TEACHER CONVERSATIONS:
BUILDING A LEARNING COMMUNITY WITH INTERACTIVE WHITEBOARDS

by

Brenda Jane Lim-Fong

B.Sc., University of Alberta, 2000
B.Ed., University of Alberta, 2003

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

MASTER OF ARTS

in

The Faculty of Graduate Studies

(Curriculum Studies)

THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)

APRIL 2010

© Brenda Jane Lim-Fong, 2010
Abstract

Of the many forms of technology that is available for use by teachers with their students in the classroom, interactive whiteboards (IWBs) demonstrate considerable potential in helping to meet the needs of students with diverse learning styles and to engage students during the learning process. Integrating elements of text, graphics, sound, video and the capability of the user to physically interact with the objects on the screen, the IWB has offered an innovative approach to teaching and learning interactively.

For over five years, teachers at an elementary school in the Lower Mainland of British Columbia have expressed an interest in the innovative potential of IWB technology and have been using IWBs in their classrooms. Teachers have observed, discussed and documented multiple ways in which IWBs have supported teaching and learning.

United by a common thread to improve their skills as IWB users, a group of teachers have voluntarily come together once a month after-school. Through a mutual strong desire and curiosity to enhance student learning, teachers engaged in conversations, and discussed issues related to the use of IWB technology in their classrooms through a teacher inquiry research group.

This qualitative study identified key attributes of the Inquiry Group as well as examined how teacher conversations about interactive whiteboard technology have evolved into a learning community. Through inquiry meetings and electronic conversations on the Group’s wiki, teachers have created time to think deeply about how their practice has changed as well as share what has happened in their classrooms. Teachers have shown professional growth in their understanding about pedagogy and practice through conversations. Teachers reflected characteristics including respect, self-reflection, openness, curiosity, leadership, passion,
cooperation and a willingness to learn. Conversations about IWB use were significant in facilitating teachers’ framing of their individual professional development and building of a network. It has enabled a group of teachers to come together to learn professionally and evolve into a community of learners.
Table of Contents

Abstract................................................................................................................................. ii
Table of Contents ...................................................................................................................... iv
List of Tables ........................................................................................................................... vi
Acknowledgements ................................................................................................................ vii

Chapter One: Introduction ......................................................................................................... 1
  1.1 Technology Trends in Education ......................................................................................... 2
  1.2 The Context for the Study: Brookstone Inquiry Group and Learning Communities .......... 3
  1.3 Research Focus ..................................................................................................................... 5
    1.3.1 The Research Questions .................................................................................................. 6
  1.4 Significance of the Study ..................................................................................................... 7
  1.5 Delimitations and Limitations of this Study ......................................................................... 8
  1.6 Overview of the Thesis ......................................................................................................... 9

Chapter Two: Literature Review ................................................................................................ 11
  2.1 Overview of the Chapter ..................................................................................................... 11
  2.2 The Interactive Whiteboard ................................................................................................ 11
  2.3 Literature Review of Interactive Whiteboards ...................................................................... 13
    2.3.1 Benefits of Interactive Whiteboards .................................................................................. 15
    2.3.2 Concerns About Interactive Whiteboards ......................................................................... 16
  2.4 Classroom Learning Environment ....................................................................................... 18
  2.5 Interactivity ........................................................................................................................ 18
  2.6 Learning Conditions ........................................................................................................... 22
  2.7 Role of Technology in Education ....................................................................................... 23
  2.8 Interactive Whiteboard Considerations .............................................................................. 25
  2.9 Characteristics of Learning Communities .......................................................................... 28
  2.10 The Notion of Conversation ............................................................................................. 34
    2.10.1 Role of Conversation ..................................................................................................... 38
  2.11 Conversation, Learning Communities and Brookstone .................................................... 39

Chapter Three: Research Methodology ...................................................................................... 41
  3.1 Context of the Study ......................................................................................................... 41
  3.2 The Brookstone Inquiry Group .......................................................................................... 44
  3.3 Research Questions ........................................................................................................... 48
  3.4 Method ............................................................................................................................... 49
3.4.1 Role of the Researcher ................................................................. 49
3.4.2 Design ......................................................................................... 51
3.4.3 Participants ................................................................................. 52
3.4.3 Data Collection .......................................................................... 54
3.5 Analysis ......................................................................................... 55

Chapter Four: Data Analysis, Results and Interpretation ............................................ 57

4.1 Introduction .................................................................................... 57
4.2 Attributes of the Brookstone Inquiry Group as a Learning Community ................. 57
4.3 Conversations about Interactive Whiteboard Technology and Teacher Pedagogy ..... 73
  4.3.1 Teacher on the Side ................................................................... 74
    4.3.1.1 Teacher to the Side ............................................................... 75
    4.3.1.2 Engaging Students from the Side ........................................ 76
    4.3.1.3 Teacher on the Side and Student Presentations .................... 79
  4.3.2 Teacher Planning and Design ..................................................... 81
    4.3.2.1 Teacher Presentation ........................................................... 83
    4.3.2.2 Using Different Interactive Tools ........................................... 84
    4.3.2.3 Digital Unit Planning ........................................................... 87
  4.3.3 Professional Development ......................................................... 89
    4.3.3.1 Individual Lessons and Shared Learning ............................... 91
    4.3.3.2 Workshops and Institutes ..................................................... 93
  4.4 Summary ...................................................................................... 94

Chapter Five: Conclusion and Discussion ...................................................................... 96

5.1 Conclusions Emerging from the Research Questions ........................................... 96
5.2 Discussion of Issues Arising From the Study ....................................................... 98
5.3 Implications for Teaching ............................................................................. 106
5.4 Evolving Issues with Interactive Whiteboard Technology ..................................... 107
5.5 Gaps in Research .............................................................................. 108

References ............................................................................................... 111

Appendices ............................................................................................... 123

Appendix A ............................................................................................ 123
Appendix B ............................................................................................ 127
Appendix C ............................................................................................ 131
List of Tables

Table 4.1: The Evolution of Three Examples .................................................................................. 74
Table 4.3: A Comparison of Lesson Planning and Design Without the Use of the IWB (Then)  
           Versus Lesson Planning and Design (Now) With the IWB ........................................... 86
ACKNOWLEDGEMENTS

Firstly, I wish to acknowledge the participation of all the teachers in the Inquiry Group. Without them, this study would not have been possible and their willingness to let me observe was greatly appreciated. Truly, a special group of educators!

I would also like to thank Gaalen Erickson for all his thoughtful support, encouragement, and guidance throughout the course of my degree. He has provided me with continuous opportunities to learn and expand my knowledge.

To Tony Clarke, my sincere thanks for the inspiration in this topic. His support in this work and thoughtful advice in all of my endeavours was much appreciated!

A special thanks to Samson Nashon for being on my committee, and for his assistance and advice in my degree program.

I owe particular thanks to Gina Wong, who has been a wonderful friend. My sincere thanks for her valuable support, advice, and encouragement throughout this degree. Thank you for reading my drafts and for your guidance and comments of this document.

I would like to extend my appreciation to my extended family in British Columbia, especially my Uncle John, Auntie Linda and family who have continuously supported me in this endeavour. As well, I wish to thank Auntie Emilie, Uncle AhWoon and family, as well as Yee Yee AhYen and Uncle Felix for their continuous support. A special thank you to my Po Po who always looked out for me and has given much love and encouragement.

Finally, a very special thank you goes to my family for their love, support and encouragement, each and every day. Thank you to my parents, Richard and Therese, and my sister, Tracy, for always being there for me and supporting me throughout my years of education.
Chapter One: Introduction

Permeating almost every aspect of our daily lives, many of us have come to rely on our technologies in order to seek, share and gain information, as well as stay abreast of the most up-to-date news, current events, gossip and data. Communication in the 21st century involves access to computers, electronic mail, text messages, cell phones, and the Internet among many other applications, including Google, Facebook and Twitter. As the number of these technological tools become increasingly common and widespread in society, educators are faced with a wide range of views of what technology is and its purposes in educational settings. Educators are challenged to prepare students of the 21st century with a more sophisticated set of transferable skills, such as problem solving, communication, and leadership, to meet rapid technological change, competitive global markets and new patterns of work that did not exist even fifty years ago. The results of a Statscan General Social Survey in 2000 supports the changing dynamic of technology within our society in that 53% of all Canadians reported using computers1 to access information compared to three times the 1994 rate of 18% (http://www.statcan.gc.ca/daily-quotidien/010326/dq010326a-eng.htm, March 23, 2010). The recent study Young Canadians in a Wired World II found that the Internet is the main choice of students searching for information for school assignments and ranges from 62% of Grade 4 students to 91% of Grade 11 students (Ontario Public School Boards’ Association, 2009). These results demonstrate the pressing need for students to not only have exposure to these technologies but to develop and be able to apply technology-related skills in various and new settings.

Traditionally, studies on educational technology have been principally interested in finding the relative success of particular technological innovations as it affects student learning

1 Reports based on computer usage during the preceding twelve months of the study
(Norris, Smolka, & Soloway, 1999) and as a result have compiled a list of effective or less
effective technological innovations (such as drill and practice software or hypermedia) when
compared to traditional instruction. Often, the rate of technological advances means that many of
these applications are soon obsolete. These types of studies do not take into account the
complexities and intricacies of how classroom teachers incorporate technology in their teaching
(Zhao, Pugh, Sheldon, & Byers, 2002). While there is the common understanding that
technology should be integrated into teaching, there has been little research on what factors are
needed to support teachers in their learning of technology and successfully integrating it into
their teaching practices. Moreover, there has been no known report of technology
implementation within a school that has been entirely initiated by its staff. In this research study,
I explored the practices of a group of elementary teachers as they worked to use interactive
whiteboard (IWB) technology to enhance their teaching and learning and examined their
evolution towards a learning community.

1.1 Technology Trends in Education

In the last century, reformers saw solutions to school problems with swift technological
advances within its schools (Cuban, 1986). This included administrative mandates to invest
technology into their schools and involved the incorporation of film, radio, and television in
classrooms. Eventually, in the mid-1980s came an enthusiasm to invest in computers for schools.
According to programmers, computers were thought to lead children into understanding how the
mind works in solving a problem through a process of writing and debugging a program (Cuban,
1986). Hooking children into learning with computers was believed to give higher self-esteem, a
feeling of competence, especially when students could teach adults how to use the machines.
During this time, it was believed that this sense of control over the technology served to be vital to children acting independently (Cuban, 1986).

The push to further incorporate technology in classroom teaching grew as the Internet became more easily accessible in 1995 with the development of user-friendly World Wide Web interfaces. To date, one of the most recent technological innovations to enter school classrooms are interactive whiteboards (IWBs). A relatively new technology to education, integrating elements of text, graphics, sound, video, and the capability of the user to physically interact with the objects on the screen, the IWB appears to offer an innovative approach to teaching and learning interactively. Not yet a mandated educational technological tool, the IWB holds great potential based on preliminary small-scale research in the United Kingdom, USA, Canada and Australia. The question of its longevity and impact on teaching and learning is an area of continued research.

1.2 The Context for the Study: Brookstone\(^2\) Inquiry Group and Learning Communities

The Brookstone Inquiry Group is a unique context comprised of elementary teachers, several university-based educators, and a researcher from their teachers’ union. The teachers have not only been exploring the educational potential of interactive whiteboard technology but they have also overcome the fears of technological change resulting in a distinctive, dynamic learning community. They have undertaken a process of educational change by questioning, planning and coordinating the multilevel social process of implementing whiteboard technology that has durability, longevity and continuation. The grassroots approach of this group to implementing an innovation has generated a community that has inspired a change in the way they teach, collaborate, relate and engage in professional development. Over several years, the

\(^2\) The name of the elementary school has been changed to ensure confidentiality and anonymity.
Brookstone staff have observed, discussed and documented several ways in which interactive whiteboards support teaching and learning. These findings have been adopted and improved as the staff collaborate and change their traditional, more teacher-directed style to a more student-directed classroom. United by a common thread to improve their skills as interactive whiteboard users and a mutual strong desire and curiosity to enhance student learning, interested Brookstone staff have evolved from what initially began as a group interested in investigating the effects of interactive whiteboards in the classroom to a learning community striving to develop learning and teaching experiences that will continue to challenge students and raise the bar for learning.

What initially began as one teacher’s interest in May of 2002, to participate in two year study with interactive whiteboard products, has evolved into a thriving, inspiring and growing group of teachers who regularly come together to discuss their experiences with their interactive whiteboards once a month and learn from each other. I have been fortunate to work with this Inquiry Group initially as a graduate student and more recently as a practicing teacher in another school district to address a number of teacher-derived questions about the effects of the interactive whiteboard in their classrooms. I have been especially intrigued by the excitement and desires of these teachers to come together on their own time outside of school hours to discuss their trepidations, concerns and successes with the interactive whiteboard in the classroom. Over the last three years, I have been able to attend the monthly meetings and observed and documented through extensive ‘minutes’ of these meetings the quiet evolution of teachers who once were filled with apprehension and concern about their lessons to ones who are confident, risk taking, synergistic interactive whiteboard users and reflective educators. This thesis documents the questions, issues and challenges of the members of the Brookstone Inquiry Group over these three years.
Questions have been a guiding force of inquiry meetings. A forum for asking and seeking answers or information has been a foundation for the Brookstone group. Wondering about the perceived changes in student behaviour, technical difficulties with the technology, and queries into how to generate a lesson on a particular topic have been at the forefront of the early years of this group. These teachers have taken note of the visual advantages of using the interactive whiteboard, especially with primary students and students with special needs, noticed an increased focus and attention from students during lessons, and identified a change in the culture of the school. Brought together by personal desires to raise questions, discuss and find solutions to these questions, the Brookstone teachers are highly motivated and volunteer their time to come together to satisfy their appetite for knowledge and professional growth. It is with great respect and fascination that I have been allowed to both participate and observe these meetings.

1.3 Research Focus

Conversations between Inquiry Group members have been an invaluable forum for sharing ideas, gaining insight, asking questions, inspiration and learning that have resulted in the development of a collaborative, collegial learning community. The grassroots nature of this process has been a strength of this group and is in sharp contrast with other initiatives that have been typically mandated by school or district administrators using a “top down” approach.

In this research study, I established myself as a research assistant, recorder and observer during the monthly Brookstone School Inquiry meetings. I became interested in and decided to examine the dynamics of the members of the Brookstone Inquiry Group for my thesis. The group was brought together by individual and common topics of interest around the perceived positive effects of IWB technology including: student engagement in learning, the use of visuals (still
images and video clips), collaborative learning, and the impact of the IWB on students with special needs and English as a Second Language students as well as how students’ output was changing. The university and union educators were invited to participate as the teachers sought ways to substantiate their findings about the IWB in the classroom. For almost three years, situated once a month in the Brookstone school staffroom, this group of educators has voluntarily come together after school to share their stories, experiences, questions, and reflections.

While my initial research question began with asking why and how the Brookstone teachers have sustained their interest and enthusiasm in interactive whiteboard technology, I believe there is a unique, deeper, intrinsic motivation that drives the success of this group. Analogous to the children’s story of the “Little Engine that Could,” the teachers have pursued their interest in IWBs (the fuel) to support one another and gained momentum from each other by lighting a passion (and fire) for this technology within themselves to subsequently engage in, as a group, (the train) further professional learning. The “I think I can...” mentality and attitude of this group serves to be an impressive feature of this group. The shared desire to learn more about IWBs as related to their teaching serendipitously served a mutual need at an ideal moment in time and continues to thrive.

1.3.1 The Research Questions

My research questions were structured to examine how the conversations during the inquiry meetings about IWB technology have evolved and have contributed to a developing learning community. Conversely, this study then allows for items of interest to emerge. This was not to be an evaluative study in which I endeavoured to answer questions about what practices
worked best or what methods of teaching were better for learning, but rather to examine how the conversations during the Inquiry meetings about IWB technology have contributed to the evolution of the group into a learning community. To reflect this emergent perspective, my research questions were the following:

1. What attributes of the Brookstone Inquiry Group have contributed to its functioning as a learning community?
2. What are the teachers’ transformed pedagogical roles within the Brookstone learning community?

1.4 Significance of the Study

Interactive Whiteboards (IWBs) are a relatively new digital learning tool for use in education and follows their initial use in office settings (Higgins, Beauchamp & Miller, 2007). As IWBs are increasingly used within educational settings, there is a need for further empirical evidence on their functionality and impact on teacher practice and student learning. As research on the use of IWB technology, interactivity, and pedagogy to foster learning implied by has been limited, further investigation of the effects of IWB use and its cognitive impact is needed. Literature on the impact of IWBs have focused on factors crucial to implementation of new technologies in classroom settings, student perceptions of IWBs and the influence of IWBs on learning in the classroom. While it would seem that effects of the IWB are overall positive, continued investigation on the use of this technology IWBs is required in order to examine more carefully the relationships between conceptual understandings, learning, and pedagogy, and to more clearly delineate its significance. There is little research into the types of pedagogical changes that must take place for teachers to effectively make use of the IWB beyond being a
glorified digital project (e.g. projecting a Rosa Parks’ YouTube video for immediate access to information in the class as part of a spontaneous classroom discussion on civil rights).

Over the past fifty years, teaching practice and principles have shifted from an emphasis on reproducing knowledge by rote learning to transforming knowledge via meaningful experiences (Cairncross & Mannion, 2001). It is thus necessary to find ways to better understand how humans interact with one another as well as how this new technology interacts with the other features of a complex educational system and contributes to better learning for all. With the rapid evolution and impact of technology use in the classroom, there is a pressing need for further systematic research to answer these questions. By examining lived experiences and stories of the Brookstone Inquiry Group integrating IWB technology, insights will be gained as to the impact and influence of a learning community on teachers’ pedagogy and in turn student learning.

The conclusions that I draw from the Brookstone Inquiry Group, experiences, stories and context are not intended to be universally valid generalizations. In this regard, the specific assertions presented may be limited to the research environment. However, through this qualitative case study, I hope to stimulate further thought and reflection upon the reader. The reader is invited to engage with this case in order to construct a broader meaning.

1.5 Delimitations and Limitations of this Study

This research project is limited to Brookstone Elementary School and members of the Brookstone Inquiry Group, with consideration given only to the larger school, and district structures as they impacted on the community. The research in this case was limited in that there is only one school in the Lower Mainland of British Columbia to my knowledge that has founded
an Inquiry Group that meets monthly within a school where IWBs have been invested in every classroom. While there have been new members who have since joined the Inquiry Group since its inception two and a half years ago, only original Inquiry Group members who have maintained membership in the group to date were included in this study. The small numbers of participants and the uniqueness of the overall school commitment to the use of the interactive whiteboard means that the sample is certainly not representative of all teachers. There was no control environment without IWBs in place in order to make comparisons. Hence, the study will not be generalizable in the statistical sense to all teachers or even to those teachers who use the IWB in their classrooms. Limited analytical generalizability (Yin, 1994) allowing for the development of general concepts and propositions regarding the use of new learning technologies is possible.

In this thesis, I make use of teachers’ rich narratives and conversations to describe how one elementary school community, through the use of IWB technology, evolved into a professional learning community. These descriptions serve to provide insight for those interested in how IWB technology can extend teacher and student abilities and practices in the elementary school setting as well as to other school communities including secondary level schools.

1.6 Overview of the Thesis

This first chapter introduces the topics of my research and provides a general background and context for the research study. The main research problem is introduced and research questions are presented within the context of the study. A brief rationale of the study is provided.

Chapter Two consists of a literature review that examines interactive whiteboard technology, and the role of technology in education. In this chapter, I explore the issues and
trends associated with the introduction and use of educational technology in the school setting. There is also a brief examination of the media debate, some of the criticisms that have emerged from research and possible responses to those criticisms. The review also examines the role of conversation and concept of a learning community.

Chapter Three outlines the research methodology of this study including a description of the data collection process, reasons for a qualitative research approach and, background information of the participants in the study. Chapter Four outlines the results of the study and identifies attributes of the Brookstone Inquiry Group that contributed to its functioning as a learning community. Also included is evidence of how conversations around interactive whiteboard technology have shifted teacher’s pedagogical understanding and practice.

Finally, Chapter Five discusses each of the research questions in detail in light of the qualitative findings that emerged. This chapter also presents some of the potential implications of the findings and recommendations for future research.
Chapter Two: Literature Review

2.1 Overview of the Chapter

This chapter is divided into two sections. Firstly, a review of literature as related to the use of technology and the interactive whiteboard (IWB) will be presented. The purpose of this literature review is to examine the broad perspective of technology in education, the innovation of the interactive whiteboard in classrooms and its benefits and drawbacks. The review will also examine the richness and complexity of multimedia applications such as the IWB and considers how they can be used to enhance teaching and learning. Consideration of the many factors using the IWB in the learning process and an exploration of the benefits and limitations of this technology is discussed. Secondly, a description of what constitutes a learning community along with key aspects about the role and nature of conversation will be presented as a way of making sense of the evolution of the Brookstone Inquiry Group and its development of a professional learning community.

2.2 The Interactive Whiteboard

Multimedia has the potential for changing the way teachers teach and the way students learn. Of the many forms of technology that are available for use by teachers with their students in the classroom, interactive whiteboards (IWBs) demonstrate considerable potential in helping to meet the needs of students with diverse learning styles and to engage students during the learning process (Beeland, 2002; Glover, Miller, Averis, & Door, 2005; Smith, Higgins, Wall & Miller J., 2005). Allowing for collective viewing on a large wall-mounted screen or placed on a separately purchased stand, IWBs allow teachers and students to interact with technology in a manner that has not been previously possible. Integrating elements of text, graphics, sound,
video, and the capability of the user to physically interact with the objects on the screen, the IWB offers an innovative approach to teaching and learning interactively.

Referred to as electronic or digital whiteboards, IWBs are a relatively new technology to education in spite of their primary origins for use in office settings (Higgins, Beaucamp, & Miller, 2007). Popular professional literature, commercial reports and IWB distributors profess to the ‘revolutionary’ impact of IWB technology in classroom settings. Connected to a computer and a projector, the IWB is capable of projecting images onto a large touch-sensitive screen. The IWB can be operated through a keyboard from different positions in the classroom or using a special pen directly on the screen. Computer applications can be controlled directly from the display, notes can be written, and work can be saved for later review. The IWB can be used to deliver instruction in a variety of ways based on three modalities of learning: visual, auditory and tactile. The IWB is “a multimodal approach [that] allows participants to move beyond language barriers [or abstract content by presenting a] variety of [means] including colour, image, sound, spatial and kinaesthetic [modalities] [for students to] make meaning” (Jewitt, Moss, & Cardini, 2007).

Whereas traditional teaching involves calling students to the blackboard or whiteboard and demonstrating concepts or completing tasks on the board or via an overhead projector, the IWB has the advantage of built-in software. For example, objects can be physically manipulated on the screen. An image can be drawn by hand via the drawing toolbar or retrieved from a photo gallery, and tasks can be completed with associated software, such as creating a graph, an essay or outline. Data, audio, animation, and video files can be accessed via the Internet and displayed on the IWB. Designed for whole-group interactive teaching (Glover, & Miller, 2001), the IWB generates a level excitement, attraction, and interest in learning (Glover, Miller, Averis, & Door,
2007) for a generation of techno-savvy learners. The ability of the user to actively engage in moving objects on the screen and using dedicated software harnesses a power of technology and provides access to a variety of presentational techniques in a way that is unlike the traditional method of presenting information by simply standing at the board (Glover et al., 2005). Moreover, unlike traditional board work, a record of the notes, annotations, and student comments can be saved and retrieved for future reference.

2.3 Literature Review of Interactive Whiteboards

There has been remarkable growth in the literature associated with the use of IWBs in the classrooms. Despite a few small-scale studies in Canada and the United States, research has been largely based in the New Zealand, Australia and especially the United Kingdom where the UK government has made a significant financial investment in the acquisition and placement of interactive whiteboards in primary and secondary schools as part of their schools’ technology initiative. A review of literature in this area suggest that results on the use of this technology is positive and rich with potential (Armstrong, Barnes, & Sutherland, 2005; Smith, Hardman, & Higgins, 2006). Claims about the efficacy of IWBs include increased student motivation and interest (Higgins et al., 2007; Glover et al., 2007), engagement, higher student participation (Beeland, 2002) and increased student access to tools that allow learners to better communicate their understandings through greater interactions (Beauchamp, 2004). Collected teacher narratives have indicated that the IWBs have promoted greater resource sharing amongst staff (Kennewell, 2004) due to the facility with which files can be saved and re-used (Glover, & Miller, 2002). Some teachers have reported how the incorporation of a range of multimedia resources during teaching has quickened the pace of lessons and thus resulted in more efficient
classroom transitions (Glover et al., 2001; Levy, 2002). It has been also been claimed that teachers not accustomed to technology have even found IWBs relatively easy to use (Smith et al., 2005).

However, some studies also reveal incongruities with the use of IWBs. One such example that counters the notion that student engagement is increased is by one eleven year old student’s claim that the IWB “help[s] you to learn by … go[ing] [to] the Internet and find[ing] out information,” and student comments that linked mathematics as “fun” and “games” (Wall., 2005, p. 861). Wall’s (2005) study on pupils’ views of teaching and learning with IWBs presents a view of IWB use that the whiteboard improved the aesthetics and presentation of the subject matter rather than improved student understanding of a concept. Perceptions that the IWB “helps children who behave badly and children who are not smart” is another issue in that the board serves to be a class management tool rather than an educational tool for learning as some pupils felt that their “learning could be facilitated sufficiently well without the use of an IWB” (Wall et al., 2005, p. 863 & 864). Other concerns include whether the IWB reinforces a teacher-centred style of delivery (Cogill, 2002), a notion that runs counter to current teacher training program philosophy that values student-centred learning, as well as the difficulty in troubleshooting and resolving technical difficulties when the IWB is not working (Higgins et al., 2007). These issues continue to be areas requiring further research to more clearly delineate the significance of the IWB and its relationships between learning and pedagogy.
2.3.1 Benefits of Interactive Whiteboards

Evidence surrounding the use of interactive whiteboards (IWBs) has been mixed. On the one hand, there are reports that identify how IWBs have been used to improve student learning. Teachers have reported that IWBs have been versatile and flexible teaching tools across age groups (e.g. Malavet, 1998; Ekhaml, 2002) and in different settings (e.g. Gillen, Staarman, Littleton, Mercer, & Twiner, 2007; Miller, & Glover, 2007). For example, in some primary and secondary schools in the United Kingdom, students have shown increases in attention, higher motivation and sustained concentration during lessons (Glover et al., 2007). The ability of the user to ‘flip back [between saved screens] to review material’ has enhanced attention spans for many students including those of lower ability or with special educational needs (Walker, 2002b). By being able to model abstract concepts through the use of IWB software and displaying various ‘captivating’ representations on the whiteboard (Kennewell, & Beauchamp, 2003), students have exhibited more focus, engagement, participation, (Beeland, 2002), and interest in learning (Higgins et al., 2007; Glover et al., 2007). Research has also shown that students with learning disabilities have benefited from IWBs. For example, Smith’s (2001) study on the use of a graphics package to handwrite on the whiteboard enabled young learners’ development of gross motor skills. While IWB use has been found to activate auditory, and kinaesthetic modalities (Higgins et al., 2007; Glover et al., 2005), its impact on visual learning in Carter’s (2002) study on deaf learners was shown to be significant. Depending on the content of the lesson, and the presentation of information within a multi-model framework, the IWB has provided students access to more tools to learn and to better communicate their understanding through greater interaction (Beauchamp, 2004).
In terms of teaching, reports have identified favourable impressions of the IWB on the part of teachers. These reports document the incorporation of a range of multimedia resources during teaching (Levy, 2002), and a quickening in the pace of lessons (Glover et al., 2001) allowing for more efficient classroom transitions. Collected teacher narratives have pointed out that the facility in saving and re-using created IWB lesson materials (Glover, & Miller, 2002) have promoted resource sharing amongst staff (Kennewell, 2004). Moving beyond the ‘wow’ factor (Beauchamp, & Parkinson, 2005), there is evidence of competent and confident technology-oriented teachers who have sought to change the way they teach because of the possibilities offered by the IWB (Becta, 2003; Beeland, 2002) and its positive effects on student learning.

### 2.3.2 Concerns About Interactive Whiteboards

On the other hand, there has been criticism over the value of the interactive whiteboard (IWB). As studies on the use of the IWB have been mainly descriptive or summaries of small-scale research projects carried out in the U.K., U.S.A, Canada and Australia (Glover, & Miller, 2001; Glover et al., 2005), there has been disagreement over the validity of data. Reports have been based on narrative or descriptive evidence and can be found in a variety of professional newsletters, journals, magazines and the Internet (e.g. Cogill, 2002; Levy, 2002; Brown, 2004). Since the U.K. government has made a significant investment in installing IWB technology in its schools in recent years, research motivations and resultant outcomes may be questionable. Due to the lack of systematic inquiry into the effects of IWB use in schools and the swift mandate to invest in technology in order to meet Ministry goals for technology, it cannot be assumed that the outcomes of recent research may automatically translate to better quality teaching and hence
better learning experiences for students (Moss, Jewitt, Levaic, Armstrong, Cardini, & Castle, 2007).

As noted earlier, research on the perceptions of the effects of IWB use on student learning have been problematic as some students have claimed that the IWB “help[s] you to learn by … go[ing] [to] the Internet and find[ing] out information,” and identified with mathematics as “fun” and “games”. These claims seemed to suggest that students viewed the IWB as a resource or mode to transmit information rather than a means to learn information. Wall et al., (2005) counters the argument that students are more engaged when an IWB is used. Perceptions that the IWB “helps children who behave badly and children who are not smart” as well as “learning [that] could be facilitated sufficiently well without the use of an IWB” when linked to the cost of the technology were particularly revealing (Wall et al., 2005, p.. 863 - 864).

Concerns have been raised over changes in teaching and learning. The notion of the IWB as a structure for whole-group teaching (Glover et al., 2001) appear to show reinforcement of a teacher-centred style of delivery (Cogill, 2002) that runs counter to current learning theories (Matthew, 1994). Kennewell (2001) argues that effective use of the IWB is possible only if students have consistent access to this expensive technology on a regular basis. Of other logistical and practical concerns were issues related to cost, adequate teacher training and difficulty in troubleshooting and resolving technical difficulties (Higgins et al., 2007). For example, establishing an appropriate IWB height that both the teacher could use and students could see simultaneously were frequently cited (e.g. Wall, Higgins, & Smith, 2005; Glover et al., 2001). These issues further reinforce the notion of providing adequate and appropriate professional development on the use of this technology.
Review of selected IWB literature reveals both incongruities and positive effects with the use of IWBs. Although it would seem that effects of the IWB are overall positive, continued investigation on the use of this technology IWBs is required in order to examine more carefully the relationships between conceptual understandings, learning, and pedagogy, and to more clearly delineate its significance.

2.4 Classroom Learning Environment

Moving from traditional to online technology requires a thorough understanding of the complexity and richness that interactive multimedia offers its users. It involves considering aspects of both the human-computer interaction and of learning theory (Cairncross, 2001). Inappropriately used in the classroom, technology can be used to perpetuate older models of teaching and learning. IWBs are least effective and have limited impact when teachers fail to appreciate that “interactivity” requires a new approach to pedagogy (Glover et al., 2001). This requires being able to draw the learner into the learning process through skilful use of technology on the teacher’s part. Acceptance of this technology as more than a tool for teaching requires effort, time, and a willingness to change existing teaching strategies, and ultimately a potential shift in pedagogy.

2.5 Interactivity

One of the fundamental issues related to the IWB is classroom interactivity. According to Burns and Myhill (2004, p. 36), interaction refers “to exchanges believed to extend thinking and enhance learning.” In a classroom where IWBs are being effectively used, “effective interactivity requires structured lesson planning with stepped conceptual learning, pace in activities and a
cognitive review; all of which offer opportunities for sustained use of a variety of IWB techniques” (Glover et al., 2005, p. 163).

The notion of interactivity can be examined on an individual level, or collective level as a broader theme within the classroom system. On an individual level, interactivity may refer to the extent that a learner interacts with content and engages in their personal learning. It refers to the learner’s level and ability to activate background knowledge, to critically think, analyse, reason and make sense of information and by drawing on new strategies for accessing and constructing knowledge. It is the hope that an interactive user in this sense will be able to make use of data or text and apply it to new contexts. The learner will search for conditions of plausibility, fruitfulness and intelligibility (Posner, Strike, Hewson, & Gertzog, 1982) of a concept in order to assimilate or accommodate information into their personal framework of how the world works.

On a collective level, interactivity can also refer to the level of physical manipulation of information within a group. This entails a level of interaction that occurs between peers, and the teacher and the context for learning. An interactive classroom will appreciate the value of discourse, and collaboration through shared construction and exchange of information. Learners will interact with their peers, such as in small group work, large group work, activities or tasks. Interactivity will reflect the level of engagement and involvement a teacher has with their students. A setting where the teacher manages the learning environment through limited one-on-one exchanges with students or limited opportunities for role-playing, such as a student taking over the role of the teacher by presenting topic or posing a question for the group, will differ from a setting where students are immersed in their learning, inquiring, exploring, and constructing knowledge with their teacher.
Interactivity also depends on the nature of the subject matter, classroom context and content being studied. In the context of science for example, this would imply that students are questioning, hypothesizing and testing new ideas that permit them to apply higher-order thinking skills and may involve physically performing experiments and evaluating data in real or virtual environments. Students will work together to discuss ideas, compare, contrast and reflect on the information presented before making a conclusion. In English on the other hand, interactivity may involve students engaging in texts, interpreting content and writing in the same stylistic form of a particular author on a topic of their own selection, or using many new tools such as those built into IWBs.

Designed for whole-group interactive teaching, where the students are all ready to participate, attentive, engaged, and focused on the teacher and presented material on the IWB, the use of the IWB adds a valuable dimension to whole-group teaching that more adequately acknowledges the social and cognitive aspects of learning and is linked to pedagogy and practice. Interactivity can be understood at both surface and deeper levels of understanding of pedagogy. Whereas increasing interactivity at a surface level might be more related to logistical, technical or physical attributes of using the technology such as familiarity with the software or positioning the IWB to minimize visual glare from the whiteboard, a deeper level of understanding will involve an approach that considers the needs and interests of learners, reworks students’ own ideas, and accounts for students’ social or cultural backgrounds (Hennessy, Deaney, Ruthven, & Winterbottom, 2007). A surface level understanding of learning would involve the teacher as an authority on learning, leading discussion and posing questions to students about a concept. Engaged or deeper learning on the other hand will involve a more dialogic environment where conversations will be less centralized. It will involve greater peer to
peer feedback or student to teacher feedback and discussion where the teacher is more of a facilitator of the environment, and a more democratic classroom context. Communicative patterns can be negotiated and improved with the use of this technology. IWBs will assist in instructing, modeling, and supporting students as they gain greater confidence to share and participate in everyday lessons and interactions.

IWBs offer more opportunities for classroom interaction and classroom learning than other new technologies (Bell, 2002). In a lesson, students and teachers can co-construct meaning and decide what the next step in a lesson might entail (Beauchamp, 2004). Teachers can still maintain a focus on achieving curricular outcomes but the class can work to build meaning together. “Teachers are able to not only [see] how the technology works on a functional level, but are also able to see how this can be used to facilitate a synergy of learning in which pupils and the teacher combine joint technical skills and teachers’ pedagogic vision to create a new learning praxis (Beauchamp, 2004, p. 434).

The IWB can be an efficient, economical and productive method of teaching. Working together through lessons helps to build a sense of community in this setting (Ornstein, 1995). Teaching the same skills to an entire class, making assignments, and administering the same tests to a group is a convenience to teachers (Ornstein, 1995) particularly since IWB lesson planning requires more teacher preparation time (Higgins et al., 2007). Students can be directed in their learning through structured activities and reinforcement of a difficult concept can be re-examined as a group in a non-intrusive manner that may single out one student. Through IWB use, teachers can not only take advantage of the structure of the whole-group learning structure but access the value of discourse and shared experiences. Although whole-group teaching may imply a traditional and passive sense of learning, “an effective teacher is likely to engage in a balance of
strategies at a number of levels in order to strike a balance between curricular needs and student needs” (Gillen et al., 2007, p. 254). Interactivity with the whiteboard requires a rethinking of teaching approaches to ensure that the availability and access to its resources of audio, video, animation and images are not viewed as a replacement for a real, authentic experience.

2.6 Learning Conditions

Learning involves interaction. It is a complex process where the learner must negotiate new information within their own personal frameworks as well as considering the perspectives of others. Learners are engaged in a personal, social and cognitive process that often involves a transformative process.

An important perspective on learning is one that has its roots in socio-culturalism (Vygotsky, 1978) where learning is influenced by both social interactions and cultural backgrounds or experiences. Socio-cultural theorists claim that “all human action is mediated by tools” (Armstrong et al., 2005). These tools include artefacts such as a pen, paper, text, diagrams, graphics, IWB or computer to help the learner mediate information (Armstrong et al., 2005). What and how students will learn will be related to their social experiences, cultural backgrounds and access to technological tools.

As education has evolved, teaching practice and principles have shifted from an emphasis on reproducing knowledge by rote learning to transforming knowledge via meaningful experiences (Cairncross, & Mannion, 2001).

Educators are challenged to establish an interactive, “personalized approach” (Hodson, 1998) to learning that reflects the nature of science as well as inspires learners to engage and be curious about the world around them. Through inquiry, learners are offered opportunities to
“explore within their natural setting to make their own ideas, to scrutinize them, and to test them for robustness” (Hodson, 1998). By creating an interactive environment that will stimulate a sense of passion for understanding, making discoveries, gaining insights and for problem-solving, students are exposed to a world of possibility. Students need to engage in inquiry, construct own understandings, be responsible and be able to make a case for their theories/explanations. Through questioning, collective brainstorming and the communication of ideas, students can be exposed to different cultural influences and worldviews. This process of exchanging input during the scientific process by questioning, collectively brainstorming and clarifying or formulating ideas enlivens science and the learning experience. Talk, combined with writing, is an important part of this learning process that may enhance the retention of learning over time (Rivard & Straw, 2000). Working together and exchanging ideas is inherent to the notion of interactive learning and complexity theory. Small changes can lead to outcomes with large differences. Learning is a communal, shared process where the teacher and student must maintain their roles as partners in learning.

2.7 Role of Technology in Education

Reviews on the role of technology in education and its effects on learning and teaching have been mixed. For the purposes of this thesis, educational technology will be defined as the hardware and software, the tool itself, and the information the tool conveys (Cuban, 1986) and therefore includes computers and its associated hardware (e.g. projectors), its software and tools available on the Internet. Useful instructional technology will be described as any device available to teachers for use in instructing students in a more efficient and stimulating manner.
Questions surround the issue of whether or not the instructional medium used has an impact on teaching and learning (e.g. Kozma, 1994; Clark, 1994). According to Richard Clark, media do not influence learning under any conditions (1983). “Media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition” (Clark, 1983, p. 445). Clark claims “studies that appear to have favour[ed] one medium over another are due not to the medium but to the method or content that is introduced along with the medium” (Clark in Kozma, 1994, p. 445). From this point of view, learning is dependent upon the instructional approach, process for learning, background knowledge or the subject matter rather than the tool or technology that is used to deliver and present information.

However, as educators, we have come to understand, learning is not a direct response to the “delivery” (Kozma, 1994) of instruction. Learning is an active, social, and cognitive process by which the learner manages cognitive resources to create new knowledge by interacting with data and integrating it with previous information (Matthews, 1994). It involves the participant interacting with the learning and information. According to Sigmund Tobias (1982), “any teaching method, instructional organization, media or instructional technology that stimulates students to actively attempt to comprehend the material, organize what is learned with what has been learned previously, and relate it to their prior experience will facilitate learning.” Thus rather than questioning whether media will influence learning, it may be more useful to rephrase the question as “under what conditions will media influence learning?” (Kozma, 1994).
2.8 Interactive Whiteboard Considerations

Imperative to understanding the role of technology in education is awareness that it is part of a complex educational and learning system. Teaching without consideration of pedagogy, effective integration of technology or student needs may not be successful in promoting a desired outcome for deeper student understanding of a particular concept. As well, using technology for the sake of using technology will potentially be no more useful than conventional teaching when considered in isolation. One must understand the context for technology use in a complex system, and its purpose in order to create an environment for ideas to emerge where information, people and processes bump into and interact with one another (Davis, Sumara, & Luce-Kapler, 2008).

When well used, the IWB offers diversity to teaching and learning through various representations that help to motivate, and inspire student learning, as well as accommodate learning styles and student needs (Glover et al., 2007; Carter, 2002). By accessing the Internet for videos or using software to assist in problem-solving activities in subject areas such as mathematics, different approaches of presentations are available through the IWB. This aspect of the IWB contributes to the recursive feature of learning. By being able to flip back or between saved screens on the whiteboard for example, the IWB demonstrates an iterative folding and enfolding of information by individuals in a learning system (Davis et al., 2008). This feature enables all learners to operate in personal sense-making in a non-linear fashion (Davis et al., 2008) and allows the user greater meaningful control and freedom to respond to feedback received. Students can ask questions, review lessons or extend learning beyond the presented material by accessing computer resources. The interactions of the group with the IWB can affect what information is taken up and in turn affect subsequent activities or lessons.
The IWB permits a powerful means of exchange. It is a means of delivering content using novel approaches that using other media may otherwise be tedious to students, and not as effective (Davis et al., 2008). The reinforcement and supplementation of information in multiple ways establishes a redundancy effect that aids the conceptualization process, including greater possibility of the transfer of knowledge into long term memory (Cairncross et al., 2001). The more senses that are engaged in the learning process, the more effective it will be for the learner (Cairncross et al., 2001). It is the multi-modal aspects, such as the kinaesthetic, visual and auditory aspects, of the IWB that assists users to learn in various ways that differs from conventional teaching. Learners are not necessarily limited to one approach to learning but offered a diversity of modalities that students can switch between as the situation fits.

As much as the IWB can offer as a resource to the classroom environment and diversity in innovative presentation, it has its limitations. IWB users are paradoxically both constrained and enabled by the use of this technology. The IWB enables learning in that it facilitates an enriching environment that allows users to explore, ask questions (not knowing what will happen next), and access various software applications and resources that may help to extend their learning. Effective IWB use provides opportunities for discussions amongst peers and the teacher. It permits a non-threatening forum for discussion that is public so that other students can critically think and reflect on diverse points of views from peers. Incorporation of the IWB allows students to take an active in role in learning such as physically manipulating objects on the screen and interacting with one another, and appeals to their auditory, kinaesthetic and visual modalities. It permits role-playing and can be useful for ongoing feedback for learners during the monitoring process.
However, as with any technological tool, success of the IWB will depend as much on the skills, experience and professional knowledge of the teacher mediating interactions with students as it does on the resources that are available for content delivery (Higgins et al., 2007). It can be easy for users to get caught up in the novelty and excitement of a new technological tool that may potentially enhance their environment. New users may ‘jump on the bandwagon’ and fail to think about the pedagogical and learning impacts of a technology, that is, the use of technology for technology sake.

It could be argued that IWBs do not necessarily encourage interactivity in the classroom any more than traditional display boards as a result of the way classrooms are managed and controlled, and how content is delivered. Although the IWB logistically only permits one user at a time to write or present information on the board, it may not offer the necessary level of interactivity that is required of more hands-on, active constructivist-type learning approaches. As an instructional strategy, it may not accommodate and be effective for all learners because of its dependence upon students’ background knowledge and cultural familiarity as well as students’ familiarity with the technology. Limited interactivity with the IWB may be due to the pedagogical approach, or educational structure that characterizes the system, which can mediate the potential of new technologies. The assimilation of the IWB into one’s existing teaching practice as a device or means to simply transmit information rather than enhance learning possibilities may reflect a lack of time that the teacher is able to devote to thoroughly understand learning theories and change pedagogy. Inadequate training or unfamiliarity in using the IWB is also a concern as technological competence may deter users from using the board as more than a glorified blackboard and making use of its full capabilities.
Although the IWB can simulate certain contextual experiences such as science learning, it cannot replace real, authentic experiences and will be constrained by the curricular objectives that teachers are required to cover. “Virtual learning” (Armstrong et al., 2005), for example, could not replace real hand-son learning in the case study of a teacher who had her students use software to learn science. The teacher intended to have students investigate an ecological system and understand the characteristics of fish and their relationship to surviving in its habitat by asking students to monitor survival time, students interpreted this ‘fun’ activity as a superficial game (Armstrong, et al., 2005). Use of the software was shown to result in learning that did not yield any significant understanding of the phenomena under consideration. Quality interactions and interactivity require thoughtful, meaningful use of technology and consideration of the many factors that may influence the balance of a complex system. Although the IWB can be perceived as an instructional strategy that enhances a teacher’s repertoire of techniques, the complex, interacting features of the IWB can serve as “powerful tools for preparation, interpretation and continuous elaboration” of student learning (Davis et al., 208, p. 207).

2.9 Characteristics of Learning Communities

Teaching is a profession embedded with ongoing learning potential. It requires teachers to continuously reflect upon situations, and constantly work on improving the classroom environment. This can be achieved through questioning, articulating and rethinking theories, beliefs and dispositions, as well as developing a sense of professional identity and authority. By developing relationships in supportive professional communities, educators can work to solve problems collectively, boost morale and develop specific instructional approaches and skills that would otherwise be limited if working in isolation. This type of relationship offers a way for
teachers to undergo career and professional growth by engaging in discourse and collaboration that enables them to access expertise from colleagues that will enhance perspectives on situations in the classroom. Working in a collaborative relationship and partnership with colleagues within the school community is one example of professional development that is most closely related to the notion of professional learning communities.

The idea of professional learning communities (PLCs) is not new as its influences can be traced date back to Dewey (1929), Stenhouse (1975), and Schon (1983). Within the field of education today, there continues to be mixed reviews around the notion of PLCs and the most effective model for professional development. Strategies on the best method to implement PLCs within schools as well as how to build professional communities are varied depending on several aspects, including the vision and mission of school districts, school community goals and needs as well as financial motives.

Andy Hargreaves (2003) identifies the components of learning communities as:

- collaborative work and discussion among the school’s professionals
- a strong and consistent focus on teaching and learning within that collaborative work; and
- gathering assessment and other data to inquire into and evaluate progress and problems over time.

Hargreaves continues his discussion of PLCs as one that:

... lead[s] to strong and measurable improvement in students’ learning. Instead of bringing about ‘quick fixes’ of superficial change, they create and support sustainable improvements that last over time, because they build the professional skill and capacity to keep the school progressing. (p. 128)
PLCs, in this view, can be an effective learning organization when implemented properly and over time.

Eaker, DuFour, and Burnette (2002) contend that by bringing in school-based professional learning communities, significant cultural shifts can occur within schools: from isolation to collaboration; from generic to specific statements about students’ learning; from random to special values and goals. According to DuFour (2005), there are three basic premises that are vital to the success and maintenance of a learning community: a common goal to ensure that students learn, the creation and maintenance of a culture of collaboration and a focus on student improvement. Following DuFour’s guidelines for implementing a PLC will result in an improved, powerful means of teaching and learning.

DuFour begins with an important assumption. One of the big ideas of the learning community is that the role of education within the model is not only that students be taught what to learn but to ensure that students learn. In order to accomplish this task, the learning community must share a common mission, vision, and shared values. This mutual understanding serves as a solid foundation from which the community can ask questions and explore as a team. What do we want students to learn? How will we know when the students have acquired the knowledge, skills and/or attitudes we intended to teach? How will we respond when students are experiencing difficulties? A learning community will engage its colleagues to work together to continually assess, make adjustments, and develop a collective response such that student learning is improved. A commitment to student learning is at the heart of professional learning, decision making, and action. A timely and systematic response will be employed to ensure that strategies are designed to support and direct struggling students via an intervention plan that can
include access to additional resources and time until the necessary concepts have been mastered; a distinction that separates learning communities from traditional schools (DuFour, 2005).

A second fundamental aspect to building a learning community is to develop and promote structures that support a collaborative culture. A strong commitment and will to participate in a systematic process in which teachers work together to analyze and improve their classroom practice can result in powerful collaboration. Teaching and learning improvement are strengthened when teachers can collectively question teaching routines, examine new or alternative concepts of teaching and learning, find ways to acknowledge and respond to differences and conflict, and engage actively in supporting one another’s professional growth. Teachers who work systematically in teams and engage in an ongoing cycle of questions promote deeper reflection, critical thinking and team learning that ultimately leads to higher levels of student achievement (DuFour, 2005). For teachers to participate in such an imperative process, together school staff and administrators must ensure that all team members are focused on student learning and committed to making time to ask crucial questions related to student achievement as well as discuss strategies for improving results.

As a result, the third premise is a focus on continual improvement that is essential to the effectiveness of a professional learning community. Not only is working together towards improving student achievement a common goal and routine work of everyone involved but a catalyst for enhanced teaching practices. By participating in an ongoing process of identifying the current level of student achievement, ascertaining an objective to improve the current level, providing evidence of progress and working together to achieve the goal, the focus of the goal shifts from the individual teacher to a team effort. The focus of striving for continual student improvement and results necessitates the notion that teachers must welcome assessment as not
solely an indicator of student progress but one that serves as a catalyst for improved teaching practice. They will work collaboratively on issues related to learning, examining and questioning, seeking new methods and testing them in order to achieve results that reflect continual improvement. The team in this case will realize that the process of arriving at an answer is more important than having an actual answer.

DuFour thus presents a plausible case for the promotion of PLCs and includes several well stated arguments. His model has been widely endorsed by (US) National Commissions and Boards as well as by both of the national US teacher unions, the National Education Association (NEA) and the American Federation of Teachers (AFT) (Naylor, 2007). However, the notion of collaboration, in Eaker and DuFour’s view, as well as in the views of others promoting professional learning communities would argue that DuFour’s methodology appears prescriptive rather than relationship-based. DuFour’s requirements for this form of community appears to consider the individual to the common good but through processes that are defined, established and often controlled.

For these reasons, DuFour’s model for PLCs presents a problematic dichotomy in that it advocates the positive spirit of collaboration but is tempered with prescription and control by advising teachers to forge ahead in their community building and ensure that student results are improved at all costs. Fullan notes that the change that is required of an initiative such as DuFour’s PLC model can be difficult as:

many schools and districts that proudly proclaim they are professional learning communities have shown little evidence of either understanding the core concepts or implementing the practices of PLCs. (DuFour, 2005, p. 9)
For sustained change to occur, educators must develop a deeper, shared knowledge of learning community concepts and practices, and then must demonstrate the discipline to apply those concepts and practices in their own settings. PLCs can thus be powerful and productive, but teachers cannot be coerced into structures and processes that are inappropriate to their needs (Hargreaves, 2003). Copland and Knapp (2006) suggest five essentials tasks for building professional communities:

- building trusting relationships among professionals in the school or district;
- creating structures and schedules that sustain interaction in among professionals;
- helping to frame joint work and shared responsibilities;
- modeling, guiding, and facilitating participation in professional communities that value learning;
- promoting a focus on learning and associated core values.

By pursuing these tasks, it is with hope that a community with shared beliefs and understanding, interactions and participation, interdependence, concern for individual and minority views as well as meaningful relationships will develop and thrive.

For these reasons, I have endeavoured to document and discuss the evolution of the Brookstone Inquiry Group as a learning community rather than subscribed to the various notions of professional learning communities. The members of the Brookstone Group have taken a unique approach to shaping their professional growth and development and serves as a focus for this paper. While the Brookstone Group may share certain features of PLCs, I refer to the Group as a community of learners as its functioning thrives on the shifting needs of the group rather than a targeted mandate or compulsory commitment to engage in professional development.
This examination of literature on professional learning communities has revealed that a successful learning community not only requires hard work but also several shared features between its members. It requires staff to focus on learning rather than teaching, and the collective ability of the group to work together on related matters of learning maintaining accountability by continually striving for higher levels of student achievement. Not only must the group share a common ground in guiding principles that articulate what the people in the school believe and what they are trying to create but members must be willing to share and network with others. Members must be willing to make a commitment to these values, have their beliefs and practices open to questioning and inquiry, be willing to foster cultures of challenge and focus, as well as encourage feedback. There is a need for trust and acceptance of differences in practices. It is with an intrinsic desire to do better and a shared interest in improving on student success that has evolved over several years and resulted in the formation of a unique learning community by the Brookstone school staff. In this thesis, I endeavoured to examine that nature of building a learning community not as one where certain features must be established or acquired but to identify the attributes of the Brookstone Inquiry Group that has contribute to its functioning as a learning community and how teacher conversations have played a role in the development of this group.

2.10 The Notion of Conversation

According to Barbules (1993), the concept of conversation can be identified as pedagogical, communicative and relational. Generally, we can say that conversation involves two or more speakers where there is a climate of open participation by any of its partners who put forth a series of alternating questions, responses, redirections, or statements that are
continuous and developmental. This sort of human practice is responsive to context and changes in purpose throughout the interchange of ideas. The nature of conversation is thus exploratory as its meaning and methods continue to unfold over time as ideas are shared, or exchanged and lends to its pedagogical nature. Drawing on Gadamer’s notion of authentic conversation (2004), we are cautioned about the difference between a genuine versus a contrived conversation:

we say that we ‘conduct’ a conversation, but the more genuine a conversation is, the less its conduct lies within the will of either partner. Thus a genuine conversation is never the one that we wanted to conduct. Rather, it is generally more correct to say that we fall into conversation, or even that we become involved in it. The way one word follows another, with the conversation taking its own twists and reaching its own conclusion, may well be conducted in some way, but the partners conversing are far less the leaders of it than the led. No one knows in advance what will come out of a conversation. (pp. 385)

This type of dialogue thus represents a continuous, developmental communicative exchange through which an individual gains a fuller comprehension of the world, themselves and others (Barbules, 1993). It serves to be a forum for collective learning and observing of different values, perspectives and intentions that may lead to increased harmony, fellowship and creativity (Bohm, 1993).

The communicative aspect of conversations allows us to convey our language, reasoning, morality and our social organization (Barbules, 1993). Firstly, we use and create language by speaking with others in such a way that each new use is entwined with previous uses. For example, clichés, slogans, proverbs and the connotations associated with each utterance contains within them a history of agreements and disagreements in prior conversations. Language is a means to converse as well as is the product of it. Conversations provide opportunities where
individuals seek to learn from one another and gain better understanding or even develop a common understanding. We seek to discover other peoples’ standpoint and horizon (Smith, 2001). By doing so, ideas become intelligible, without our necessarily having to agree with them and we can come to terms with the other (Gadamer, 2006). In this, the understanding we bring from the past, our experiences and background knowledge is tested with encounters with the present and shapes what is experienced in the future through a ‘fusion of horizons’ (Smith, 2001). Secondly, according to Vygotsky (1978), conversation is related to our capacity for thought and our ability to solve problems in that language precedes thought. For example, we often see young children speaking aloud to themselves, as if from another person, directing themselves through the steps of a complex or difficult process. This need to talk ourselves through the process allows us to gain that understanding, reasoning and internalization of information. The third dimension of conversation is that it is linked with our self-conception as moral creatures. The concept of conversation as a process of communication is thus closely tied with the values of involvement, respect, and concern for one’s partner(s) in discussion (Barbules, 1993). There is a sentiment of care, an air of open-mindedness and spirit of equality. It involves mutual respect for one another, reciprocity and a shared commitment to being fair-minded, open and appreciative of ideas where presented views are treated with validity. There is a level of trust and understanding between collaborators that what is being discussed is honest, sincere, will be treated with impartiality and responses candid. We engage in conversation under the belief that it holds possibility; although unsure of what information will be gained, there is faith that the inherent value of the conversation will be insightful and carried forward (Smith, 2001). Finally, communication is the fabric of our society and for that reason, conversations make possible the establishment of relations of negotiation, cooperation, mutual tolerance, the pursuit of common
interests and the nonviolent resolution of conflicts (Barbules, 1993). Dewey (1916) argues strongly in favour of the need for open communication within social groups in a democracy. He believes the greater the variety of concerns that can be discussed within the public sphere, the more sturdy a society it will be. With this view, the nature of our democratic society can exist only when different individuals and groups are able to learn about and understand competing issues. Conversation in this sense is essential to democracy (Barbules, 1993).

As described by Vincent Crapanzano (1990), “etymologically, [conversation] is a speech across, between, through two people. It is a passing through and a going apart ... It is a relationship of considerable tension” (p. 276). This suggests that effective conversation depends on the establishment and maintenance of a particular kind of relation among its participants. Conversation involves being engaged where participants not only share concerns but also develop and maintain a social bond. Conversation is more than an act of exchanging ideas and information because it entails a kind of relationship and interaction (Smith, 2001) involving virtues and emotions (Barbules, 1993).

While the ideal notion of an effective conversation is one that depends on the establishment and maintenance of a particular kind of relation among its participants and has some generally, characteristic formal properties, it is not bound by these. What underlies the interaction in a conversation are the attitudes, emotions, and expectations that participants have for each other and the value of the conversation itself (Barbules, 1993). What sustains the conversation over time is not only animated conversations about topics of interest but also a certain commitment to each other for an ongoing communicative relation, where there is a mutual respect, care and commitment to discourse and the greater understanding to learn from one another. As Gadamer stated:
The horizon of the present is being continually formed, in that we have continually to test all our prejudices. An important part of that testing is the encounter with the past and the understanding of the tradition from which we come ... In a tradition this process of fusion is continually going on, for there old and new continually grow together to make something of living value, without either being explicitly distinguished from the other (Gadamer, 1979: 273)

It is the nature of a this unique dialogical relation to be able to “carry away” its participants, to “catch them up” in an interaction that takes on a force and direction of its own, often leading beyond any intended goal to new an unexpected insights that will sustain conversation. The concern is not to win an argument but to advance human understanding and well being. Conversation is not simply a matter of two isolated persons who decide to start talking to one another but involves a symbiotic and synergistic dynamic where participants share a cognitive interest in pursuing understanding, knowledge and agreement (Barbules, 1993).

2.10.1 Role of Conversation

Cultivating conversation lies at the centre of what educators do. Through conversations, our goals involve engaging individuals in their learning by gaining feedback, transmitting information, initiating reflection and testing out preconceptions. Conversation is unlike other forms of communication which includes chatting, talking, arguing and so on, but is much more. Engaging in conversation is an activity that is directed towards discovery and new understanding which seeks to improve participants’ knowledge, sensitivity and insight (Barbules, 1993). In general, conversation is interactive and serves to empower learners to take an active role in their
learning by asking questions, sharing, and discussing their thoughts and ideas. It provides opportunities for participants to express their observations and interpretations of the events they experience and stimulates their natural curiosity to learn more about their world. The telling of stories is a way of making sense of our lives, seeking possible solutions to problems and constructing logical order from our experiences (Moen, 2006). Conversation enables inquiry into and an understanding of one’s surroundings in an environment where ideas are valued and respected. In conversation, a group of people can explore individual and collective ideas, beliefs and feelings. It is an opportunity to participate in a process where one can communicate successes and failures within a safe environment.

2.11 Conversation, Learning Communities and Brookstone

Conversation, dialogue, discourse, talk, and discussion among others are terms frequently used interchangeably. For most of the time, as educators we are talking in an everyday way about students, work, the community et cetera. Unlike Freire’s (1970) notion of dialogue where the goal of dialogical teaching and learning is the mutual development of understanding through a process of shared inquiry, teachers’ conversations tend to be less formal and less stringent about its end goal. Freirean pedagogy seeks to emancipate the oppressed from the shackles of ideology, learned helplessness, and dependency with the intent to gain knowledge. Compared to Freire’s idea of dialogue, to be in conversation much of what is discussed is casual, everyday matter where there may or may not be an unmasking of a hidden truth or set agenda followed. Often times there is no finite answer but a suggestion that will lead to further investigation or require additional exploration.
Conversation involves a unique interaction and social relation that entails mutual concern, respect, appreciation, trust and hope (Smith, 2001). In some ways, dialogue can be seen as a form of conversation; more serious in format. For the purposes of this thesis, a focus on conversation rather than dialogue is more useful. When in conversation, there is a fluid exchange of ideas and teacher talk that has an air of informality that is less obligatory than dialoguing. Dialogue, in the sense that Freire uses, is one element of what educators do regularly. While educators also engage in activities directed towards discovery and new understanding, they are also concerned with the sense of being, involving emotions and belonging in the classroom. Teachers value the emotional and social aspects of the process of learning and development as well as teaching for understanding. Learning is more than just having knowledge, but is a skill and attitude that must permeate teaching. It involves teachers being flexible in order to provide students with a variety of opportunities within a well-managed environment where students can be creative and discover knowledge. Combined with the attitude that teaching is not only a learning process for children but also a continual learning process for the teacher in addition to the faith in IWB technology, a synergistic relationship has developed and enabled the Brookstone Inquiry Group members to come together to learn professionally and build a community of learners. Teachers have been drawn to engage in conversation whose aim is not necessarily a correct answer but rather a heightened sense of sensitivity and understanding of other persons, and through understanding them, newly understanding themselves. It is this shared understanding, passion and enthusiasm for learning that makes the Brookstone community a unique context of interest to study.
Chapter Three: Research Methodology

3.1 Context of the Study

For over five years, teachers at an elementary school in the Lower Mainland in British Columbia have expressed an interest in the innovative technology of IWBs and have been using IWBs in their classrooms. In May of 2002, prompted by an email about a grant programme for obtaining free IWBs by SMART\(^3\) Technologies, one teacher at Brookstone Elementary School responded and subsequently applied to the SMARTer Kids Foundation. The proposal was accepted and consequently the school received two IWBs plus a paid trip to Calgary, Alberta, for one week of professional development during the summer months. A condition of the grant was that the new boards be used in the grade five classrooms during the first year and then be passed onto the grade six teachers for the following year. At the end of this year, the teacher who had applied for the initial grant was reluctant to give up her board as she had transitioned to using it in nearly every lesson. At the time, although the IWB functioned similarly to a whiteboard with multi-colored pens, the capability to save the lessons for the next day or print off the digital notes for particular students who were absent, struggling students or students with output difficulties was a significant support in creating continuity from one day to the next. She successfully appealed to the School Parents’ Association to purchase one more board that could remain in her classroom. Although her initial use of the IWB was relatively simplistic, it already offered features that enhanced her traditional lessons. While her colleagues at Brookstone School seemed to share an enthusiasm and passion for IWB use in their classrooms with their students, its overall use in the school remained limited.

\(^3\) SMART Technologies is the maker of SMART boards (one brand of interactive whiteboards). Brookstone School has acquired and installed SMART boards in each of its classrooms.
It took several years for some of the teachers to gradually develop confidence and conviction that IWB technology would lead to long term student and teacher gains for teaching and learning. The two boards from the grant that stayed in the school were rarely turned on in the second year, as the teachers who were given an IWB had not received any professional development and generally were not interested in adopting new technology. The original teacher continued to use hers and her students would talk about the boards in their other classes. In the third year, a teacher with a one year contract arrived. He was enthusiastic about the use of new technologies. He talked to the staff about how he was able to use the IWB to capitalize on more “teachable moments” by finding up-to-date information on the internet and projecting it to the entire class. When additional funding was made available to the school, Brookstone staff surprisingly voted to purchase three additional IWBs in lieu of other educational equipment or textbooks. The value of IWB permeated the rest of the school staff through praise from students and the small group of teachers using them. Consequently IWB use eventually captured the interest of the remaining staff. With technology being quite prevalent in the homes of the students, teachers wanted to build on these skills and explore the educational potential of the IWB further.

During the 2005 school year, Brookstone staff became involved in a yearlong professional development program which entailed working with teachers in the nearby high school plus District support staff. This program was a type of “Appreciative Inquiry” (Proudfoot, 2006) whereby the school identified strategies and school initiatives that were working well in the schools that enhanced student academic acquisition and increased student involvement in the school communities. After several interviews with parents, educational staff, and students, the IWBs emerged as a powerful tool for learning and increased engagement and the schools met to
decide how they could add more resources to enhance any initiatives that were identified. Both schools approached SMART Technologies for a grant to purchase more boards at a substantial price discount. As a result, Brookstone was able to acquire six more IWBs.

In a follow-up to the earlier Appreciative Inquiry, the Associate Dean of Education at a university was approached to see if some university faculty members might be interested in working with a group of staff members to investigate the effects of IWB use in classrooms. By the fall of 2007, an Inquiry Group was created to document and explore teacher-derived observations and questions about how IWBs enhanced the teaching and learning in their classrooms.

This inquiry group included six teachers (five from Brookstone and one former teacher now at another school), the principal from Brookstone, two university faculty members, one research assistant and a teacher union researcher. The meetings take place after school and conversations have been incredibly rich and varied in regards to the changing views and practices on teaching and learning resulting from the use of IWBs.

One teacher in the Inquiry Group said:

_I find the [IWB] meetings very powerful in that after we have spent time sharing information and catching up on what has happened, then the ball starts rolling on what is occurring in the classroom, and an idea gets kicked around and builds and grows. This whole discussion that leads to real action is an amazing part of collaboration, because I get to see a lesson in its making and have a hand in its shaping, as do the other people sitting at the table._

(Priscilla, personal reflection, January 30, 2008)
The meetings have not only provided opportunities to extend and probe thinking but have led to a uniquely developed learning community because of its grass roots nature of IWB teachers coming together and sharing their observations.

In addition to the monthly Inquiry Group meetings, once a month the IWB teachers host SMART cafés as a means for interested staff and people from across the district to share IWB teacher – created lessons, ask questions and discuss new classroom uses of IWBs. Most recently, the Brookstone teachers have begun to offer province wide workshops where they instruct educators on SMART Board’s basic functions but also share some of their findings of how their educational pedagogy is shifting.

Working with the parent school council and SMART Technologies, to date, Brookstone Elementary School has installed IWBs in all its classrooms K – Gr. 7, the library, music room, district gifted classes and all resource rooms.

3.2 The Brookstone Inquiry Group

To date, there have been 20 inquiry group meetings at the school, involving all the IWB inquiry teachers, the school Principal, and the external researchers from the local university and the teachers’ union. A wiki has also been established for members of the Inquiry Group as a forum to document their Inquiry approaches as well as share, pose individual questions, comment, provide feedback, reflect, collaborate and describe their use of the IWB.

Nearly half of Brookstone’s teaching body came together voluntarily over monthly dinners in the staffroom to discuss the effects of IWBs on the classrooms. While all Brookstone teachers were invited to join, half accepted. This group included: two primary teachers, two intermediate teachers, a resource teacher, teacher-librarian, one teacher from another school who
did not have a board yet and the school principal. At present, the Inquiry group has grown to include two additional Brookstone teachers as well as one teacher from another school interested in the professional discussions and topics of the group.

Some initial areas of inquiry for the group included:
- Can IWBs support active learning in the classroom?
- If teachers deliver their lessons using IWBs, can this model meet the needs of more learners better than the more traditional approach of using a blackboard? If so, how?
- How do video clips affect learning?
- How does using the IWB allow people to collaborate?

During the discussions, natural partnerships emerged among teachers of similar interests. For example, the two primary teachers focused on their shifting pedagogy from a teacher-directed approach to more of a collaborative learning-together structure. Moreover, an intermediate and resource teacher who team-taught some subjects focused on how IWBs could support diverse learners. In each meeting, participants shared stories that exemplified educational advantages of IWBs and how their pedagogy was shifting to incorporate these advantages. The university and teacher union members served as valuable facilitators in terms of meeting one-on-one with teachers to develop a focus area for their inquiries. During the monthly group meetings, they also guided the group with key questions, such as “how has your practice changed?” and “how is this improving student learning?,” questions that helped the conversation to delve deeper into what exactly was working. To help explore the inquiry topics, some teachers observed each other’s lessons and discussed how the interactive whiteboards were being used and to record what exactly the students were doing while the lesson was being taught. Others surveyed their students to better understand what the children found most valuable.

A very collaborative community developed among the participating teachers. For example, using their IWB, teachers from different grades identified strategies and whole units
that were working well and placed these materials on a school computer network. These materials became available to the teachers whereupon they adapted them to support their own curriculum and goals in different classrooms. The facilitators created a members-only wiki space where teachers could record their observations and the facilitators could respond. Key themes emerged from the Inquiry Group that the teachers shared with all their colleagues and staff within the district. The meetings were so useful for the members that it was continued in 2008-2009 and will resume in 2009-2010. As previously mentioned not only have additional members joined the group, but original questions and interests have also evolved and expanded in order to explore a variety of issues in greater depth.

In 2008, Brookstone requested and received the distinction of becoming the Lower Mainland’s only Technology Inquiry School. This meant that all the staff agreed to use IWBs while continuing to investigate other technologies like video and digital cameras to enhance lessons. Certain teachers who were less comfortable with technology were initially apprehensive but not resistant. A key to these initiatives was to provide continuing professional development opportunities to be mentored by fellow staff members. Teachers also continue to be engaged in a thoughtful examination regarding how technology can be used to support student learning and teacher effectiveness, in terms of preparation and lesson delivery. Using technology has become part of a larger school goal which is to create more opportunities for active learning, meaning the lessons have interactive components. It was noted in the Inquiry group that teachers tried to describe projects they were working on and software features they were using in their classroom during their lunch break with other teachers in the staffroom. In response to this teacher interest for an informal demonstration space, an IWB was installed in the staffroom. An unexpected use was that teacher aides of special needs students began booking the staffroom to work on projects.
As other schools within the Lower Mainland area install IWBs in their classroom, the district has referred teachers and administrators to Brookstone for consultation on IWB use. So many requests came in that the teacher who received the original grant for an IWB has taken on the job of SMART Board Mentor one day per week in the District. The teacher now offers professional development workshops by traveling to schools to work one-on-one with teachers to build up their skill level or to deliver an example lesson in another teacher’s classroom to better demonstrate the potential of the technology. Members of the Inquiry group decided to offer two types of workshops on their own time for district teachers. The first are free, monthly SMART cafes which are intended to be a place for teachers from across the district to share lessons, ask questions and discussion classroom applications. Each meeting is attended by twenty-five to forty teachers depending on the preset topic.

Initially for the cafés, Brookstone staff created a one-hour workshop that showcased primary and intermediate applications with twenty minutes allocated for questions at the end. In 2008-2009, other teachers outside of the Inquiry group were encouraged to bring examples from their classrooms to share. To further support this collaborative environment in 2009-2010, five other schools have agreed to host cafés at their schools with Brookstone’s support. Topics have included subject areas like Mathematics and English, supporting learners with special needs and student presentations. Feedback from these monthly cafes has been very positive and many teachers attend regularly.

The second typical workshop is done less frequently and provides schools with an introduction to SMART Board technology. These workshops are offered two to three times a year and are for schools considering acquiring a board for the first time. Teachers and administrators from a variety of local school districts, as well as parents representing their parent
association attend the workshop. Inquiry Group members feel the workshop is different from the product demonstration offered by the local suppliers as it showcases how IWBs meet the needs of diverse learners and support multimodal lessons. It can be described in fact as a type of vision workshop.

One result of the workshops was that educators from around the province started to ask if the Inquiry Group would offer additional workshops in their area. Accordingly two day Summer Institutes were offered twice in the summer of 2008 by the Inquiry members and a total of approximately 75 participants attended. About 100 teachers participated in the 2009 Summer Institute. The design of the Institute is such that the participants begin by learning the basic functions of an IWB and the corresponding software and progress to developing their own lessons that they can take back to their school. A portion of each Institute focuses on how the educational pedagogy is shifting for members of the Inquiry group and presents some of the key findings emerging from the Inquiry process to date.

A simplified version of the Institute workshop was offered in October 2008 for teachers during a province–wide professional development day. One hundred educators from around British Columbia attended. Inquiry group members recommended the SMART cafés to those teachers in the Vancouver region wanting to continue their professional development in this area.

3.3 Research Questions

For the last three years, Brookstone Inquiry Group members have voluntarily come together once a month after-school to raise questions, share stories and discuss issues related to the use of IWB technology in their classrooms. The purpose of this study is to identify attributes of the Brookstone Inquiry Group and to examine the role of conversation within the Brookstone
Inquiry Group and how teacher conversation about interactive whiteboard technology has evolved into a learning community. Therefore the research questions for this study are:

1. What attributes of the Brookstone Inquiry Group have contributed to its functioning as a learning community?
2. What are the teachers’ transformed pedagogical roles within the Brookstone learning community?

3.4 Method

3.4.1 Role of the Researcher

At the start of this project I was recruited as a research assistant by the principal investigator of the Brookstone Inquiry Group. My role was to serve primarily as an observer and to document meeting minutes during the monthly Inquiry Meetings. Part of my responsibility was to also collect the audio recordings of the meetings and email copies of the meeting minutes to members of the group as well as compile academic literature/resources related to IWB technology and its use in the classroom.

Prior to this study, I did not have an extensive understanding of IWB technology. Although I felt I had a reasonable understanding of computers in general and how to use them, I had not heard very much about IWBs. At the time, I had no prior experience with IWBs nor knew of the possibilities for its use in the classroom. I am a registered teacher in Alberta and British Columbia with experience teaching at the elementary and middle school levels. This experience has given me a strong awareness of curricular course content and any potential

---

4In August 2009, I participated in a certified SMART board (one type of IWB) training program and am a certified trainer in the use of the SMART board
differences in the ways that a lesson could be taught in a traditional classroom versus a lesson using the IWB and the associated professional conversations.

Thus, I felt it was necessary to gain an understanding of IWBs and spent time in Brookstone teachers’ classrooms to experience what the teachers felt were positive effects on both teaching and learning. Since its outset, I have worked extensively with the teachers in this project, both in discussing what they felt were their teaching best practices with the IWB, visiting their classrooms and have even participated in some of their professional development sessions. I have spent a lot of time in the research setting getting to know them and their classroom, listening to narratives of their encounters with the IWB in order to gain insights and identify emerging themes.

Over the last three years that I have been working with these teachers, I have built a strong rapport and connection with each of them as individuals and spent a great deal of time with them listening to their struggles and successes teaching with IWBs. This relationship has allowed me access to personal information into participants’ experiences with the IWB and my research has shifted slightly and become more participatory. Initially an observer, quietly taking notes on the side and listening in on teachers’ conversations, Brookstone members have involved me in their discussions by asking about my interests in IWB technology and what I would be interested in learning more about as well as solicited my perceptions on their experiences. I have become more engaged in their conversations, participated in discussions and posted ideas and reflections on the group’s wiki. Instead of my earlier questions that were more superficial in nature such as: how does the board work?, what would suggest that students are more engaged in the lesson? or how do you use the board?, my questions to the teachers became more thoughtful and based on the behaviours that I observed in the different teaching environments and
conversations during meetings. Examples include: why do you think students are more attentive and engaged in their learning, how does using the IWB change the way you plan?, how would you describe your role as a teacher using the IWB compare with traditional methods? My experiences with Brookstone teachers in their classrooms have provided me with opportunities to reflect on the situation, my personal experiences as an educator in order to better engage in conversations with the group given the evidence I had witnessed.

The Brookstone Inquiry Group members, university staff and the teachers’ union researcher were very welcoming and supportive of my presence within the group. As I began my research, the staff accepted me easily into their group and appeared very willing to discuss their experiences with the IWB.

3.4.2 Design

A case study design which employed a qualitative, interpretive methodology provided rich descriptions of teachers’ understanding, experiences as a learning community and reflections on their use of IWB technology. Qualitative research is about trying to understand human behaviour: what people think about the world influences how they act in it (Palys & Atchison, 2008). The intent of qualitative research in this case study is to try to understand what teachers and students do within their working environments including both their individual classroom and their engagement in the Inquiry Group and identify emerging themes. The focus is on participants’ perceptions and experiences and how it unfolds in the context of the community. This allows for a flexible framework so that the researcher could gather descriptive data and identify emergent themes (Denzin & Lincoln, 1994; Merriam, 1998)
The purpose of a case study approach was to preserve the holistic and meaningful characteristics of real-life events and to understand the specific case under study, as well as to describe how things were at a particular time and place, instead of trying to explain why things are the way they are (Stake, 1995). The research is pragmatic, interpretive and grounded in the lived experiences of people in a specific context. In order to gain these insights, a lot of time in the research setting and contact with participants was necessary (Merriam, 1998). As there was no procedure to code data, a flexible structure was needed as appropriate judgments and changes could be made as the setting for conversations and events unfolded and evolved.

3.4.3 Participants

This study involved the teachers of the Brookstone Inquiry Group. This group was in place when I joined as a research assistant and I became interested in inquiring further into the group dynamics and inquiry because of the group’s unique grassroots approach to inquiry. Teachers in this group all share an interest in learning more about their teaching practices and the impact of IWB technology on their teaching. Since this is an exploratory study, it has a small group of participants and includes teachers of varying skills, and abilities who teach at differing grade levels and provides a range of possible experiences and situations. Since the research group involved educators, informed consent was not necessary. This case study differs from the traditional sense of quantitative research and the use of surveys to gather data that reflects a large population sample in order to make generalizations by demonstrating causation by the control and comparison of variables (Jorgenson, 1989). For these reasons, the themes identified may not be entirely generalizable but can be seen as contributing to a larger body of knowledge on IWB technology that will allow comparisons to be made. The Brookstone context is a unique setting
which the information gathered represents the potential for growth and opportunity should this model be applied in other situations.

As there were several teachers involved in this case study, three teachers were selected for interviews in order to gain further insight on their experiences and journey with IWBs within the Brookstone context. These teachers were selected based on their interest to participate in my research, their years of experience with IWBs and teaching experience. I was interested in selecting a representative sample of the group. Mary was selected as she was an intermediate teacher who successfully applied to the SMART grant programme, had been teaching for 23 years and had been using the IWB prior to the formation of the group. Mary had only begun using technology when she entered university. Sarah was selected to participate in the interview process as she was a younger teacher who had seven years of teaching and had experienced the use of technology from a very young age. Sarah was a primary teacher who had observed Mary using the IWB in the early years but did not begin using the IWB in her classroom until one and a half years prior to the establishment of the Inquiry group. Lastly, Martha was chosen due to her perspective on the use of IWBs as she had been a Brookstone staff member but moved to another Vancouver elementary school after a secondment to work as a faculty associate at a local university. Upon her return to teaching, Martha initiated the purchase of the sole IWB in her new school to use in her primary classroom. These three teachers thus reflect a broad and diverse representation of the teachers involved in the group have each distinctive teaching backgrounds, experiences with technology and accounts of IWB use.
3.4.3 Data Collection

My research goals were to describe the emerging practices of the teachers as they interacted with the IWB in the Brookstone context. Qualitative data was collected through interviews, observations, reflections, postings on the group’s wiki, anecdotal comments and field notes. The wiki is a password-protected site where only members of the Inquiry Group may post information, reflections or questions. Three teachers were selected for interviews\(^5\) based on varying experience and length of IWB use in the classroom to provide a broad spectrum of knowledge that would be representative of the group and were interviewed individually twice using a semi-structured interview format. The semi-structured format included mostly open-ended questions which endeavoured to solicit teachers’ perspectives, experiences, attitudes, and beliefs about their teaching practice with the use of the IWB. As it would be hard to anticipate participants’ responses, it would be difficult to design a survey or questionnaire to ask these questions. Open-ended questions allowed me to inquire into the teachers’ responses that were important to address the research questions guiding this study. Data analysis was aimed at identifying emergent themes regarding the teacher beliefs, practices, and experiences of the Brookstone Inquiry Group that made it evolve into a learning community and how teachers’ roles were transformed. Appendix B contains an exemplary list of questions that were explored during the teacher interviews.

During the first year of the inquiry group, to help facilitate the interviews, I spent at least two days, at least a week apart, in each teacher’s classroom making observations and field notes about how the IWB was incorporated into their lessons and used the information gathered to guide interview questions. The first interview took place in 2008 in the first year of the Inquiry Group once the initial observations were completed. The focus of the interviews was on

\(^5\) Informed consent was obtained prior to interviews can be found in Appendix A.
teacher’s experiences, and pedagogy as observed during class time. The second interview took place approximately six weeks after the initial interview. This enabled me to transcribe the initial interviews and to generate further questions to clarify the teacher’s beliefs and practices. This time period also allowed the teacher to reflect upon some of the issues discussed in the first interview. The interviews were audio-taped and transcribed verbatim. Through the use of the group wiki, members of the Brookstone group as well as the interviewed teachers posted reflections throughout the period of study to record their feelings, questions, and experiences.

3.5 Analysis

Data for the qualitative analysis was obtained in three ways. Each source represented a different type of conversation that was triangulated to identify recurring ideas, themes and examples. The first source was through the series of Inquiry Meetings that were all recorded and burned onto CDs and converted into a set of meeting notes. Conversations from the meetings represent dialogue and reflections of the teachers at one particular point in time over the last three years. Through classroom observations, meetings and visits, I have also recorded observations that I felt were relevant at the end of the visit and reflected on the day’s lessons.

Secondly, interviews conducted towards the end of the first Inquiry year were recorded and transcribed. Interviews were analyzed to identify recurring themes and ideas and served to provide greater insight into teachers’ understanding of IWB technology and their beliefs, attitudes and opinions about their experiences with the whiteboard. The third source of qualitative data was the Inquiry Group’s wiki where teachers could post questions, reflections, narratives and comments. Similar to the face to face conversations, the wiki represents a different forum for conversation that extends through time and space and allows teachers to converse with
one another outside of inquiry meetings. The wiki includes feedback teachers have given to each other after observing one another teach in their classrooms.
Chapter Four: Data Analysis, Results and Interpretation

4.1 Introduction

This chapter is divided into two sections. In this chapter I present my findings and identified themes from my experiences in researching the Brookstone Inquiry Group. In responding to my two research questions:

1. What attributes of the Livingston Inquiry Group have contributed to its functioning as a learning community?; and
2. What are the teachers’ transformed pedagogical roles within the Brookstone learning community?,

I begin by exploring and identifying attributes of the Brookstone Inquiry Group that have contributed to its functioning as a learning community. Then I provide a brief description of the role of conversations within the Brookstone Inquiry Group. This includes an explanation of how the conversations around the use of interactive whiteboard technology have shifted teachers’ pedagogical understanding and practice. I highlight three recurring topics that have evolved over the last three years and explain each of them in relation to the conversations of the teachers and how it has supported the professional growth and the development of a learning community. The data presented in this chapter is subject to my interpretation within the Brookstone context, experiences and narratives of Inquiry Group members.

4.2 Attributes of the Brookstone Inquiry Group as a Learning Community

The “Brookstone Inquiry Group” has been a collaborative venture between the university, the teachers’ union and a group of school-based educators from a school district in the Lower Mainland in British Columbia. Since its inaugural meeting, Brookstone Inquiry meetings have
been replete with topics for discussion, goals for the group and revelations. The unique, free-flowing nature of this forum for discussion has been a source for ‘aha’ moments, innovation and collaboration that would not be as likely under different circumstances. In this section, I discuss several features of the Brookstone Group that I believe have contributed to its success and evolution towards a learning community.

While most but not all the participants of the Brookstone Inquiry Group work at the same school, the common thread of IWB use has connected each person in the group. Whatever the individual topic or focus, there appears to be an authentic interest in all uses of the IWB and the strong belief that what they are noticing in their classrooms is valid. Teachers are eager and quick to share their experiences with the IWB.

Our discussion ... was fantastic – I think there is something to learning first, eating next, and then getting into a discussion. Even though I am working with Lydia\textsuperscript{6}, Mary and Ruth in Learning Assistance Groups, I rarely see or talk to Mary or Lydia. It was fantastic to hear what was happening in their classrooms, and to share what the students are doing. It was fabulous to hear about what was happening with in the Kindergarten rooms, because even though I see Jennifer and Sarah frequently, we are not always talking about the [IWB] specifically, and so there is information I really want to hear but when is all of this discussion going to take place?

(Sylvia, journal reflection, April 5, 2008)

The teachers share an intrinsic, natural desire to learn more about the IWB and its potential in the classroom. Their willingness, in the summer of 2009, to devote their time to learning more about IWBs by voluntarily participating in a three-day training course on the applications and features

\textsuperscript{6} All names of teachers in this thesis have been changed to ensure confidentiality and anonymity.
of the IWB in the days leading up to the first day of school is a further example of their faith and confidence in this technology. The mutual understanding and collective stories have resulted in a unique bond between its members and a common ambition to seek more information about IWBs.

Whereas meetings are often established with predetermined agenda items, and fixed topics for discussion with a set objective in mind to be ascertained by the end of the meeting, Brookstone meetings often differ from the agenda as its participants take their cues and shape the issues that arise within the group and over the course of the meeting. I have noticed that conversations are authentic, spontaneous and natural, driven by the participation of its members and the stories shared rather than dictated by a need to fulfill a particular agenda item or discuss a specific issue. Participants have reiterated the notion that the opportunity to hear other teachers share their experiences with the IWB has been encouraging as teachers share similar stories in their classrooms. The exchange of ideas and dialogue is especially valuable between its members as it not only reinforces their teaching practices but strengthens the idea that the IWB is having a positive impact in the classroom. This is especially evident in the following extract from the Wiki that starts with one teacher’s reflections on her observations in another teacher’s classroom. When she posted this on the Wiki, the observed teacher then responded, thereby generating a dialogue on practice:

**Priscilla:** Sarah brought her Grade 2/3 class down to the library to work on their election PowerPoints. I really enjoy watching Sarah work with her group, because I learn, too! We realized there was a problem with the students retrieving work from Hand Out and saving it to Hand In. I sent a FootPrint to the Tech Desk, and Larry, our tech came after school. He said students should go to Hand Out, Save As to My Documents,
and when they have finished their assignments, put a copy in Hand In. It’s a lot of steps for the little ones to do. P. P. [a teacher-librarian] at [another Secondary school], came over after school to see the placement of the [IWB] how to orient it, and I showed her a number of activities Jennifer, Mary and myself have created. It would be a good idea for us to put all of our activities in Teachers Community on the Shared Drive with clear subject titles like, Hiroshima, Jeopardy Religion Game, etc.

Friday – I had the Reading Recovery Grade 1 students use the [IWB] to draw the alphabet and to draw a picture of a word that starts with the sound. This added a level of interest to them - - students rarely get a chance to have the [IWB] all to themselves for an extended period, and it is good for them to be standing on their feet, using a large pencil (grip) making large motions with their arms to create the letters. This is something for us to consider: the physical aspect of using the [IWB]. I also used the [IWB] to review the last two months of book talks: what is an omnivore, carnivore, vertebrate, etc. Most students remembered with the picture prompts.

**Sarah:** I think this is a great idea Priscilla, to have the [Reading Recovery] kids work on the [IWB] I know that for K., she will be much better at/willing to demonstrate her knowledge through the [IWB]. And that's what I'm noticing. The [IWB] is a great facilitator in helping us express ourselves. We are still doing the same kind of things (phonics, spelling, reading, math etc.) during our lessons, but the [IWB] changes the mode of expression. With the [IWB], I’m motivated to show what I know because it’s fun to do so (even as a teacher!). I think for K. and a lot of the younger learners, the [IWB] maximizes the "game" quality of an activity, and helps us to make most lessons look
similar to an online game. And kids like K. might not feel comfortable telling me what
sound does p say, but would be completely used to click on the p when she hears the "p"
sound. Let me know how it goes!!)

(Priscilla, Wiki, April 5, 2008)

Brookstone teachers have not only demonstrated their willingness to listen to each other’s experiences with the IWB but are willing to share their experiences by welcoming colleagues into their classrooms. One example of this is demonstrated when one teacher in the Inquiry project went to observe another teacher member use the IWB at the different school. Both teachers found the conversation that was exchanged constructive as the observer became more aware of the positive effects of the IWB had on students in the classroom and the teacher-presenter gained feedback on her teaching. While the Brookstone teachers all range in years of experience, grade level and familiarity with technology, their intrinsic desire and motivation to learn from one another about IWB technology seems boundless.

Meeting always after school, when one might expect fatigue after a day’s teaching, teachers voluntarily come together to engage in rich and varied conversations about the nature of their teaching and student learning as well as how their views are being changed by the use of IWBs. Teachers are eager to share their stories and keen to discover more about how IWBs were being used in other classrooms and always ready to give examples of their experiences. When interviewed about why the teachers choose to meet on their own time to discuss their experiences with the IWB, on top of their regular work demands, and personal life, the teachers’ energy, enthusiasm, passion and whole-hearted conviction that the IWB better engages their students in their learning, and therefore enhances the learning experience was reiterated. Despite the initial investment and extra time required to become accustomed to using the technology in the
classroom and the eventual need to change one’s approach to teaching, the optimistic attitude of the teachers is evident as one teacher explained to me, “if I think the pay-off is going to be big, then I’ll go to the trouble [of learning it], otherwise forget it.” When questioned on the effects the Inquiry Meetings have had on their learning and whether the meetings met their needs, teachers’ comments succinctly reflect the merits of the group and its continued success:

I noticed just how important our group meetings and discussions were for me to feel that I was collaborating with staff. Taking time to meet and discuss our teaching happened the first year we did levelled reading groups, and those meetings raised my respect for other teachers, because it was very powerful to hear educators talking thoughtfully about the students and what they do to respond to students’ needs. It was also powerful because I felt part of a group that was working together and incorporating many ideas into a group project.

(Priscilla, journal reflections, January 30, 2008)

I find the [IWB] meetings also very powerful in that after we have spent time sharing information and catching up on what has happened, then the ball starts rolling on what is occurring in the classroom, and an idea gets kicked around and builds and grows. This whole discussion that leads to real action is an amazing part of collaboration, because I get to see a lesson in its making and have a hand in its shaping, as do the other people sitting at the table. I'll need to think more about what collaboration is and what to call the various interactions I have.

(Priscilla, journal reflections, January 30, 2008)
Teachers’ comments reflect a natural appreciation for the collaboration, a genuine enjoyment for working together, as some members work at other schools, and demonstrate a high value for the differences of each member in its group.

Brookstone teachers have come to share a united passion for IWB technology in that it offers their students a mode of learning that cannot be achieved through traditional means. Brookstone teachers have identified and understood the positive effects of IWBs improved on their practice through the actions of their students:

- Engagement: Students were more attentive and focused during lessons.
- Active participation: Students seemed more keen to participate when they anticipated being able to write or manipulate something on the IWB.
- Memory: The ability to revisit a saved visual presentation of a lesson seemed to help students who relied heavily on visual memory.
- Development of background knowledge: The use of video clips from a variety of sites helped students make a connection to a place and time in a manner that a textbook could not do.
- Integration: Students with special needs had more tasks available to them in the classroom through the use of the IWB features.

Several participants have reflected on what they perceive to be improved student engagement since the use of the IWB became common:

*We feel that the IWB enhances the students' learning in several ways. Students and struggling students in particular seem to take risks. The use of IWB technology in daily lessons seems to increase their confidence in volunteering answers, oral presentations and research skills. Many who would never get up in front of the class now volunteer to...*
use the [IWB] technology to showcase their understanding. There seems to be a willingness to make mistakes and not feel ashamed. In fact these students will continue to stand at the [IWB] and try to problem solve rather than wanting to escape back to their desks. We surmise this confidence may come from experience with computer and video games that require them to try again and again until they get it right. This routine seems to be transfer to classroom learning with technology.

(Lydia & Ruth, journal reflections, March 14, 2008)

Teachers have reiterated the notion of how the IWB has better engaged their students in the classroom by students raising their hands more, sharing their ideas more in classroom discussions and being more willing to participate by coming up to the board. Teachers have described that students are more keen to participate when they anticipate being able to write or manipulate an object on the screen. Sarah and Jennifer’s comments about their primary class exemplify this notion of increased engagement as they make a brief comparison of classroom life with and without the IWB.

I think part of why my students are engaged in lessons with the [IWB] is due to their sheer excitement at the anticipation of being able to get up and touch/use the [IWB]. So if my students are looking at the board then it increases their chance of being able to know when to put their hand up so they can use it. My students are also keen to figure out problems with the [IWB] or just to learn more about how it works. They’re often watching my every move as I open up a new document or create a new page. They are eager to learn what I’m doing so that they’ll be able to do it themselves.

(Sarah, personal reflection, April 29, 2008)
We believe that when we see our students’ hands up asking or answering questions then that shows they are engaged in the lesson as they are following it. We’ve definitely noticed that since we’ve been using the [IWB] that there’s been an increased level of participation in our lessons. I often feel overwhelmed with who and how to pick kids, as there are so many hands up wanting a turn. This definitely was not the case with lessons I taught without the [IWB].

(Sarah & Jennifer, personal reflections, April 29, 2008)

Students have not only shown increased participation in class lessons from the example above but illustrate a newfound excitement for learning with the use of the IWB’s multi-modal features. The built-in features of the IWB, including the use of colour, its large screen, still images and video clips, audio files and the user’s ability to physically manipulate objects on the screen, have played a large role in students’ retention of knowledge. One teacher’s story of a student who had previously had great difficulty retaining details and facts explains how the visual feature of the IWB has had a strong impact on one particular student’s memory and recall of information.

We had brought the slavery topic into the 1900’s with the continued segregation of blacks. We looked specifically at the period of the civil rights movement and started with Jackie Robinson, the professional baseball player. A couple of days after watching the video clip, I enlarged the image from the thumbnail of Jackie Robinson. Just looking at this image, a different student who struggles to get anything down on paper was able to re-tell orally the entire Jackie Robinson story using this visual prompt. I believe that had he not learned this content initially through the engaging video clip, he would have been far less successful. In his re-telling of Robinson’s life, he remembered the precise year.
The use of a video clip in this example not only has enabled students to have better retention of information because of the IWB’s large size screen, colour and visual aspects as well as access to the internet but also demonstrates how access to information has resulted in improving students’ background knowledge. One teacher describes the changes to students’ development of background knowledge due to the immediate access to information Together, students and teachers can take advantage of teachable moments and together locate an answer. This is further evidence of the notion of increased student engagement and participation during lessons.

*The prevalence of information on the internet has changed how our students can approach information and the ownership of information. Information no longer belongs in a library or a textbook or a teacher’s brain. It can be gathered and grasped within seconds and is literally at their fingertips. Knowledge has never been so accessible or such a commodity as now. I believe this potential for students to so readily access information helps keep them engaged. Instead of passively have information fed to them, they now have the power.*

(Sarah, personal reflection, April 29, 2008)

During Brookstone discussions, some teachers used particular students as examples of how student engagement during classroom lessons has changed as well as how the IWB have helped students overcome their anxieties about coming to the board by being more willing take risks and actively participate in learning:

*Marilyn*⁷ has been attending our school for two years. Last year, she was designated as a selective-mute student. From the start she had demonstrated extreme anxiety, especially

---

⁷ Student name has been changed to maintain confidentiality and anonymity.
in the area of performance. This year, she is attending kindergarten for the second time. While she has shown some improvements during simple social exchanges, she still shows strong reluctance when asked to respond. However, since January, she has surprisingly been raising her hand occasionally to come up and use the [IWB]. Here, by volunteering, she is literally putting herself on the spot to come up and demonstrate her knowledge. I am convinced that the [IWB] offers her a sense of security that she otherwise does not have. In addition to this, she actually raised her hand and came up to show an answer when the Globe and Mail reporter and photographer came in to visit our classroom and take pictures. Last year, Marilyn refused to engage and respond whenever there were strangers, particularly men, in the room. ... Yet, during that session, she raised her hand and came up and answered a question using the board, in front of a room full of adults, some of which were stranger. In short, Marilyn’s willingness to participate speaks volumes about the type of emotional safety that the [IWB] offers. She can demonstrate what she can do (which adds not a little to her confidence), while still remaining mostly invisible. It is truly exciting to watch this progress.

(Sarah, personal reflection, April 4, 2008)

While students like Marilyn may have received alternate programming with the school’s resource teacher, the IWB in the case above shows how the IWB has lessened the barriers of students with special needs by seamlessly integrating students with special needs into the classroom and can fully participate in lessons with subtle or no adaptations. The ability of the Brookstone teachers to show insight by recognizing the impact and effect the IWB has on student learning, by giving examples and making reflections substantiates how the unique
attributes of the Brookstone Inquiry Group have contributed to its functioning as a learning community. Moreover, it highlights how the conversations have played a role in helping teachers to recognize changes in their understanding of pedagogy and practice.

Teachers’ reflections on their IWB use have provided tremendous insight into their professional understanding and evolution with technology. It demonstrates their willingness to engage in self-examination, self-discovery, and the ability to be introspective; all valuable teacher aspects that have helped their professional growth and ongoing development of a learning community. The above comment illustrates a change within the classroom that traditional teaching would not have ordinarily permitted. Evelyn’s ability to engage in the lesson with the use of the IWB has levelled and equalized the playing field for all students so that everyone has the opportunity to participate in the learning. Teachers’ reflection on the use of IWB technology makes evident how the technology can seamlessly engage and activate a diverse range of students, including students with special needs:

... the board made it so accessible to them. It gave them an opportunity to choral read aloud with text that was larger than life. We could stand up, gather around the board like a little family ... they could get the highlighter, they love doing things with their bodies and the board allowed them to do that and they were riveted ... The payoff in the classroom was so tangible, you could just feel it in the air.

(Mary, Interview #1, April 30, 2008)

We feel that the [IWBs] enhance the students' learning in several ways. Students and struggling students in particular seem to take risks. The use of [IWB] technology in daily lessons seems to increase their confidence in volunteering answers, oral presentations and research skills. Many who would never get up in front of the class, now volunteer to
use the [IWB] technology to showcase their understanding. There seems to be a willingness to make mistakes and not feel ashamed. In fact these students will continue to stand at the [IWB] and try to problem solve rather than wanting to escape back to their desks. We surmise this confidence may come from experience with computer and video games that require them to try again and again until they get it right. This routine seems to be transfer to classroom learning with technology. Many of the special needs students and 'grey-area' students have never been able to create a presentation or project that compares with the 'regular' students. [Now] their presentations are genuinely engaging and their classmates are focused during the entire length. In fact real questions and complements follow each talk.

(Lydia & Ruth, personal reflections, March 14, 2008)

One Grade One teacher in the group had a colleague, observe her teaching with the IWB in the first year of the group meetings and writes in her reflection,

*Martha taught a couple of great lessons. It was nice to see her class so attentive and excited about the [IWB]. I noticed the class was calmer and quieter during times when the [IWB] was on especially when there were opportunities for them to be involved with using the [IWB]. I was impressed with how much Martha has learned in such a short amount of time. Her screens were colourful and full of little extras from the gallery. You can tell she’s spent a lot of time learning and figuring things out. I was also impressed with the helpful nature of many of her students when they would need to solve a problem. There was one point when Martha wasn’t quite sure of what to do and they all worked together. The class was silent and they were all focused on figuring it out.*

(Jennifer, personal reflection, April 15, 2008)
This quote is particularly revealing in that it demonstrates the positive attitude of its members to learn new technology, a willingness to try something new and add skills to their teaching repertoire and involve their students in the process. This reflection is invaluable to the teachers as it allows them to develop insight into their own practices as they observe their colleagues teach and discuss their experiences as is shown as the teacher continues to write,

*Through Martha’s lesson and her focus topic, I became aware of how the [IWB] does introduce so many new vocabulary words and how many subtle concepts are used/taught throughout our lessons while using the [IWB]. There are definitely times when the vocabulary is used but there are also many subtle things the kids did by just observing and subtly learning. The students may not have used as much computer vocabulary as Martha did but they clearly seemed to understand her, they could follow through with the directions, make suggestions themselves and use the [IWB] effectively. Some were still learning as it were new but bottom line they were learning this new vocabulary and being successful with it when using the [IWB].*

(Jennifer, personal reflection, April 15, 2008)

Posted on the wiki, Jennifer’s reflection on Martha’s teaching reiterates an important feature of the Brookstone group in that conversations are a necessary feature of professional growth. The opportunity to share stories is not only cathartic but authenticates their own personal experiences.

*Being in a community with others who are working on this technology has definitely inspired me to try new things with the [IWB] technology. This has been a crucial support for my learning in using this technology. I know I work better in collaboration and community. Is that not what our classrooms are a reflection of?
The sharing of narratives is reassuring for the teachers as they learn how other people are experiencing or have experienced similar outcomes.

The noticeable positive effects of the IWB have been a driving force behind the teachers’ desire to learn about the technology and its application within the educational setting. Getting beyond the early phase of using the IWB in lieu of a chart stand has created unimaginable opportunities for teachers and students. The teachers’ willingness to take risks by implementing IWBs in their classroom have provided great rewards that further inspired the teachers to strive for more ways to connect with their students. Brookstone teachers’ eagerness to learn more about and with the technology is evident not only in their learning but also their students’ learning. As teachers have grown in their ability with the IWB functions, students have taken on greater responsibility for their learning by becoming teachers within their classroom through student presentations via the IWB. This has resulted in a huge shift in the teacher-student relationship where the general perception is that teachers always have the answer and that the ultimate authority in the classroom. This shift has been the result of the teachers’ willingness to relinquish authority and share the role of the teacher. The conversations in the classroom between the teacher and student have thus also been a source for professional growth as the classroom community collaborates and works together to learn about IWB technology. Teachers are mirroring the creation of a learning community in their own classrooms as well as in the Inquiry Group meetings. Teachers’ have not only created higher expectations for themselves when using the IWB but have also found new ways to engage their students in higher level thinking skills. One describes this as:
The criteria [for learning with the IWB] has become more complex, more detailed, yet the children’s performance have gone up and allowed for the making of a community through the IWB. It makes a communal learning experience that is much different from reading a passage by yourself. The community is a huge issue in the use of the [IWB]. It’s a supportive community and welcomes risk taking ... Adults are willing to admit that they don’t know the answer and the teacher and student will search for information together.

(Lydia, Inquiry meeting, November 3, 2009)

In summary, the Brookstone Inquiry Group teachers can be characterized in terms of a number of attributes that have contributed to its formation and functioning as a learning community. As a group of self-reflective professionals, the teachers have realized the potential of IWB technology and all share a willingness to learn its use and its applications. Teachers are respectful, open, willing, passionate learners and role models. They have not only demonstrated an intrinsic desire to learn about technology to improve their skills as a teacher and to better engage their students in their learning but also a willingness to take risks, and share and learn from others, including inquiry group members, colleagues and own students. Teachers have demonstrated their conviction in IWB technology by demonstrating an eagerness to share and model what they learn with their peers and students every step of the way in the last three years. Most importantly, they have learned to engage themselves in conversation about what they learned about IWBs with one another and students and ultimately established a thriving learning community.
4.3 Conversations about Interactive Whiteboard Technology and Teacher Pedagogy

Conversation has been an invaluable aspect of the Brookstone group that has not only driven discussion topics during group meetings but also has been manifested in an electronic forum to which teachers have gathered to share insights, ask questions and collaborate. This school’s ability to communicate understanding amongst staff members as well as administrative support to allow for professional development and resource allocation has been vital to the success of the Brookstone Inquiry Group. By providing opportunities for teacher reflection, collaboration, talk, interaction and time for ongoing professional orientation, teachers have been given an opportunity to improve their practice and have resulted in an impetus for the school change. The description of this Inquiry Group represents a distinctive community that has initiated an ongoing process of inquiry as a form of collaborative professional development. It has also resulted in other supports including whole group facilitation, individual project support, and supporting participation in workshops and presentations. While the fundamental educational philosophy of the teachers has not changed, significant changes in pedagogical approaches are evident in improved students’ engagement, retention and output.

In this section, I use three examples that illustrate the evolution in teachers’ pedagogical understanding and practice through the use of the IWB. The notions of teacher on the side, teacher planning and design as well as professional development are three thematic issues that have arisen through the on-going conversations in both the meetings and the wiki. A summary of the evolution of these three examples can be found in Table 4.1.
Table 4.1: The Evolution of Three Examples

<table>
<thead>
<tr>
<th>STAGE</th>
<th>THEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-inquiry and Stage 1</td>
<td>‘Teacher on the side’</td>
</tr>
<tr>
<td></td>
<td>Teacher to the side of a chart stand</td>
</tr>
<tr>
<td></td>
<td>Teacher presentation (as a tool)</td>
</tr>
<tr>
<td></td>
<td>Individual lesson</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Engaging students from the side</td>
</tr>
<tr>
<td></td>
<td>Different interactive tools (start of diversity)</td>
</tr>
<tr>
<td></td>
<td>Shared learning</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Teacher on the side as students make presentations</td>
</tr>
<tr>
<td></td>
<td>Digital unit planning (critical thinking)</td>
</tr>
<tr>
<td></td>
<td>Workshops and institutes</td>
</tr>
<tr>
<td>Beyond+</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>?</td>
</tr>
</tbody>
</table>

Each topic, the notion of the teacher on the side, teacher planning and design as well as professional development is used to discuss the value of conversation and explain how it has aided in the development and evolution of a learning community. Conversations around these themes have had a significant role in supporting teachers’ understanding of their pedagogy and practice. Time for reflection, feedback from peers and conversations has helped teachers to unpack and delve deeper into their knowledge about teaching and learning with the use of IWB technology. Each example demonstrates the progression that teachers have undergone, and through conversation, have resulted in the current dynamic, collaborative community of the Brookstone Inquiry Group.

4.3.1 Teacher on the Side

As its name literally suggests, teachers can often be found ‘on the side’ in a classroom. Whether it be to the side of student who needs to be re-directed to stay on task, or to the side of a
student requiring extra assistance or to the side of the blackboard, or whiteboard, this notion of
the ‘teacher on the side’ has been a recurrent theme within conversations of the Brookstone
Inquiry Group. The notion of the ‘teacher on the side’ has evolved in three ways: from the idea
of the teacher being to the side of a chart stand to the teacher engaging students from the side to
teachers being on the side as students become the teachers through IWB presentations.

4.3.1.1 Teacher to the Side

While there may be varying philosophies on the role of a teacher, all teachers share the
common feature of directing students in their learning. This could involve providing direct
instruction to completing the task at hand, directing students to conduct their behaviour, or
directing students in a lesson; all require the physical presence of the teacher as an aid in the
learning process. Typical use of the IWB requires that teachers physically stand over to the side
when using the board so as to not impede students’ abilities to see and view information being
projected onto the screen. By physically standing to the side of the board, students’ attention can
be directed to the information being presented. Teachers lead students in their learning by being
at the front of the room and maintaining their authority. Different coloured pens, clipart from the
software gallery and the basic IWB functions available on screen are frequently used with very
little difference to the conventional whiteboard. Even through the use of the IWB’s basic
functions, one teacher’s comments posted on the Group’s wiki reflects a significant change
within their classroom early on in the first year of inquiry.

The [IWB] does give us a degree of safety as teachers in that it feeds into our sense of
teacher-efficacy. Increased engagement, evidence of learning that transfers into long-
term memory, and students eager to participate all feed into our sense of
accomplishment. With the IWB, simple lessons which would have "done the job" with traditional materials such as the chart-stand, flashcards, posters, books etc., become transformed into powerful learning experiences when used on the IWB. Students are genuinely engaged and are willing to participate. As teachers, we feel "safe" when we have spent time planning a IWB lesson because we see our students coming out of their shells. The lesson accomplished what it was supposed to do. We feel that we are doing our jobs as teachers. This sense of professional self-efficacy that results from IWB lessons feeds into our sense that it is "safe" when we are teaching with it.

(Sarah, personal reflection, May 15, 2008)

This early recognition of the IWB’s potential to alter students’ attention and increased engagement in learning marks a commonly heard thread during subsequent Inquiry conversations on the power of the technology on teaching and learning.

4.3.1.2 Engaging Students from the Side

As teachers have gained greater confidence, familiarity and knowledge about the IWB and its application, a noticeable change in the definition of student engagement is evidenced in teachers in what I have labelled as the second stage in a teacher’s evolution. Brookstone Inquiry Group members have frequently reiterated the notion that the IWB “automatically engage[s]” students to be more attentive and focused during class time. When questioned about this they explained, teachers explain the change in the teacher-student relationship. Whereas teachers previously expected students to give their full attention to the front of the room during a lesson,
teachers can step further away, off to the side, and still retain students’ attention and focus. As one teacher explains,

... the teacher is still the teacher but they are more like a facilitator rather than the one front and centre....Don’t get me wrong, we are definitely there teaching but because we have done the prep work creating the different screens and ultimately the sequence of the lesson then during instruction time, the IWB does most the talking. The students get to do the talking/learning as they are the ones coming up and participating after it’s been modeled and we coach them on beside the screen.

(Sarah, personal reflection, May 15, 2008)

It is through this example that illustrates teachers’ recognition of a shift in the students’ attention and focus to the content on the board and a change to the dynamic of their classroom. While conversations continue to occur, teachers can facilitate, re-direct and guide students’ understanding from the side and allow students to involve themselves more in the discovery process.

The multi-modal features, visual aspects such as colour, sound effects and the user’s ability to move objects physically on the board, of the IWB has aided in the management of students in the classroom by grabbing students’ attention. The teacher although at the front of the room becomes less conspicuous as students attend to the information being presented thereby redirecting the focus off the teachers and onto the content displayed on the board. When probed about this phenomenon, one teacher notes,

*They are definitely less distracted by our person attributes (Miss F., I like your boots.) and our personalities. Instead, we are now the facilitator that helps them access the information on the [IWB]. Rather than us being the vehicle to the information, the [IWB]*
is now the vehicle to the information. We are now facilitating the process of accessing that information “on the side”. While ultimately, it is still us as teachers orchestrating what goes on during the lesson, this shift in lesson delivery via the [IWB] has created a sense of “safety” during the use of the [IWB]. The [IWB] enhances visibility with larger than life images, vibrant colours and moving animation. It can also bring sound in to aurally enhance images and words. These factors not only contribute to a richer and more enhanced learning experience, but it also draws attention away from me while still allowing me to be in the driver’s seat. Yet, the [IWB] is not at all dehumanizing the teaching and learning, because we are still right there. Teachers and students are still need to be actively involved in accessing the information and generating the knowledge. Yet, I feel that this interesting combination of allowing me to maintain control while removing me from the immediate focus of attention is the reason I feel “safe” while using the board.

(Sarah, personal reflection, April 4, 2008)

In this manner, the sense of 'teacher on the side' has become more of a facilitative role with the students at the centre of learning. Whereas a teacher being physically to the side of the board previously involved directing students in the learning, to certain text or objects, students no longer required this direction and automatically engage themselves in their learning knowing that that information presented will be worthwhile. The notion of the teacher teaching from the side illustrates a change in the teacher-student relationship and dynamic of the classroom; a sharing of intellectual control. Student engagement not only involves the physical characteristics of showing attentiveness through their eyes and body, but has a generated level of excitement,
laughter and greater participation from students wanting to learn and having a chance to come to the board.

4.3.1.3 Teacher on the Side and Student Presentations

In the third stage of the notion of the teacher on the side, teachers have not only developed their own comfort with IWB technology but have effectively demonstrated their competence to students such that students create their own presentations using the IWB. The students’ ability to perform this task represents not only an application of higher level of skills but a shift in authority from the teacher to the student and greater student autonomy. This third stage of the teacher on the side has given students what normally teachers possess and students have taken on a greater portion of the teacher role by formulating ideas by developing presentations and democratized the classroom learning space. This power in learning is especially evident within the Brookstone Inquiry Group when the conversation entails teacher stories about their classroom. For example, one teacher shared her experiences with her primary class by asking her students to demonstrate their learning on the IWB to their parents.

With Mary talking about the power of student presentation and learning, I began to think about how this may look at the grade one level. During Goal Setting Conferences a couple of weeks ago, I wanted my students to use the [IWB] to demonstrate something for their parents. Thus, I made a template with different colour shapes for students to demonstrate their understanding of patterning to their parents. The students had to create a pattern, ask their parents what comes next, invite them to slide the next shape in place, and then name the pattern in two different ways. As I observed the students making
and naming patterns, they showed their understanding patterning and the use of this technology. Most parents were impressed with how their children were showing their learning. ... There was definite enjoyment in this interaction between parent and children. Students were proud of what they could do and parents were amazed with the use of the technology. More than half of the families do not speak English and this way of learning is very different from their own experiences.

(Martha, personal reflection, October 2008)

The above reflection illustrates the transformed teacher-student relationship where the teacher is not the sole authority in the classroom as it allows more opportunities for students to explore and engage in their learning unlike before. While the task of student presentations typically provides rich learning experiences for the presenters, it often is not as experiential for the audience and especially for academically struggling students. Poster projects can be awkward and unorganized and a PowerPoint presentation is not as engaging to peers. When students were assigned projects and the use of IWB software reviewed, students demonstrated many teaching techniques. They adopted teacher language of instruction and created opportunities for their peers to predict, participate and question. In short, they engaged the audience to such a profound extent that the other students were learning. The students became the teachers. This revelation can be exemplified when one student asked her classmates, “Who would like to come up and slide Sweden into the right position on the map?” and all the hands went up. The teacher had not expected the students to imitate her. Teacher expectations have shifted and a partnership in education created. During the inquiry group, a teacher stated that:

*The [IWB] is a powerful learning experience to show students that teachers are not omnipotent. We model lifelong learning and show how to access information.*
Unexpectedly, we have created a democratic globally inclusive approach to learning.

Students and teachers combine our knowledge to create new understanding with support of technology. Often students become the experts of many of the special skills to make technology work. They are recommending to us how to do things more efficiently on the [IWB] and computer. The student is becoming the teacher.

(Martha, Interview #1, April 28, 2008)

The evolution of involving the students in creating their own presentation with the IWB demonstrates this notion of engagement as one that is beyond the learning in the classroom. This has allowed different project ideas to flourish and permitted students to demonstrate their thinking in more sophisticated and various ways. Students have shown greater willingness to spend the time to look for information more and take ownership for their work because of the immediacy of results and data gathering. These examples of the teacher on the side notion exemplify the value in conversations not only for the teachers involved but for the students involved. These conversations illustrate a cooperative, open spirit between teachers and between teacher and students, and a direction toward mutual understanding with the intent to better understand our teaching and practice; a fundamental aspect of the Brookstone Group.

4.3.2 Teacher Planning and Design

Effective lesson planning and design is an integral part of teaching. Conversations with the teachers have revealed how the IWB has changed the dynamics of their classrooms not as a result of changing their teaching philosophies but rather by complementing their teaching repertoire and by supplementing the way they prepare for teaching. Teachers have reported that having immediate access to information on the internet and IWB tool functions have allowed
their lessons to flow with greater vividness and fluidity. This is exemplified by one teacher’s reflections on how the IWB has impacted their teaching:

*I have noticed significant changes in the way I teach and the way students react to certain lessons when I use the [IWB]. While I still incorporate a large amount of hands-on, manipulative experiences for my students (because that is so important in early childhood development), I have also created parallel lessons on the [IWB] to accompany them ... since the students have had multiple exposures to the sound and have manipulated it in a variety of ways, I find that students are much more confident with the reinforcing activity than in previous years when I taught without the [IWB] ... The [IWB] was able to help reinforce the content without being intrusive ... The [IWB] has been very helpful with integrating pieces of background knowledge for our students. I am able to incorporate real pictures, and pull up sound and video clips to demonstrate and flesh out content with ease and speed. In this way, I can provide my students access to so much more background information in years past.*

(Sarah, personal reflection, February 2, 2008)

In terms of teacher planning and design, teachers have advanced from using the IWB as a tool where the teacher has been at the centre of the presentation to increasing greater interactivity with students using different interactive tools to digital unit planning. The IWB has not only revitalized their approaches to teaching with technology but reinforced the need to continue to examine teaching practices.
4.3.2.1 Teacher Presentation

While feelings of trepidation, anxiety, frustration, excitement and joy were initially some of the emotions that the Brookstone Group experienced at the start of their journey with the IWB, many have come to view the technology as an invaluable and indispensable classroom apparatus. All of them have come to share a sentiment and attitude that one teacher shared with me during an interview,

*I can’t live without it. Now I feel dependent on it and dependent in a good way. It’s like a beautiful marriage kind of thing. I absolutely love walking into my classroom knowing that I’ve got that there as a resource.*

(Martha, Interview #1, April 28, 2008)

I have noticed that the IWB offers teachers the capacity to teach in very different ways while also developing improved student participation and engagement. I believe these teachers have experienced changes not necessarily to their teaching philosophies but changed the way they teach by appreciating the potential that the IWB, when well used, offers to their students. As one teacher put it,

*It’s what you do with the page that makes it work... it’s not good teaching in and of itself... no one would know what to do just by giving a page... it still requires a lot of teacher know-how*

(Mary, Interview #1, April 28, 2008)

While the confidence and comfort level of the Brookstone staff would suggest that teachers involved in this project are all comfortable technology users, teachers at this school demonstrated a range of technology use prior to the introduction of [IWB]s. Teachers with less technology-
oriented approaches adapted their practices using the technology because they saw increased student engagement because of the technology.

While learning how to use the IWB and its basic features limited the teachers’ ability to present lessons as simply a presentation tool, teachers quickly adjusted and adapted to the technology. When asked about their initial impressions with the IWB, several teachers would agree with Mary’s comments where she,

simply used my [IWB] as an electronic blackboard ... I loved how the use of bold colour at my fingertips could make my lesson presentation more clear and highlight key points. I loved how I could return to a saved lesson and build from there. I resisted the call ‘to play’ with the other features believing that I couldn’t ‘get good at it.’

(Mary, personal reflection, December 7, 2007)

For most teachers and fortunately for Brookstone students, this basic functional level of use with the IWB was short-lived as teachers grew more comfortable with the board’s interactive features.

4.3.2.2 Using Different Interactive Tools

By using the different interactive tools, teachers have elevated the expectations for themselves and for their students in that the IWB is acts not simply as a presentation tool, but a multi-faceted, multi-dimensional resource in the classroom. When questioned about how the IWB has changed the way they teach compared to teaching without technology, the teachers claimed that they were now designing lessons with the IWB technology in mind rather than design a lesson and use the IWB as an add-on to the lesson. IWB technology has allowed teachers to change the content and display information in a more sophisticated way.
The [IWB], in addition to helping students, are a fabulous tool for teachers. We are able to address the 'teachable moment' instantly. Whether we use images from the gallery, internet sites or audio files, we are able to answer and expand upon the students' questions and concerns. In the past, many opportunities are missed because we didn’t have a book, poster, or song to show as an example. The access to information allows us to tackle more sophisticated topics in our class. The critical issues are introduced through text but brought to life with the [IWB]. Our students are now able to retain the big ideas of the topic because they remember the video or audio clips that we had thought were just supportive. Also we are noticing the transferring of information to other classes. Our students are making sophisticated connections that we had never expected. Their learning is much deeper and seems to be retained longer than pre-[IWB] time.

(Ruth and Lydia, wiki, May 14, 2008)

The ability to access information via the Internet and various IWB tools have changed the way teachers prepare lessons. Instead of searching for information through books, teachers now search on-line for information and resources including different media such as short video clips or the production of an educational game electronically; many of which were not a part of the classroom lesson. While teachers have admitted that lesson preparation using the IWB involves extra time, the longer-term payoff such as making the lessons available in an electronic format such that they can be shared among teachers and used in subsequent years and the students increased interest in learning is indicative of the technology’s positive effect on teaching. Two teachers who have considered how their teaching has changed with respect to prep work, have outlined how the increased use of technology and the development of resources has
influenced their lesson planning and design (Naylor, Erickson, Clarke, Lim-Fong, Brook, Cassie, et al., 2008). These differences are summarized in Table 4.2.

Table 4.2: A Comparison of Lesson Planning and Design Without the Use of the IWB (Then) Versus Lesson Planning and Design (Now) With the IWB

<table>
<thead>
<tr>
<th>Then</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>I used to spend a lot of time searching for “real” experiences of the content to make the learning more effective and to encourage more transfer of knowledge into long term memory. These experiences could range from books to videos to fieldtrips and guest speakers.</td>
<td>In some respects I spend less time prepping now, in that I don’t have to drive to a variety of different stores or libraries to pick up books and materials needed to teach lessons. However, in other respects, I spend more time looking up new resources online to compliment my lessons. I also spend time looking through the gallery or creating pages in [IWB] to teach a lesson. I don’t mind putting in the time because I know my students will be excited about the lessons I create, which makes me feel excited about the job I’m doing. Also, I know that my files and lessons will be saved in my documents so I can go back to them in future years. These lessons can be easily adapted too.</td>
</tr>
<tr>
<td>I relied on books and pictures to communicate a message which are small and can’t have the movement/sound component which makes it harder for kids to put the object into a greater context.</td>
<td>I use the internet all the time when planning lessons – so much is available to me at a very quick speed.</td>
</tr>
<tr>
<td>I spent time photocopying images (enlarging them, colouring them in) which takes a lot of time and it can alter their true look.</td>
<td>I want to use the [IWB] when planning because I see the excitement in my students’ eyes when I use the [IWB] and I notice a big difference in their participation. When I see these things I feel rewarded and have greater incentive to plan with it.</td>
</tr>
<tr>
<td>I tried to create lessons that had a hands-on component but naturally there was more sitting and listening in traditional teaching.</td>
<td>Planning is more fun for myself because it allows me to be creative. The finished product is professional looking, visually pleasing, and can be saved in its pristine condition for next year. The shelf life of these materials is potentially much longer because the digital materials won’t be worn down by every day wear and tear.</td>
</tr>
<tr>
<td>I bought a lot of</td>
<td>I try to think more about how my students can play an active role in their learning, hence I want to increase their participation in my lessons and that’s easier to do with the board. Now I find my lessons have multiple hands-on activities.</td>
</tr>
<tr>
<td></td>
<td>When I am planning now, there is a shift in how I plan out my lessons. The [IWB] is a tool that I bring into my lessons to highlight content. Instead of planning out a lesson, and then thinking of ways that I could incorporate the [IWB] into that lesson, my focus starts at the [IWB] and grows out from there.</td>
</tr>
<tr>
<td></td>
<td>Because of the internet, I am able to bring in issues and ideas which are more “current”. The ease with which I can search out images and articles to use for my lesson also</td>
</tr>
<tr>
<td>Then</td>
<td>Now</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>resource unit books to give me ideas and black-line masters to use for a particular topic</td>
<td>encourages me to keep using the [IWB] as a resource.</td>
</tr>
<tr>
<td>• Bring in newspaper articles on current events.</td>
<td>• I am able to find a wealth of information and materials online free of costs. Also, the variety of resources, even within the same category is huge. This allows me to plan many lessons that I may have been reluctant to do before due to the lack or the expense of resources.</td>
</tr>
</tbody>
</table>

### 4.3.2.3 Digital Unit Planning

Only recently have the Brookstone teachers begun exploring the ideas of digital unit planning. Although teachers initially used the IWB as a whiteboard and created lessons designed to last for only one or two days, during the summer of 2008, one Inquiry member used the IWB software to design a unit with multiple chapters that would last a full term and other members have begun to develop the digital unit plans and are adding their own layers to the initial design. Consequently, the Inquiry Group is now engaging in conversations during our meetings regarding the components that make a good digital unit and this is an area that will continue to be explored. Teachers have conferred that a digital unit plan includes the following components:

- **Title page**

  An initial page that outlines all the chapters and reminds the students what has been studied before and the next topic we are going next. An important design element is to illustrate each chapter with an icon that can support the students who organize information visually.

- **Prior knowledge pages**

  At the beginning of a chapter, teachers are trying to include a page that helps students to examine their previous beliefs and knowledge of the topic. A page that is image-based, interactive and generates discussion is the most beneficial and can be used as a vehicle to
introduce new vocabulary. For example, in the First World War unit, students were asked to brainstorm reasons countries go to war. Then students were asked to reflect on Canada’s role in global conflict over the past 100 years. Other prior knowledge pages have included sorting pictures into harmful and helpful categories, matching vocabulary with definitions and looking at an image with guiding questions to ascertain the events or mood.

- **Information pages**

  Though textbooks are typically used at the intermediate grades, some students have difficulty with text at their grade level. Moreover, teachers sometimes want to explore certain topics more deeply than the textbook. With teacher-created information, text can be adjusted to the reading level of students. The layout of these pages is carefully designed and can be printed off on one page with a readable sized font for students to follow and build notes. With the text on the left hand, there is a large space on the right hand side of the page to be used for class note taking. Embedded within or beside the text are still images or links to maps that are integral to the topic. In addition, as often as possible, the page contains multiple links to video and radio clips that illustrate the topic. Video clips with a more narrative nature are easier for the students to understand. If more than one information page is needed to develop a topic, all pages are created on the same color background to create unity.

- **Questions**

  At the end of each chapter, students must answer a deep thinking question. These questions usually do not have a right or wrong answer but can be argued from each side. For example in the First World War unit, the chapter on the assassination of Franz Ferdinand ends with the question “Is Serbia, the country, responsible for starting the war?” After discussing their point of view with a partner, the students must write their names in the Yes or No column. These
types of questions help the students to synthesize the information from the chapter and help the teacher to assess if all the students understand the content based on the sophistication of their reasoning.

- **Review**

An interactive review that uses the crossword, sort or quiz features, included in the IWB software, concludes each chapter. Sometimes the students will build the review for their class members using the information learned or the teacher may have prebuilt it. Some classes divide into teams to create a competitive atmosphere, while others do the review collaboratively. The students look forward to the review and it can serve as a practice for a written test (Lim-Fong, & Robins, 2010).

These digital unit components reflect not only a passion for learning and for continued professional growth but the ability to take the potential of IWB technology to the next level. Teachers have transitioned from a basic level and use of the IWB to one that is advanced. It demands students to think more critically in the process of their learning. Through conversations, teachers have engaged and immersed themselves with the technology and journeyed with their students in the process.

### 4.3.3 Professional Development

*The Inquiry Group has been an instrumental avenue of professional support in my usage of this technology with my students. The exchange of teaching practice, learning and ideas has inspired me to take more risks and envision the possibilities. The group has also been a community of learners who provided encouragement and support during challenging times with hardware, tech support and feelings of isolation. This group also*
provided a forum for problem solving issues and opened opportunities that moved my teaching and learning towards professional development for colleagues.

(Martha, Inquiry meeting, November 3, 2009)

As exemplified above by one teacher’s reflection on what effect the Brookstone Group has had on her learning, professional development has played a valuable role within the Brookstone Inquiry Group over the last three years. The Brookstone community has served to be a place where teachers have developed a strong sense of trust, comfort, support, respect and openness with one another. Teachers have volunteered to spend time with like-minded individuals to share their passion for IWB technology. With no other forum to discuss understandings and teaching practices and pedagogy related to IWB technology, the Brookstone group has been a source of insight and revelation for its members. It has permitted teachers to engage in conversation, to raise questions, to be reflective and deepen one’s practice within a setting unlike any other offered in the lower mainland. The Brookstone Inquiry meetings have provided teachers with the opportunity to think more critically about their teaching practices and to probe their pedagogy and beliefs. It is through the exchange of stories and narratives that have helped the teachers to better understand their teaching and learning. Conversing about their experiences with IWB technology has helped Brookstone members to develop a unique relationship that has led to the group’s evolution towards a learning community and sense of collaboration. Brookstone teachers have shifted from being a novice user creating individual lessons to sharing learning with fellow colleagues to offering various IWB workshops and mentoring relationships and finding new ways to continue to deepen their understanding of IWB technology.
4.3.3.1 Individual Lessons and Shared Learning

The Brookstone Inquiry Group is comprised of individuals with a diverse range of skills, abilities, levels of experience and creativity. Teachers have worked, from very early on, to learn how to use the features of the IWB and ensure that their students sustain their interests in learning. Teachers of varying grade levels created individual lessons on particular topics resulting in a lot of resources posted to the public folder within the school’s internal server that is accessed only by its staff. Conversations about the differences in lessons and topics quickly revealed the need for not only the sharing of resources but the need to engage in a process of shared learning. As one teacher explains,

"It’s easy to give the file to somebody else especially since we’re on the network. I’ve found that I can take [a component] and I just go in and modify it how I want to modify it, change it, the words, the pictures et cetera. Before, if someone in grade 4 gave me their file on bats, it’s possibly going to be way too difficult [for students], depending on which activity they could have created. I’m not going to take a person’s file and use it; that’s impossible. ... But with the [IWB], it’s very possible to transfer a lot of things. I can take other people’s ideas. In fact, I want other people’s ideas on how to use the [IWB] because I think inside the box. ... I can take an idea [from someone else in another grade level] and lower it down to a lower level so that my kids can do it. ... as much as we will share ideas, all these ideas, you still unless you take it, and have taught it and made it yourself, you still won’t be able to use it."

(Sarah, Interview #1, April 28, 2008)

The learning that has occurred through conversation and the exchange of lessons has not only made lesson planning and design more efficient in terms of time or ease, but provided an
opportunity for reflection and the sharing of ideas. Shared lesson ideas have inspired teachers to develop innovative ways to present content through the use of IWBs. As teachers engage in the sharing of their lesson plans with the use of the IWB, teachers have involved themselves in metacognitive processes that have allowed them to delve deeper into understanding their teaching practices with the IWB and to evaluate its impact on student learning. Through many and varied conversations, the Brookstone teachers have created opportunities for themselves to become more metacognitive about their own practices and aware of the effects of the IWB in their classroom.

The development of community has thus been a natural, intrinsic feature of this group. The IWB has connected the community in that the shared experience and being able to work together is not only reflective of students being able to move long in their learning but also the teachers’ evolution in understanding the IWB technology potential.

*In creating community, we’re all looking at the same thing at the same time. We have the ability to manipulate the information [to suit our students’ needs]. This is an evolution. We have the public information. We’re all looking at the internet together.*

(Priscilla, Inquiry meeting, November 3, 2009)

Part of Group’s current success, is the realization by the community of the empowerment that students have been afforded by the IWB. As one teacher puts it,

*They are building life-long skills rather than just school. This is connecting to the larger social circle that schools are a part of. The digital aspect is so much part of the world. This is allowing kids to see the future and see themselves operating in the future. This school is making that connection and allowing students to see their potential and seeing*
the relevance to the outside world. ... Kids are still coming to school despite the environmental challenges/ backgrounds that they come from.

(Martha, Interview #1, April 28, 2008)

The Inquiry meetings, conversations and wiki have been necessary forums for Brookstone teachers to develop their professional growth and understanding about IWB technology through the sharing and exchange of knowledge.

4.3.3.2 Workshops and Institutes

The passion for creating rich lessons that have been supported by the IWB, and its payoff in the classroom has been a motivating force for the Brookstone teachers’ willingness to communicate with other teachers around the province through workshops and various district committees who have only just discovered the benefits of IWB use. The desire for Brookstone teachers to take what they have learned about IWB within their community is illustrative of the positive impact conversation has had on the group. By continuing their conversations outside of the Group, teachers continue to engage in their professional development and build an extended learning network. Teachers continue to model what they want their students to be able to do in the classroom by offering workshops and summer institutes to others who are interested in furthering their knowledge and understanding of IWB technology by sharing what they have learned. This expansion of their network has strengthened the Group’s need to continually learn more and demonstrates members’ ability to maintain high expectations by taking what they’ve learned to the next level and the effects of professional conversations. By exchanging information, stories and experiences with others, teachers have furthered their development in
teaching practices by locating resources and opportunities to learn from others. This model for collaboration has resulted in networks where members of the Group are now connected with teachers and educators in other schools and districts, sometimes through school district structures, and sometimes through teacher union structures such as local teacher association committees, or through the provincial teacher union’s Provincial Specialist Associations. Additionally, teachers who have been engaged in the Inquiry group also manage several ‘Smartboard Cafes’ for the benefit of school district teachers from other schools who are also starting to work with IWBs. The Cafes provide insight into another dimension of the teachers and their engagement with the IWB.

There is substantial evidence of a thriving learning community within the school. A dual community has resulted in that group members can not only focus on improving their understanding of their individual classroom but involve the broader community engagement.

4.4 Summary

In summary, the nature of the conversations of the Brookstone Inquiry Group has had a significant role in teachers’ professional growth and understanding about IWB technology. It has not only helped to identify a number of attributes that members of the Brookstone share including, openness, respect, passion, a willingness to learn, and a belief in IWB technology but has also demonstrated how conversations have contributed to the group’s evolution towards a learning community.

Through Inquiry meetings and electronic conversations on the Group’s wiki, teachers have been able to better articulate their awareness of the changing role of the teacher and has subsequently evolved into different and deeper forms of teacher-student relationships.
Conversations have provided teachers with much needed opportunities for sharing ideas, giving feedback and inspiring each other with various and creative lesson approaches with the IWB. Inquiry meetings have permitted teachers with the time to think deeply about how their practice has changed as well as share what is happening in classrooms. Conversations about how the IWB has changed teaching practices as well as changed their classroom environment have helped teachers to identify of several evolving issues such as the notion of the teacher on the side, changed approaches to lesson planning and design and their own professional development. The collaborative nature of the group, positive attitude and their willingness to share their learning has been a basis for the group’s evolution of a learning community. Conversations about IWB use have permitted Brookstone teachers to frame their own professional development and build a network that has been essential to the aspect of community and individual growth. Thus, it is with the combined attributes of a unique group of teachers, the conversations and opportunities for reflection, the potential offered by IWB technology and shared enthusiasm for professional growth that has resulted in the development and evolution of a unique learning community.
Chapter Five: Conclusion and Discussion

The conclusion, discussion and implications for practice that appear in this chapter are drawn from the reflective practices of members of the Brookstone Inquiry Group, reflections on the Group’s wiki, meeting notes, interviews and observations. This chapter is divided into four sections: conclusions emerging from the research questions, a discussion of issues arising from the study, implications for practice, and possibilities for future research.

5.1 Conclusions Emerging from the Research Questions

To answer the first research question - What attributes of the Brookstone Inquiry Group have contributed to its functioning as a learning community? – a number of characteristics became apparent within members of the Brookstone Group that has enabled professional development and emergence of a collaborative network of learners. Brookstone teachers were identified to share the following attributes:

- an enthusiasm and willingness to learn about IWB technology,
- a willingness to share knowledge and engage in conversations with peers, colleagues, students and the community,
- are committed to learn more about IWBs,
- demonstrate distributed leadership,
- are self-reflective,
- respectful,
- open, and
- possess a mutual desire to improve their skills as a teacher.
While the shared need to learn more about IWB technology united members of the Inquiry Group, the sharing of these identified attributes among teacher members have been a key aspect in the formation of the group and evolution into a learning community. Each identified characteristic has complemented members of the group and contributed to the synergistic relationship that has developed between group members. Possession of these attributes have allowed for the successful collaboration, formation and maintenance of a learning community.

Members of the Brookstone Group have collectively recognized the value of conversations and of learning from and with each other. Conversations have revealed tremendous insights into the potential of IWB technology in classrooms and have enabled teachers to deepen their understanding and teaching practice with IWBs. By examining lived experiences and narratives group members’ integrating IWB technology, insights have demonstrated the positive impact and influence of the learning community on teacher’s pedagogy and in turn student learning. Thus, with the implementation of interactive whiteboards, the conversations and sharing of narratives have not only enabled teachers to gain insight, communicate values, experiences and understand educational practices with IWBs but are crucial to the facilitation of a community of learners.

In answer to the second question - How have conversations around the use of IWB technology shifted teachers’ pedagogical understanding and practice? – several factors have contributed to the success of the Brookstone Inquiry Group. Conversations about IWB technology have provided teachers with opportunities to raise questions, share insights, provide feedback and engage in collaboration through the sharing of IWB experiences and teacher narratives. The sharing of stories have helped teachers to make sense of their practices with IWB technology, offered possible solutions to problems and permitted teachers to logically construct
meaning from their experiences. Conversation has been an invaluable aspect of the Brookstone Inquiry Group by allowing members time to engage themselves in reflective practices and recognize their practices consciously within a supportive community of learners to support their professional growth and understanding of teaching and learning practices around the use of IWBs.

5.2 Discussion of Issues Arising From the Study

Educators are familiar with the pattern of the introduction of new initiatives and then the subsequent mandatory implementation often required by Ministries of Education. Although many new initiatives are educationally sound and will benefit students, teachers may feel pressure of an increased workload as they are required to change existing practices to accommodate the initiative. Unlike previous case studies done in the United Kingdom (Glover et al., 2005; Smith, Higgins, Wall & Miller, 2005; Cogill, 2002) where a technology mandate for its schools and an influx of financial support from the government enabled the implementation of IWBs, the Brookstone case is unique in that it was through professional and personal interests that Brookstone teachers came together and shared a common excitement and vision in order to attain IWBs for all of the classrooms in the school. Through an inquiry process involving teachers from Brookstone and from other district schools, several educators from the University of British Columbia and a researcher from the British Columbia Teacher’s Federation, the teachers came to understand the significant potential of IWBs to enhance lessons within their immediate educational environment and subsequently to provide professional development for teachers from other districts throughout the province.
The Brookstone Group has developed into a learning community because of several key factors that Copland and Knapp (2006) list as fundamental to building a professional community. The relationship between members of the Group as well as with their students is one that is founded on trust and respect. Members have created a structure and schedule that sustains interactions among professionals. The Inquiry meeting space was one such structure where rich conversations permitted teachers to extend and probe their thinking through professional discourse between members. The meetings reflected the sense of community within the school where both as a group and individually, a diverse range of interests could be explored. The meeting time and space allowed participants to engage in reflection and extend their own professional thinking and development by sharing narratives, providing insight and asking questions. The framework that members of the Brookstone Group have established, of meeting monthly over the school year, has allowed participants to engage in their own professional development. The Group provided members with the time and opportunity to get together and examined their individual understandings of teaching pedagogy with the use of the IWBs at a deeper level. The group’s ability to work collaboratively has established a bond and high level of knowledge about IWB technology such that the group has begun offering workshops on IWB use with other schools, inside of and outside of the school district, as well as offer two and three day Summer Institute workshops to outside participants who are interested in learning about IWB practices. The conversation, facilitation, guidance, sharing and role modeling of Brookstone teachers between one another, colleagues and their students reflects a professional community that places a high value on learning as well as a conviction in IWB technology. They have not only demonstrated their willingness to be open, to learn and share what they know about IWB
technology but have also established a powerful and productive culture of professional
development that continues to evolve.

The facility with which the Brookstone teachers communicate with one another is
indicative of the level of respect, trust and openness that members esteem, value and model with
one another and their students that have contributed to the success and development of the
Brookstone community. Drawing on these attributes, teachers have been able to reflect and gain
greater insight into their pedagogy and practice by revealing any incoherence in their thoughts
(Bohm, 1993). The dialogue and conversation has made it possible the teachers to discover and
establish a genuine and creative collective consciousness (Smith, 2001). The conversations about
IWB issues have created a network of learning for teachers to draw upon as part of their
professional development. This has included the development and use of a group wiki for
participants to share ideas and information, to post reflections, and articles, and share their
inquiry. By sharing their experiences with one another, teachers in turn demonstrate their
learning and understanding of IWB use. Listening to one another’s stories about how they’ve
used the IWB in their classrooms have helped the teachers to gain perspective and confidence
about their own teaching, especially when other teachers reveal similar occurrences, or
experience revelation when they learn of a new approach to using the IWB from colleagues. The
teachers’ learning is further mirrored and reflected in the students’ conversation about their
learning. Examples of this include students’ ability to present information on the IWB using
many of the skills that their teachers have modelled for them. Teachers have not only enabled
their own learning and professional growth through the Inquiry Group but have also elevated the
standard for learning in their classroom with their use of the IWB.
Bohm (1993) outlines three basic conditions for dialogue that the Brookstone Inquiry Group has successfully met that has contributed to the development, maintenance and cultivation of a learning community. By suspending their beliefs, such as the differences in teaching grade levels and years of experience with IWB technology, Brookstone teachers have shown a level of respect and openness that has helped the development of their learning community. Demonstrating high esteem for one another, and treating one another as equals by giving feedback and asking peers about their IWB experiences is reflective of their desire to learn from one another. University and teacher-union researchers have facilitated the Inquiry Meetings by highlighting points of interest for further discussion. Conversations have proceeded interactively, cooperatively, not toward a specific common goal, but in a process of mutual engagement directed toward shared understanding (Barbules, 1993).

Using IWB technology has corresponded to a huge shift in pedagogical practice. Seeing the positive effects of the IWB in their classroom and improved student learning, Brookstone teachers have identified increased student engagement, focus, attention, participation, motivation, memory retention, greater background knowledge and better integration of students with special needs in the learning process. With IWB technology, teachers have noticed how the playing field has been evened between students and teachers as a common language and kinship has developed. Social interactions have changed within classrooms and the discourse has shifted as a result of the IWB medium.

The Brookstone case study is an example of how the interactive whiteboard has become more than a tool in the classroom but is used as an integral element that maximizes the value of interactions and better matches teaching to the learning needs (Glover, Miller & Averis, 2005). Brookstone teachers not only utilize digital technologies that connect students to the world they
live in but built bridges and improved communication and collaboration with that world.

Brookstone teachers have learned to create interactive learning experiences with their IWBs and enabled students to see the relevance to what they are learning. The modeling of the IWB’s features and in turn assigning students the task of using the IWB to present their projects is representative of the shift Brookstone teachers have undergone. Teachers have learned to share their authority in the classroom and democratized the learning environment by their receptiveness to involve their students in their professional learning through classroom discussions and activities. This has been exemplified by the evolution of examples such as the teacher on the side, teacher planning and design as well as collaborative professional development.

One example that teachers’ pedagogy has changed involved a discussion of how the IWBs shifted students' focus away from the teacher towards the board, which led to a consideration of the 'teacher as guide on the side'. It also generated discussion about student participation, in part generated by the teacher being on the side:

*The IWB gives the students all the things the teacher normally has possession of - the gift of being able to teach themselves using the tool. It democratizes the teaching space by engaging students.*

(Martha, personal reflection, November 3, 2009)

The notions of the teacher as 'guide on the side' and changing student participation have been central to how the group has explored what they believe to be new ways of teaching and learning. The teacher as ‘sage on the stage’ has shifted to ‘guide on the side’ in that teachers are open to sharing what they know about IWBs with their students and in turn respect what their students have to offer. Thus, there is a sense of community not only within the Brookstone group
but a collaborative community within teachers’ classrooms. One example of students offering advice and support to teachers in terms of problem-solving IWB use demonstrates this shared relationship:

*Miss, you don't need to do that. Just do it this way and it will be OK.*

(Martha, Anecdotal notes, November 3, 2008)

Comments such as this were welcomed and encouraged, reflecting teachers' comfort with students becoming experts in using the IWBs, and highlights the journey of learning that is shared by both teachers and students, with each learning from the other, and all teaching at some stage.

By teaching to the side of the IWB, this case study further substantiated research by Beeland (2002), Miller and Glover (2007) and Wall et al. (2005) who have identified more effective learning through IWB due to greater student attention and engagement in learning as well as acknowledging the potential positive effects on teacher practice. Several teachers have commented on the fact that when using the IWB they feel that student attention is often directed towards the board rather than to them, hence the sense of 'teacher on the side' in a more facilitative role. Some teachers spoke of this in terms of 'safety', reflecting their sense of greater ease and comfort with having the boards as an additional centre of student attention, rather than all attention being directed towards the teacher. An example of this can be reflected in Inquiry Group teachers’ recognition of feeling more effective when leading lessons as the need to manage student behaviour has been minimized due to the increased on task student behaviour. When compared to one primary teacher’s view of traditionally presenting calendar time with a poster versus one placed on the IWB screen, “[students] would get bored, really restless by then and just tune out...somehow [the board] focuses everyone’s attention.” The IWB potential has
allowed the teacher to become better at the discourse in the classroom and as a side effect minimized the need to manage classroom misbehaviour. Teachers in this group echoed similar reflections of their own experience with the board in that, “most kids were looking forward with anticipation, they were paying attention and wanting to help. They were generally well behaved and quite focused on what was happening.” (Jennifer’s personal reflection, February 6, 2008)

The increased level of comfort with the basic functions of the IWB including writing on the board, drawing shapes, using still images and access to information combined with the greater sense of safety and comfort with the software’s applications demonstrates not only the teachers’ willingness but students’ willingness to take risks and engage themselves in their learning. As one teacher puts it,

> There is a bit of a dichotomy with the [IWB] in that the combination of permanence and impermanence is the right balance for the environment for learning. We can make corrections as needed. We don’t have to take the poster down right away. It’s always a work in progress. It’s not a personal insult because of the mistake, it can be easily remedied and that’s okay.

(Lydia, Inquiry meeting, November 3, 2009)

This evolution demonstrates what teachers involved in this inquiry project have in common; an intrinsic desire to challenge themselves and seek out innovative ways of teaching in a manner that will engage and inspire students in their learning. “By giving the kids more control, I think I’m connecting more with what their needs are and their learning interests.” (Martha, Interview #1, April 28, 2008)

Effectively incorporating technology into the classroom and its integration into one’s teaching practice can be an arduous task. It demands not only a technical understanding of how
the technological tool works but an awareness and appreciation for its potential in the classroom and is reflected in the teaching practices of Inquiry Group members who are willing to relinquish some of their authority in the classroom and provide students with their own sense of self-efficacy by their demonstration of IWB use.

The use of the IWB as a large chart stand with basic functions and the traditional view of the teacher on the side is a good initial example of an attempt of using the technology as a tool in the classroom. However it also demonstrates the lack of a deeper level of understanding necessary for successful integration of technology use and reiterates the need for teachers to have sufficient time to ask personal questions, explore, connect with the technology and examine the deeper implications of the context in order to gain greater appreciation for the potential technology. When burdened by the day-to-day effects of teaching, responsibilities, personal involvement with students and interactions with colleagues, opportunities to learn how to use technology can be limited (Fullan, 2007) and strengthens the teachers’ call for more time to learn about IWBs. Teaching effectively requires reflection in and on practice to ensure that learning is holistic, personalized, engaging, and relevant. Being an effective teacher means shaping experiences that encourage thoughtful creativity, initiative, and curiosity as well as recognizing when intervention is will be needed to assist students in their learning. It requires an understanding of the nature of learning, the role of technology and its effective use, and an appreciation and in-depth knowledge of the way the world works. It entails enabling learners to expand or modify knowledge often in situations involving collaboration, scaffolding and intervention when needed.

Effective teaching requires that the teacher ensures that lessons go beyond the superficial level of learning. Effective IWB use entails teachers having a transformed pedagogy and deeper
understanding of the full potential of technology when implemented appropriately. This means using the IWB as more than a resource in the classroom but as an integrated, element that maximizes the value of interactions and matches teaching to the learning needs (Glover, D., Miller, D. & Averis, D., 2004).

5.3 Implications for Teaching

Knowledge can be represented and communicated in a number of ways. The classroom is not a homogeneous unit but is comprised of students with various modes of learning and multiple intelligences. No single instructional strategy will be equally effective for all students (Tobias, 1982). The use of the IWB presents an additional means of presenting information with the intent of promoting conditions for meaningful learning by drawing in and involving as many students as possible in the process. Interactive teaching is where teachers integrate into their lesson plans, their knowledge of pupils and evaluate means for appropriate student input within set parameters (Cooper, & McIntyre, 1994).

If deep learning is to be promoted, then the application should actively engage the user in carrying out tasks (Cairncross et al., 2001) and allow them to apply new knowledge to other situations. Students no longer need to crowd around one computer to view instruction or watch a projected image on a screen where they are unable to see what the teacher is doing but rather can be engaged in discussions where they are prompted to think critically rather than reproduce ideas that the instructor conveys.

As partners and stakeholders in education, teachers are challenged to seek out best practices that meet the needs of their learners. This process requires self-examination and an in-depth reflection of what and how a teacher values education. For some educators, this is an
immensely difficult, time-consuming task as ideas about teaching and how to teach have become enriched with greater experience. However, many teachers continue teaching the way they were taught in spite of evidence that may suggest superior methods of instruction (Nashon, 2005).

As agents of change, teachers must continually seek out a variety of strategies that will enable contextual learning that can relate to broader conceptual frameworks and will foster critical thinking. If it is a societal goal to enable students to develop into responsible, global, and scientifically literate citizens, teachers themselves must understand that role first. Teachers must not only have an adequate background in concepts, a flexible attitude, respect for the nature of science but, a diverse repertoire of strategies upon which to draw on as the need arises. Teachers must continually reflect and adapt their teaching to ensure that it tailors to student needs. Education should be celebrated in a positive environment that nurtures students’ talents, abilities and inspires learning. This is important not only because it shapes the future of the student but because of the positive societal implications in that success breeds success.

5.4 Evolving Issues with Interactive Whiteboard Technology

Successful technology implementation and integration into one’s teaching practice is not an easy feat and for some users, it remains on the periphery to their teaching practices. As noted by Martha (2008), “leadership plays a key role in how far [IWB] technology goes ... “It’s a bigger issue than just my own classroom stand alone and that’s why I say working in community and within the system that you are, [will] affect how far you’ll go with this technology.” Although the sole user of IWB technology at her school, a common vision for IWB use by all members and a consistent, reliable technology infrastructure must be considered for long-term and successful technology implementation is needed.
What is valuable about learning with technology is that through the process of understanding our own competencies, intricacies and complexities of change, one can develop a sense of the problems and possibilities associated with the implementation of technology. Making these problems and possibilities explicit is essential for developing a more detailed educational rationale, for understanding how our competency relates to our professional development as teacher educators, and for responding to the technology goals at our schools (Clarke, & Mitchell, 2007). Changes in beliefs and understanding and engaging in a continual process to re-evaluate priorities, needs and behaviours are the foundations for achieving lasting reform.

5.5 Gaps in Research

With the rapid evolution and impact of technology use in the classroom, there is a pressing need for further systematic research to answer these questions. Effective teaching requires continued development of practices that will enable students to meet the challenges of society. Recently, IWB research identified the need for further research in the areas of teacher’s views and beliefs of IWBs, pedagogical implications, effect on student learning and achievement as well as the transformative potential in teaching and learning (Cox, Webb, Abbot, Blakeley, Beauchamp & Rhodes, 2004; Schuck & Kearney, 2008; Lewin, Scrimshaw, Somekh & Haldane, 2009). Most of the educational research in IWB technology is very new, within the past ten years; the majority of the research is based in the United Kingdom (BECTA, 2003; Hall & Higgins, 2005; Smith et al., 2005) due to government policy, initiative and investment in IWB in schools. Increasing research into IWB technology is occurring in other countries such as Australia (Lee & Boyle; 2003) and the United States (Gerard, Widener, & Greene, 1999;
Schroeder, 2007). Currently, there is limited Canadian research concerning the theoretical pedagogy related to the implementation of IWB.

There is a tension that exists between effective technology use and ensuring that content-laden curriculum objectives are being fulfilled. Concept development must be integrated in a coherent and progressive way that exploits what the IWB has to offer as a means of reinforcing understanding and retention (Glover et al., 2005). There is concern regarding the level of student interactivity with the IWB and the effects this technology has on learning. Further to this study is the issue of how teacher-student conversations have impacted the learning environment. Thus, questions for further inquiry include:

- To what extent are IWBs complementing subject-specific demands such as language, thinking skills, problem-solving and higher-order skills?
- To what extent can students cope with the stimulation of the senses and process all the information presented in this setting?
- What is the role of the kinaesthetic aspect of the IWB on learning?
- How does the IWB impact different gender groups?
- How do student conversations mirror teacher pedagogical practices?
- How does IWB technology transform pedagogical approaches and literacy practices in our classrooms differently?

New technologies present new possible opportunities of learning about the natural and social world. It is creating a society in which people are making new assumptions and values about the skills a global citizen must know. It is necessary to find ways to better understand how humans interact with one another as well as how these tools interact with the other features of the complex educational system and contribute to better learning for all. The dynamic, complex
interactions and relationships with increasingly new technology demand further development of theories to inform our understanding of how technology is shaping our society socially, culturally, politically, and economically.
References


Cogill, J. (2002). How is the interactive whiteboard being used in the primary school and how does this affect teachers and teaching? *Sponsored by Becta Research Bursary.* Available online at:


Moss, G., Jewitt, C., Levaaic, R., Armstrong, V., Cardini, A., Castle, F. The interactive whiteboards, pedagogy and pupil performance evaluation: An evaluation of the schools


Teacher Consent Form for the Study:

The Ways in which Elementary Teachers make sense of their Attitudes, Beliefs and Practices as a Result of the Introduction of an Interactive Whiteboard

Dear Teacher,

We are writing to invite you to participate in a study entitled, “The Ways in which Elementary Teachers make sense of their Attitudes, Beliefs and Practices as a Result of the Introduction of an Interactive Whiteboard.”

Principal Investigator: Brenda Lim-Fong, Department of Curriculum Studies, Faculty of Education, UBC

Co-Investigators: Dr. Gaalen Erickson, Department of Curriculum Studies, Faculty of Education, UBC
Dr. Anthony Clarke, Department of Curriculum Studies, Faculty of Education, UBC

Purpose: To study aims to investigate the attitudes, beliefs and practices of elementary teachers as a result of using an interactive whiteboard.

Study Procedures:

1. Teachers will be purposively sampled to participate in this study.
2. Teachers will be observed for prior to the first interview to monitor their use of the interactive whiteboard and interactions with students and field notes will be taken by the investigators.
3. Teachers will take between 45 minutes to an hour and will be audio-taped.
4. Teachers will be interviewed at least two times between April and June 2008.
5. Interviews will take between 45-60 minutes
6. Teachers will keep a journal regularly during the period of study to comment on their experiences with the interactive whiteboard.
7. Teachers will be able to check and modify the transcripts of interviews and observations will be asked to clarify meanings and interpretations.

Your Participation in the Study:
Your participation in the study will involve tape-recorded interviews of approximately 45 minutes to an hour in length (one near the beginning of the study and one towards the end). There will also be interviews, approximately every 2 weeks for about 30 minutes in duration. In these interviews we will discuss aspects of how the use of the interactive whiteboard has influenced your attitudes, beliefs and teaching practices. These interviews will be arranged at a time and location that is convenient for you. One of the researchers involved in this study may also discuss with you the possibility of visiting your classroom and school at a time that is convenient to you.
**Risks:**
There are no known risks to participation in this study. Rather, the study will provide an opportunity to enrich your understanding of the ways that the interactive whiteboard could contribute to the enhancement of your own teaching practices as well as the learning practices of your pupils.

**Confidentiality:**
Data collected in this study will remain confidential between the investigators, and yourself. When results of the study are compiled we will ensure that data collected from you will remain anonymous. All documents will be identified by code number and kept in a secured location. Digital data records will be kept on password protected hard drives. We may use some of your verbatim comments, excerpts from audio data to illustrate the findings of the study in forums such as the final report of the study, scholarly conferences, and journal articles. For this reason you will be given the opportunity to review all data collected that pertains to your interviews and to decide if you are willing to allow this data to be used for the research. In all cases your identity and your school will be concealed by use of a pseudonym.

**Contact for information about the study**
If you have any questions or require further information with respect to this study, please contact Brenda Lim-Fong at 778-838-9633.

**Contact for concerns about the rights of research subjects**
If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

**Consent**
Your participation in this study is entirely voluntary. You are free to decline to participate in or withdraw from the study at any time without consequence.

We wish to thank you for your consideration of this invitation to participate in this study.
Please check the box indicating your decision.

☐ I CONSENT to my participation in the above stated study. I have read the attached form and understand the nature of my participation in this study. With my consent I acknowledge receiving a copy of the study information.

☐ I DO NOT CONSENT to my participation in the study activities described in the attached form. I understand that my decision to not take part in the study will not affect my job as a teacher or have any consequences.

Teacher’s Full Name (please print): ____________________________________________

Signature: _____________________________ Date: ________________
Appendix B
Interview Questions

- State teacher name and date
- Have participant sign consent form and give copy
- Explain interview process. Start with general. Give examples if you can.

Demographics:

1. How long have you been teaching?
2. How long have you been teaching using the SMART Board?
3. How long have you been teaching your current classroom using the SMART Board?
4. Describe your classroom and the number of students.

Attitudes about the Interactive Whiteboard

5. What has been your experience with the interactive whiteboard been like? How did it make you feel?
6. What was the transition been like?
7. What do you remember about your initial experiences with the interactive whiteboard?
   Can you elaborate on....? Clarify response with more questions to describe experience with the interactive whiteboard. How did you feel about using the whiteboard?
8. From this list of emotions, which ones occurred most frequently, when and why?
   (frustration, stress, anxiety, excitement, contentment)
9. Describe a really positive experience that you had with the interactive whiteboard. How did it make you feel?
10. Describe a really negative experience that you with the interactive whiteboard.
11. What are your feelings about the interactive whiteboard now that you have been using it for x amount of time? Why?
Beliefs about the Interactive Whiteboard

12. What do you remember about your experiences with technology? What did you like about it? What did you not like about it? Describe your experiences.

13. What piece of technology would you say has had the greatest influence in your life? Why?

14. What piece of technology would you say has had the least influence in your life? Why?

15. What are your opinions about the interactive whiteboard? Describe.

16. What do you like about using the interactive whiteboard? Why?

17. What do you not like about using the interactive whiteboard? Why?

18. Do you think you will continue using the interactive whiteboard in the future? Why or why not?

19. What characteristics do you have that has helped you make use of the interactive whiteboard in your classroom? Explain.

20. What characteristics do you have that has hindered the use of the interactive whiteboard? Explain.

21. What are your thoughts about the impact the interactive whiteboard has had in your classroom? Can you provide some examples and explain?

22. What attributes do you feel have contributed to the formation of a learning community? How so?

23. How has the Inquiry Group affected your professional development?
Teaching Practices in regard to the Interactive Whiteboard

24. How do you incorporate the IWB during your lessons? Can you provide me with some examples?

25. How has the introduction of the whiteboard changed the way you teach? Explain with examples.

26. How is the introduction of the IWB different from the way you used to teach? Can you give me some examples of what has changed in the ways that you teach?

27. How has the IWB influenced other aspects of your duties as a teacher?

28. How has the introduction of the IWB influenced the way you plan lessons?

29. How has the introduction of the IWB influenced the way you assess students in their learning?

30. How has your idea of the teacher changed since using the interactive whiteboard?

31. Did you acquire any skills that you didn’t know you had or that would be useful in using the interactive whiteboard?

32. What subjects are most conducive to using the SB? Least conducive?
The University of British Columbia  
Office of Research Services  
Behavioural Research Ethics Board  
Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - MINIMAL RISK

PRINCIPAL INVESTIGATOR: Gaalen L. Erickson  
INSTITUTION / DEPARTMENT: UBC/Education/Curriculum Studies  
UBC BREB NUMBER: H07-02028

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Other locations where the research will be conducted:
Livingstone Elementary School, Vancouver School Board; Various locations in China where teachers will be interviewed (typically in their workplaces or a location convenient for the subjects); Various locations in Australia where teachers will be interviewed (typically in their workplace or a location convenient for the subjects);

CO-INVESTIGATOR(S):
David Anderson

SPONSORING AGENCIES:
Social Sciences and Humanities Research Council of Canada (SSHRC)

PROJECT TITLE:
Professional Learning Communities: A Multicase Study in Three Countries

CERTIFICATE EXPIRY DATE: October 15, 2008

DATE APPROVED: October 15, 2007

DOCUMENTS INCLUDED IN THIS APPROVAL:

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol: Professional Learning Communities</td>
<td>Version 1</td>
<td>October 10, 2006</td>
</tr>
<tr>
<td>Consent Forms: Teacher Consent Form</td>
<td>Version 1</td>
<td>September 3, 2007</td>
</tr>
<tr>
<td>Questionnaire, Questionnaire Cover Letter, Tests:</td>
<td>Version 1</td>
<td>September 6, 2007</td>
</tr>
<tr>
<td>Exemplary Interview Questions</td>
<td>Version 1</td>
<td>October 15, 2007</td>
</tr>
<tr>
<td>Other Documents: Approval Letters from VSB and China schools</td>
<td>version 1</td>
<td>October 15, 2007</td>
</tr>
<tr>
<td>Translation of Letter from Dongsheng School District, China</td>
<td>version 1</td>
<td>October 15, 2007</td>
</tr>
<tr>
<td>Translation of Letter from #4 School Beijing, China</td>
<td>version 1</td>
<td>October 15, 2007</td>
</tr>
</tbody>
</table>

The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

1 of 2  
15/04/2010 8:20 PM