, a key component of action research is self-reflection. This was encouraged both for the participants and for the researcher. The participants were invited to record their self-reflections in whatever manner was personally most helpful. A few participants valued the use of the tracking sheets provided, while others preferred a more informal system of conversations or e-mail notes. Self-reflection was strongly encouraged; however, this aspect of the professional development model was not utilized to its full potential due to time constraints and the busy schedules of the participants.

The following conversation during the Focus Group in Session Three shows how participants prefer to reflect in different ways. It is important when designing professional development models, to allow flexibility and choice in regards to the process of self-reflection.

> **Yvonne**: So, in terms of your self-reflections, do you find it helpful to be able to think back and look at a lesson and reflect on it? Did it help you to motivate yourself to look at how you would change it or go further in your learning? Also, what kind of self-reflection did you find helpful? Were you able to do it?
>
> Did you record on an email or jot down notes or the tracking sheet? What helped you to go forward?
>
> **Traci**: I thought it would be easier to just email you, but then after I was finished my lesson, I found this tracking sheet really good. Because then I could write down any problems that I had right away. Things like that, that I wouldn't have even thought of later in the day. I could also write down what the students helped me with, such as

mistakes I made. The tracking sheet was all laid out and I could also look back on my last lesson and improve on it.

Sarah: So, knowing that this is part of your research and knowing that someone was going to ask me about it, honestly, the motivation of knowing that someone was going to ask me about it, definitely made me think more about it. And, to be honest, I am not having a lot of motivation to make new lessons these days. I am tired, the kids are grumpy. It is kind of nice that I do think each week or ever couple of days, 'oh, I haven't done that for a while, so I better try it'. Again, if there wasn't that learning as a group, I am not sure how motivated I would be all of the time.

Yvonne: Yes, I totally agree. Anyone else?

Jonas: I feel that the most beneficial question or technique was going to another teacher and having a chat about it. The recess bell rings and I quickly run to the staffroom and have a chat with anybody, really.

Yvonne: Right, I tried this and it worked or I tried that and it didn't work.

Jonas: So, I guess it is not necessarily my partner teacher. The other grade four teacher and I bounce ideas off each other all of the time and we share things. I feel that seems to be the most intuitive, I guess, or the most natural to me. I feel that the conversations stick the most. I tried to write down things in an email but I only sent one email. I feel that the conversations are the most effective for me.

Yvonne: I think we find what works for us and what is best for your learning.

As part of the process of self-reflection, participants were asked to identify learning goals each month. Because each participant was at a different stage in their technological skill level, it was important to encourage participants to set goals relevant to their own learning. The development of each participant's goals was further evidence of their growth. The table below demonstrates the increasing difficulty of the skills and the progression of the learning goals.

Summer and Danielle, for example, were beginning SMART Board users. Their initial goals centred on the technical aspects of how to set up the SMART Board and how to use the technology. As the months progressed, they became more confident with the technology and could move towards using the technology as a pedagogical tool. Jonas, on the other hand, had a fair amount of previous knowledge with the technology. As such, his goals centred more on how to incorporate the SMART Board into his teaching practice. He began with an initial goal of creating a review activity for a

mapping lesson. His final goal demonstrated his desire to rely less on traditional or “old school” methods of teaching and more on incorporating the pedagogical technology seamlessly into his daily lessons. As the participant’s confidence grew, the complexity of the goals increased; the goals became more “educationally” focused and less “how-to” focused.

Table 4.1 Personal Learning Goals

Participant	Self-Identified Goal(s) in Session 1	Self-Identified Goal(s) in Session 2	Self-Identified Goal(s) in Session 3
Danielle	-Learn to configure -Play around with the different things to do and become familiar -Make a lesson (place value)	-To have the program up and running -To try the sorting activity (text sort) and the sentence arrange activity -To experiment and try out some of the features	(absent)
Isaac	-Make a lesson on measurement (volume and capacity) for review	(absent)	- To make up some activities for math and/or science using the techniques that we went through in today's session-specifically creating quizzes and "move and reveal". -To try to do something once a week
Jenny	-To spend 15 minutes a day exploring all the different options on the SMART Board menu learning about all the basic tools and what sample lessons are available.	-Make 3 lessons for J. using the Gallery Essentials or Lesson Activity Tool Kit	-Upload an ipad video and breakdown the steps to show on a dual page to show a student the months of the year or the days of the week
Jonas	-Mapping labelling review activity: maybe a matching game or identify geographical areas -Play around with the software	(absent)	-To leave the SMART Notebook open and ready for 1 day (I find myself using "old school" methods when doing a quick intervention or explaining a concept; when upon reflection, a Gallery Activity or Notebook template would have been more effective and saveable)
Sarah	-Set up the Board in my classroom -To become more familiar with the functions/features of the SMART Board has and to apply these to my classroom	-To try different management styles -Add more activities to my repertoire	-Create some of my own activities using the Lesson Activity Tool Kit
Sophia	-To become more familiar with the functions/features of the SMART Board has and to apply these to my classroom	-Try the PDF function and highlighting	(absent)
Summer	-Counting money and making change	-To explore the Gallery Essentials and Lesson Activity Tool Kit for lessons to use	-To learn how to save (download) clips from the internet to my SMART Board file on my desktop -To learn how to copy and save pictures -To know how to organize my files
Traci	(absent)	-Try one new lesson or activity a week	-Create 2-3 interactive lessons or review activities -Try to use the dual screen and drag/reveal features of the SMART Software

Although some participants were intrinsically motivated, others appreciated the accountability offered by me, in the role of Coach. Through regular e-mails, informal conversations and scheduled observations, I encouraged participants to progress towards their individual learning goals.

Although self-reflection on the part of the participants was an important element of the professional development model, it was equally important for the researcher to be self-reflective. Throughout the process of preparation, delivery and follow-up, I reflected on the effectiveness of the sessions in the role of Presenter. Following Session Two, participants seemed overwhelmed. I then reflected and questioned what caused these feelings and realized that the scope of the learning was too large for the time allotted and that too little time had been devoted to practicing the new skills. This was further evidence of the importance of time for practice and the value of presenting skills in digestible increments.

In an effort to overcome these issues and to aid the participants in their growth, I prepared a ‘How-To-Guide’ and e-mailed it to all participants, along with the following explanation:

- **Email Communication from Yvonne to Participants** (April 13, 2014)

> I have been thinking all weekend about the session on Friday. As I reflect, I realized I may have overloaded you with way too much information and left too little time for practice. I become so excited with all the cool things you can do with the SMART Board and then I want to share it all with you. But, that is poor pedagogy when I don't allow time for you to absorb and try. To help you out, I will prepare a short "how to" guide on the things we covered. I will jot down some of the key 'features' we looked at and where to find them. That way you have something to refer to when you want to try a lesson.
>
> Next session, I will structure the session with less of me talking and way more of you 'playing' and 'experimenting'. I hope you still took some useful things away from Friday evening. I enjoyed watching you design your lessons. You created awesome pages that can be used right away in your class. Enjoy the week and happy SMART Boarding!

This process of self-reflection within action theory is not sequential, but rather evolves in a cyclical manner through the process of planning, executing and fact finding (Bognar, 2013). This evolution process was evidenced in how the structure of the workshop sessions and the process of observation and feedback changed throughout the four-month research study period as a result of self-reflection.

5. Conclusion

5.1. Implications

In qualitative research, researchers “engage in interpreting the data” by “abstracting out beyond the codes and themes to the larger meaning of the data” (Creswell, 2013, p.187). Within this process, the interpretation can be based on “hunches, insights, and intuition” (p. 187). When I drafted my research proposal and began the workshop series, my hunch was that the teachers would report significant progress in their journey from a “beginning” SMART Board user towards an “expert”. I expected to see a visible difference in results from a series of workshops in combination with the various elements in the professional development model as compared to the results of a single, one-off workshop.

On the post-assessment questionnaires, I was initially shocked and somewhat disappointed to see how the participants rated their skill level following the four-month professional development. Despite the demonstrations during the four sessions, observation and feedback, collaborative time for practice and the availability of ongoing support via mentorship, four participants rated themselves at the same place on the rating scale as before attending the four-month professional development. Because of possible inaccuracies when asking participants to estimate their competency level, another approach for future studies would be to ‘test’ their knowledge through a pretest and a post-test. During the exit interview with the participants, I explored this further.

Table 5.1 Comparison of Participant's Level of Expertise

Participant	Self-Identified Skill Level Prior to Participation	Self-Identified Skill Level Following Participation
Danielle	No experience	Beginning
Isaac	Beginning	Beginning
Jenny	No experience	Beginning
Jonas	Novice	Novice/Accomplished
Sarah	No experience	Novice
Sophia	Beginning	Beginning
Summer	Beginning	Beginning
Traci	Beginning	Beginning

The following descriptors were used in both the pre-assessment questionnaire and the post-assessment questionnaire.

- No Experience: You are aware of the technology but have not had the opportunity to try it out
- Beginner: You've just started to learn about this technology but your understanding is limited
- Novice: You've used this technology (i.e., SMART Boards) often and you are thinking about how to develop your skills further
- Accomplished: You often think about opportunities to use this technology and you practice your skills. You consistently use this technology. (i.e., SMART Boards)
- Expert: You consider yourself a master in using this technology and you are a role model to others

During the first exit interview, I listened as my participant described how she assessed her skill level. From her answers on the post-assessment questionnaire, I was aware that she chose the same descriptor as the pre-assessment questionnaire. In response to her reply, I wondered how the participants would describe their skill level on a different rating scale. Although the interview was guided by specific research questions, it was unstructured enough to allow the addition of new ideas. As a result of the natural flow of conversation, I thought of equating the participant's learning to that of a number line, in addition to the rating scale used on the Questionnaire. So, I asked

participants during the exit interviews to imagine a number line, with zero equating 'no experience' and ten equating 'expert'. The following table demonstrates their growth according to a number line scale.

Table 5.2 Comparison of Participant's Level of Expertise on a Number Line Scale

Participant	Self-Identified Skill Level Prior to Participation	Self-Identified Skill Level Following Participation	Change in Self-Identified Skill Level
Isaac	1-2	3-4	1-2
Jonas	6-7	8-8.5	1.5-2
Traci	1	3	2
Summer	1	3-4	2-3
Danielle	0	3-4	3-4
Sarah	1	5	4
Sophia	1	5	4
Jenny	1	7	6

When analyzing the growth of skill level according to a number line, substantial growth was reported by the participants. It seemed that the participants' lack of confidence played a role in their placement on the rating scale used on the pre- and post-questionnaires. Even though I personally witnessed progress in skill development, most participants still felt unsure of their skills, and thus rated themselves quite conservatively. To increase confidence levels, however, ongoing professional development through informal, collaborative, practice sessions would have been very helpful.

The substantial growth that was self-reported on the number line scale and through my observations corroborate the effectiveness of the professional development model tested in this research study.

Based on this research study, the proposed model for effective professional development that stimulates meaningful change in a teacher's practice should include the following elements:

- Sequential presentation of relevant skills by authentic presenters with in-depth knowledge of the designated context
- Sustained lessons or workshop sessions, with optional follow-up sessions
- Collaboration among colleagues
- Adequate time for deliberate practice
- Interim period between sessions to allow for self-reflection, goal setting, observation and constructive feedback
- Mentoring by knowledgeable coaches, as well as opportunities for peer mentoring

Although the aforementioned elements are important, variables such as time limitations, family commitments, available funds, and accessibility to materials, may hinder the progress of the professional growth of the teachers.

When designing a program for teacher training, it is also recommended that the model be flexible and adaptable to the specific needs of the participants. The course should be structured to include 'required' sessions and 'optional' sessions. The 'required' sessions would introduce theory, research and application to the classroom. The syllabus for subsequent sessions should identify more complex skills and target specific learning outcomes. These subsequent sessions could be optional, allowing the participants opportunity to select the sessions based on their learning needs to acquire the necessary skills and to become competent in applying the skills to their own classroom teaching. This flexibility would account for the difference in skill level prior to the professional development and would offer participants a certain degree of choice, thus preventing feelings of frustration or resentment. In addition, optional follow-up sessions could offer the dual purpose of accountability and collaborative learning. The challenges faced in using the technology could be shared with the group and become a springboard for further learning. Within the syllabus, the course material would be presented in developmentally appropriate increments and would follow a logical progression of skills. Each session would include sufficient time for practice by providing specific tasks to reinforce the skills. Time for practice is particularly important when learning technology; if you don't use the skills, you will lose them.

During interviews with participants, the following conversations implied a desire for additional sessions.

- **First Interview with Jenny**

Yvonne: Do you feel that four sessions is enough?

Jenny: Four sessions is enough to entice you. Definitely, if it is ongoing, I think it would be a lot of fun and I would learn a lot of stuff.

- **First Interview with Sophia**

Yvonne: What techniques would you find most helpful to continue your learning?

Sophia: I think it would be nice if we could have some refresher courses.

Yvonne: How often would you envision that or what would you find most helpful?

Sophia: The once a month was great but I know it is hard for you and maybe for the participants. Maybe once every two to three months would be great. Or maybe once a term just to check in.

Because time is such a precious commodity for teachers, flexibility in professional development would allow teachers to choose which sessions are best suited to their needs and to their time tables. As witnessed in this study, a variety of life circumstances, such as moving homes or a death in one's extended family, are bound to occur.

However, a trade off with offering a flexible model is the possible loss of a sense of community among participants. As seen in this study, the camaraderie that developed throughout the sessions encouraged participation and a willingness to be vulnerable when trying new skills. With a flexible model that allows participants to 'drop-in' for pertinent sessions, participants may not feel the sense of safety needed to explore and to try new things.

5.2. Limitations

Time was a major limitation to this study. A teacher's schedule is dictated by the school calendar. Because of interruptions such as Spring Break and the end of the

school year, the continuity of the long-term professional development model may have been affected. In addition, because a teacher's time table tended to be already filled with many 'extra-curricular' duties, it was difficult to schedule the workshop sessions to accommodate all the participants. Unfortunately, due to scheduling conflicts, only two of the participants attended all four sessions. This problem is indicative of the issues faced when planning professional development and added authenticity to the study and the believability of the findings.

Due to limited time, classroom observations were shorter than intended. For maximum learning and professional growth, classroom observations would ideally be longer and would allow for more detailed feedback.

The size of this study sample could be considered another limitation. However, the smaller number of participants did allow for more opportunities for mentoring, coaching and personal attention. The challenge of scheduling the workshop sessions would have increased exponentially had the number of participants been larger.

Limitations of grounded theory also need to be considered. Because the data collection occurs in an environment constructed by the researcher, it is possible that a similar study held in an alternative environment would have different findings (Creswell, 2013). Another limitation of grounded theory is the difficulty to prevent researcher-induced bias. As I was intricately connected to the study as the researcher and as the implementer of the professional development, this may have inadvertently resulted in researcher-induced bias.

Specific measures were put into place to reduce the effect of bias such as the video and audio recording of all the workshop sessions by an unbiased assistant. Through the process of viewing and transcribing these recordings, I was able to analyze the data with a fresh perspective. The results generated through grounded theory are highly qualitative in nature. As the researcher, it was important to find ways to present the findings in a manner that can be usable to others in the field of study. Through the use of qualitative data, however, I was able to provide a rich description of the participants' experiences. Selection bias is another limitation to consider. It is possible that the participants in this study chose to participate as a favour to me rather than a

genuine desire for professional development. This may have also impacted the study results as the participants already felt some sense of safety and familiarity. In addition, because the teachers were part of my research, they may have reacted in ways that were different from their norm. When considering the generalizability of my model of professional development, this potential bias needs to be taken into account.

5.3. Closing Remarks

Because education is not stagnant, expert teachers must grow and develop in an effort to find creative ways to engage the next generation. Although this model of professional development can be applied to any new educational change, adequate training for teachers within pedagogical technology is crucial. Sipilia (2013) states emphatically that "if the goal is for teachers to use the learning environment in non-traditional ways, to join new technology with new pedagogy or to develop collaborative knowledge building, reaching the goal requires twenty-first-century competence to be developed in the teacher" (p. 14). Thus, it is imperative to equip teachers with the necessary training.

Technology changes so rapidly that teachers must be prepared to learn continuously, adapt and grow in their skills. Through the use of the proposed model of professional development, program designers may be able to prepare effective training to assist teachers as they prepare to move beyond the way they have always taught and into the 21st century. However, although designers may do an excellent job of preparing stellar professional development opportunities, the fact remains that teachers must be motivated to participate. The motivation of teachers was a major theme of the Literature Review for this study. How can teachers who are stagnant and unwilling to pursue professional development be motivated to attend and fully engage? Because this question remains unanswered, further research in this area would be needed to understand fully how to increase teacher's full participation in professional development.

Another area of further research is the learning potential of pedagogical technology. During the course of this research study, the value of pedagogical technology was broached by the participants. Initially, some participants questioned how

the use of technology within the classroom enhances student learning. As with the introduction of any new educational tool, innovation or technology, it is important for educators to analyze the educational value critically. Thus, the implication of the effectiveness of pedagogical technology to increase learning is a valid question which will require further study.

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Appendices

Appendix A.

Cover Letter

SFU SIMON FRASER UNIVERSITY
THINKING OF THE WORLD

Development of Teacher Expertise with Interactive Whiteboards:

A Collaborative Inquiry using Grounded Theory

Principal Investigator: Yvonne DeWith, Graduate Student, Faculty of Education, SFU
Thesis Supervisor: Dr. Allan MacKinnon, Faculty of Education, SFU
Application Number [2014s0016]

Dear Colleagues,

Gaining proficiency with Smart Board technology can be seen as a trajectory from 'beginner' to 'expert'. When introducing a new technology or innovation into the classroom, professional development can take a variety of forms. I am conducting a research study to examine the effectiveness of a multi-session model that would allow for sufficient practice in a supportive, collaborative environment. By exploring how educators moved further along the trajectory, I hope to explore what professional development opportunities would give teachers the skills needed to use Smart Boards effectively. I would like to invite you to participate in this study.

The research study will take place between March and June, 2014. As part of the study, you would attend 4 three-hour workshops. During the first workshop, you will be given a 5 minute questionnaire to indicate your level of familiarity with Smart Boards. During the workshops, you will have the opportunity to discuss and suggest topics for the subsequent workshops and to generate guiding questions for self-reflection. In addition, you will be encouraged to keep a diary to jot down your reflections on your own use of the Smart Board in your classroom. If funding is approved, you may have the opportunity to observe another participant in action in his/her classroom and to meet to reflect on the developing expertise and on the effectiveness of the use of interactive whiteboards in the lessons. The highlights of these conversations would be written down and submitted to me, the researcher. In addition, I will visit your classroom four times during the course of the study for the purpose of further developing your skills. Please be assured that neither I, nor the participating observers, will be visiting to judge your effectiveness of a Smart Board lesson. The goal of the visits will be to collaboratively and supportively help you to move along the trajectory of learning.

As a volunteer participant, you may withdraw your participation at any time with no adverse effects on your employment status. Your identity will remain confidential throughout the study. Excerpts from the data collected may form part of the analysis about professional development opportunities, but your name will be withheld to preserve your anonymity. You may obtain copies of the results of this study, upon its completion by contacting me at […].

Any documentation collected throughout the study will be retained by me, Yvonne DeWith. The data will be stored on a memory stick which will be kept in a locked file cabinet at my home. All data will be destroyed after five years.

Permission for this research study has been obtained from Peter VanHuizen, Executive Director of Christian Schools Association of BC and from Anne Ferguson, Principal of John Knox Christian School. In addition, this research study has been approved by the Office of Research Ethics at Simon Fraser University. Once you have agreed to participate and have signed the consent form, I will contact your administrator and send him/her a letter requesting permission for your participation.

I am not aware of any potential risks associated with the study. Although there are no personal or financial benefits from participation in this study, it is hoped that the knowledge and skills gained through this study will be invaluable to you as a teacher. Such skills in this area of technology could be an excellent addition to your resume.

Attached is a research consent form necessary for participating in this study. Please read it carefully, and contact me if you have any questions or concerns. If you agree to take part in the study, please complete the attached form and submit it to me by scanning the signed copy and emailing it to me directly at […]. Once I have received your signed consent form, you will be notified about the dates of the upcoming workshop sessions (the dates are somewhat flexible depending on the schedules of all of the participants).

Thank you for your time and attention.

Sincerely,

Yvonne DeWith
Graduate Student, Faculty of Education
Simon Fraser University […]

Page **1** of **1**

Appendix B

Initial Questionnaire

SFU SIMON FRASER UNIVERSITY
THINKING OF THE WORLD

Questionnaire

Development of Teacher Expertise with Interactive Whiteboards:
A Collaborative Inquiry using Grounded Theory

Principal Investigator: Yvonne DeWith, Graduate Student, Faculty of Education, SFU
Thesis Supervisor: Dr. Allan MacKinnon, Faculty of Education, SFU
Application Number [2014s0016]

1. Think of your general experience with computers and technology. How would you describe your skill level using the descriptors listed below?

No Experience: You are aware of Smart Boards but have not had the opportunity to try one out.

Beginner: You've just started to learn about Smart Boards but your understanding is limited.

Novice: You've used Smart Boards somewhat often and you are thinking about how to develop your skills further.

Accomplished: You've often think about opportunities to use and practice your Smart Board skills. You consistently use a Smart Board.

Expert: You consider yourself a master in using Smart Boards and are a role model to others.

Level of Experience	No experience	Beginning	Novice	Accomplished	Expert
(mark an X to indicate your perceived level)					

2. Think of your competency in using Smart Boards. Where would you place yourself on the following continuum? *Use the same descriptors as listed above.*

Level of Experience	No experience	Beginning	Novice	Accomplished	Expert
(mark an X to indicate your perceived level)					

3. What experiences have helped you to arrive at that level of skill with Smart Boards?
   - ❑ *a workshop on the basics of how to operate a Smart Board and the online resources available (in-service training)*
   - ❑ *a professional learning community to learn together face to face with colleagues*
   - ❑ *online support (ongoing personal support)*
   - ❑ *time devoted to 'playing and experimenting'*
   - ❑ *informal collaboration among colleagues*
   - ❑ *accessing the software on home computers to practice*
   - ❑ *Other:* _____
   - ❑ *Other:* _____

Page 1 of 2

4. In your opinion, what are the biggest hindrances that prevent you from moving forward on the continuum of skill level with Smart Board technology?

5. Do you have any suggestions as to how to move beyond these barriers?

6. If I am able to host additional sessions, *(perhaps on an evening or a Saturday morning in Burnaby)* would you be interested in follow-up sessions to network face to face with colleagues and continue your learning of Smart Board technology?

Yes, thank you! ***No, thank you!***

If yes, please provide your contact information.

Name: _____ *School email address:* _____

Please hand this document back to me before you leave today.

Thank you for your participation.

Yvonne DeWith

[...]

Appendix C

Sample Focus Group Questions

Sample Focus Group Questions

Development of Teacher Expertise with Interactive Whiteboards: A Collaborative Inquiry using Grounded Theory

Principal Investigator: Yvonne DeWith, Graduate Student, Faculty of Education, SFU
Thesis Supervisor: Dr. Allan MacKinnon, Faculty of Education, SFU
Application Number [2014s0016]

Workshop Session #1

1. Why did you decide to participate in the Smart Board action research project supporting teachers' learning of technology?
2. What would you consider 'action research'?
3. Have you had previous experience with action research? If so, describe your experiences.
4. What are you expecting to learn through the four workshop sessions?
5. What current barriers do you face when using a Smart Board in your classroom?

Workshop Session #2 and #3

1. Describe a successful lesson using the Smart Board that you taught during the past month.
2. Describe an unsuccessful lesson. What challenges did you experience? What would you suggest to change next time?
3. How did you incorporate the lessons from the previous session into your teaching during the past month?
4. What would you like the workshop focus to be next time?
5. Did you experience any challenges when recording your anecdotal observations? How could this be changed to ensure your success?

Follow Up Focus Group Interview Questions

1. What is your overall assessment of the action research project? Would you consider the data findings accurate?
2. Which aspects of the action research project were most helpful to embed Smart Board technology into your classroom teaching?
3. What challenges did you experience during the project? What could have been done to make the experience a better learning experience for you?
4. Has your teaching changed throughout the project? How? What factors have influenced your shifts in teaching?
5. Do you have for any recommendations for future projects such as this one that your school might initiate?

Appendix D

Tracking the Use of SMART Boards in the Classroom

Tracking the Use of a Smart Board in my Classroom

Development of Teacher Expertise with Interactive Whiteboards:
A Collaborative Inquiry using Grounded Theory

Principal Investigator: Yvonne DeWith, Graduate Student, Faculty of Education, SFU
Thesis Supervisor: Dr. Allan MacKinnon, Faculty of Education, SFU
Application Number [2014s0016]

Name of Participant: _____

Today's Date	Subject Area	Focus of Study (Topic)	Group dynamics • whole class (WC) • small group (SG) • individual (I)	Type of interaction • teacher directed/led instruction (DI) • student directed instruction (SI)	Notes • How did the lesson go? • Anything you would change next time? • Level of student interest?	Any barriers or problems? • Questions you would like to ask the group at the next workshop

Page 1 of 1

Appendix E

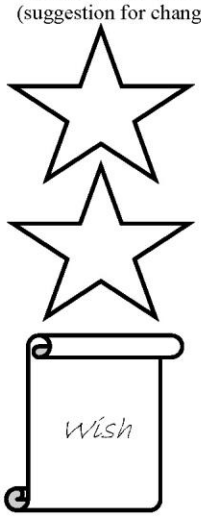
Peer Observation Conversation Highlights

Peer Observation Conversation Highlights

Development of Teacher Expertise with Interactive Whiteboards:
A Collaborative Inquiry using Grounded Theory

Principal Investigator: Yvonne DeWith, Graduate Student, Faculty of Education, SFU
Thesis Supervisor: Dr. Allan MacKinnon, Faculty of Education, SFU
Application Number [2014s0016]

Following your peer observation, please provide your colleague with two stars (compliments) and one wish (suggestion for change).



Please record the highlights of your conversation in the space below *(feel free to add additional pages)*.

What was the main focus of your conversation?

Did you find the process of observing/meeting helpful in your ongoing development of your Smart Board skills?

Peer Observer's Thoughts (Name:)	Teacher-Participant's Thoughts (Name:)

Page **1** of **1**

Appendix F

Sample Interview Questions Following Classroom Observation

Sample Interview Questions Following Classroom Observation

Development of Teacher Expertise with Interactive Whiteboards:
A Collaborative Inquiry using Grounded Theory

Principal Investigator: Yvonne DeWith, Graduate Student, Faculty of Education, SFU
Thesis Supervisor: Dr. Allan MacKinnon, Faculty of Education, SFU
Application Number [2014s0016]

Questions:

1. How did the workshop session(s) help to prepare you to use the Smart Board in your lessons?
2. Is there a certain subject area that you tend to use the Smart Board for most often? If so, what is the subject area? Why do you think you tend to choose this subject area most often?
3. Please describe one of your favourite ways to use the Smart Board in your classroom.
4. What do you find most difficult about using the Smart Board in your lessons?
5. What techniques did you find most helpful to self-reflect on your use of Smart Boards?
6. Overall, what have you found the most helpful in developing your expertise with Smart Boards?
7. If you could design a professional development model that would help teachers learn a new technique, curriculum or innovation, what would it look like?
8. Before we end our session, is there anything I can do to further assist you in developing expertise in using the Smart Board in your classroom? Are there specific techniques that you would like help with?

Appendix G

Demographic Survey and Post Assessment Questionnaire

SFU SIMON FRASER UNIVERSITY
THINKING OF THE WORLD

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Post Assessment Questionnaire and Demographic Survey

1. Your name: (for my purposes only; your name will be withheld and confidentiality will be preserved)

   _____

2. How many years have you been teaching?
   - ❑ 1-5 years
   - ❑ 6-10 years
   - ❑ 11-15 years
   - ❑ 16-20 years
   - ❑ 21-25 years
   - ❑ 26-30 years
   - ❑ 30+ years

3. What is your gender?
   - ❑ Female
   - ❑ Male

4. What is your current position at your school?

5. How long have you been at this school?
   - ❑ 1-5 years
   - ❑ 6-10 years
   - ❑ 11-15 years
   - ❑ 16-20 years
   - ❑ 21-25 years
   - ❑ 26-30 years
   - ❑ 30+ years

6. How many Smart Boards or Interactive Whiteboards are currently at your school?

7. On average, how many days (including after school sessions) in a given school year do you spend in some type of professional development?

- ❑ 1-2 days
- ❑ 3-4 days
- ❑ 5-6 days
- ❑ 7-8 days
- ❑ 9-10 days
- ❑ 10-12 days
- ❑ 13-15 days
- ❑ 15+

8. Out of those professional development experiences, what percentage (on average) is taken on your own initiative and is not mandated by your employer? (ie. You request permission to attend)

9. Think of your general experience with computers and technology. How would you describe your skill level using the descriptors listed below?

No Experience: You are aware of Smart Boards but have not had the opportunity to try one out.

Beginner: You've just started to learn about Smart Boards but your understanding is limited.

Novice: You've used Smart Boards somewhat often and you are thinking about how to develop your skills further.

Accomplished: You've often think about opportunities to use and practice your Smart Board skills. You consistently use a Smart Board.

Expert: You consider yourself a master in using Smart Boards and are a role model to others.

Level of Experience	No experience	Beginning	Novice	Accomplished	Expert
(mark an X to indicate your perceived level)					

10. Think of your competency in using Smart Boards. Where would you place yourself on the following continuum? *Use the same descriptors as listed above.*

Level of Experience	No experience	Beginning	Novice	Accomplished	Expert
(mark an X to indicate your perceived level)					

11. What experiences were most helpful to arrive at that level of skill with Smart Boards?

- ❑ *a workshop series on the basics of how to operate a Smart Board and the online resources available (in-service training)*
- ❑ *a professional learning community to learn together face to face with colleagues*
- ❑ *online support (ongoing personal support via email)*
- ❑ *time devoted to 'playing and experimenting'*
- ❑ *informal collaboration among colleagues*
- ❑ *accessing the software on home computers to practice*
- ❑ *Other:* _____
- ❑ *Other:* _____

12. In your opinion, what are the biggest hindrances that prevented you from moving forward on the continuum of skill level with Smart Board technology?

13. Do you have any suggestions as to how to move beyond these barriers and to increase your skills with Smart Board technology?

Thank you for your participation in the Smart Board Workshop Series. I hope it was beneficial for you! If you require additional assistance in using the Smart Board, please don't hesitate to contact me!

Please hand this document back to me before you leave today.

Thank you for your participation.

Yvonne DeWith […]