Applying SMART Board Technology in Elementary School Classrooms:
Investigation of a School-Wide Initiative

Submitted by:
Health and Education Research Group
Faculty of Education
University of New Brunswick

Acknowledgements

Executive Summary

Project Intent, Assumptions, Phases: SMART Board Initiative

In August 2007 the Health and Education Research Group of the University of New Brunswick, in collaboration with the New Brunswick Department of Education, Park Street School, School District #18 and SMART Technologies undertook an initiative *to investigate the school-wide implementation of SMART Board technology in elementary classrooms, kindergarten through the grade five levels.* The intent of this project was to document and investigate *implementation processes* of the initiative, as well as its *associated outcomes* related to instructional knowledge and practices, student engagement in learning, and staff support and collaboration. The major assumptions of the proposed project framework placed emphasis on the development of grade-level professional learning teams among educators, application of evidence-informed practices, incorporation of strength-focused content, and enriched learning environments for students and teachers. This endeavour was comprised of five project phases: **Phase I:** Installation of Classroom-based SMART Board Technology, **Phase II:** Development of a Conceptual Framework for the Project, **Phase III:** Organization and Execution of Data Collection Activities: *leadership interviews, pre- and post- teacher evaluation surveys, structured classroom observations of instructional practices and student learning and focus group sessions with combined grade level learning teams,* **Phase IV** Analysis and Synthesis of Project Data, and **Phase V:** Preparation of the Final Project Report.

Project Findings

The following provides an overview of the aggregate findings according to the major areas of inquiry:

CONCEPTUAL FRAMEWORK AND CONSISTENCY OF IMPLEMENTED ACTIVITIES

Outcomes from the focus group data sessions and leadership interviews provided evidence of the documented activities and outputs related to the work of the various school teams and committees and their link with the overarching intent of the initiative to effectively apply SMART Board technology in the inclusionary education context. Overall, there was adequate evidence to support the consistency of executed activities with the proposed project framework.

TEACHER ENGAGEMENT AND PROJECT PREPARATION

The addition of the SMART Board as part of the permanent set-up of the classroom in September was viewed as an important catalyst for engaging educators in not only initiating use of this resource, but also for introducing the discussion of this instructional method as part of ongoing conversations and dialogue with other colleagues. The design and delivery of tutorial sessions by the School Technology Mentor for educators were regarded as particularly beneficial

because they were tailored to the individual learning needs and competencies of educators, and delivered on-site at the school to facilitate immediate application of acquired skills.

<u>OUTCOMES RELATED TO INSTRUCTIONAL KNOWLEDGE AND PRACTICES</u>

Ninety-five percent of survey participants reported daily use of their classroom SMART Board to present instructional content or to engage students in learning activities. Survey, focus group and observational outcomes revealed a range of reported instructional practices including organizing visual and interactive demonstrations of new concepts, eliciting unique and specialized information for instructional presentations or enrichment projects, creating opportunities for students to share learning products, and providing timely responses to information gaps and student questions. Across grade levels there was observational evidence of efficient use of SMART Board technology to transition seamlessly from one curriculum theme to another, or to respond to students' areas of interest or inquiry by immediately accessing more detailed information on a given topic. Focus group and survey results also revealed increased use of online resources. In traditional classroom configurations (seats in rows) there were generally fewer technological innovations incorporated into teacher instructional presentations, with the SMART Board being used similarly to an overhead projector.

<u>OUTCOMES RELATED TO STUDENT ENGAGEMENT IN LEARNING</u>

Focus group, survey and observational data revealed that students were generally more engaged in learning activities when SMART Board technologies were incorporated into instructional activities. An observable innovation across many classrooms related to student attention and engagement was the use of classroom FM systems to enhance sound linked to SMART Board instructional activities. When used in conjunction with the SMART Board, it was noted that students attended carefully and sustained attention for extended periods of time.

<u>OUTCOMES RELATED TO STAFF SUPPORT AND COLLABORATION</u>

Focus group outcomes supported the notion that active educator participation and staff team collaboration in the project were linked to having daily access to SMART Board technology in their respective classroom settings. Early in the fall term, sharing lessons learned and exchanging curriculum strategies about SMART Board use in the classroom were noted themes of informal discussions among educators in the hallway, classrooms, staff room and during professional grade-level learning team meetings. Mentoring relationships also emerged during the fall term and continued throughout the project, with more experienced staff members providing personal support and coaching to peers who were newer to SMART Board technologies.

<u>CHALLENGES, GAPS OR AREAS FOR CONTINUED DEVELOPMENT</u>

Although there was often evidence of full class engagement with respect to SMART Boards focused on learning activities, there were also noted incidents when students with specific learning needs were less engaged with the technology than were their peers. Students with identified learning challenges were often observed working on independent instructional

activities during the time periods when their peers were participating in SMART Board instructional lessons. Qualitative survey responses underscored the value of continued professional development on SMART Board instructional applications designed to target the needs of students with exceptionalities or specific learning needs.

Recommendations for Future Applications

Project participants' highlighted specific recommendations related to future applications of this project. These included: *increasing use of the Education Portal to share SMART Board applications, continuing the current individualized model of professional development, targeting SMART Board applications for students on SEPs, and extending the initiative to other schools.*

TABLE OF CONTENTS

1.0 Introduction

1.1 Project Purpose and Areas of Inquiry

In August 2007 the Health and Education Research Group of the University of New Brunswick, in collaboration with the New Brunswick Department of Education, Park Street School, School District #18 and SMART Technologies, Inc. undertook an initiative to evaluate the school-wide application of SMART Board technology across elementary classrooms in kindergarten through the grade five levels. The intent of this project was to document the conceptualization and implementation of the initiative, as well as to investigate potential outcomes or changes related to instructional knowledge and practices, student engagement in learning, and staff development and collaboration. More specifically the key areas of inquiry for this initiative included:

- What were the key aspects of the conceptual model that emerged as a guiding framework for this school-wide technological initiative? Was there consistency between the project's framework and the activities of the initiative?

- Did the initiative effectively engage and prepare teacher participants for implementation of this project?

- What specific changes or outcomes were documented over the course of the project related to instructional knowledge and practices?

- What specific changes or outcomes were documented over the course of the project related to student engagement in learning?

- What specific changes or outcomes were documented over the course of the project related to staff support and collaboration?

- What challenges, gaps or areas for continued development were identified with respect to instructional practice and student learning?

- What specific developments or recommendations might be considered to enhance the effectiveness of subsequent applications of similar initiatives in other jurisdictions?

1.2 Project Phases

The project was comprised of five key phases that were completed between August 2007 and July 2008. The preliminary two phases involved execution of initial preparation activities to support the subsequent implementation and evaluation of the initiative. Phase III involved the organization and completion of process and outcome data collection activities that spanned the full academic year. The final two phases involved analysis of gathered data, synthesis and presentation of project

findings, and preparation of the final report. The following provides a concise overview of each phase.

<u>PHASE I: INSTALLATION OF CLASSROOM-BASED SMART BOARD TECHNOLOGY</u>

SMART Boards were installed at Park Street Elementary School during the summer of 2007 in preparation for launch of the project in September 2007. In total, 25 SMART Board systems accompanied by corresponding ceiling LCD projectors were mounted as permanent instructional aids in each classroom.

<u>PHASE II: DEVELOPMENT OF A CONCEPTUAL FRAMEWORK FOR THE PROJECT</u>

Leadership interviews were undertaken on a monthly basis throughout the initiative. The preliminary sessions focused on creation of a logic model framework for the project. This model assisted in structuring both implementation and evaluation activities over the course of the project.

<u>PHASE III: ORGANIZATION AND EXECUTION OF DATA COLLECTION ACTIVITIES</u>

Data collection activities began in October 2007 and continued until June 2008. Data collection activities included administration of pre-and post-teacher evaluation surveys (October 2007, June 2008), structured classroom observations of instructional practices and student learning (October 2007, January to May 2008), and focus group sessions with combined grade level learning teams (October 2007, March 2008, May 2008).

<u>PHASE IV: ANALYSIS AND SYNTHESIS OF PROJECT DATA</u>

As data were collected for the project, they were coded and entered into a project database. Content and descriptive methods were applied to analyze key project trends related to the implementation and outcomes of the initiative. Key findings were synthesized at three points over the course of the initiative to assist in the preparation of interim project reports (October 2007, February 2008, May and June 2008).

<u>PHASE V: PREPARATION OF THE FINAL PROJECT REPORT</u>

The fifth phase of the project involved preparation of the final project report. This effort involved completion of synthesis of the overall project findings. Graphs, figures, as well as concise written descriptions were used in the presentation of key evaluation themes. This effort was completed during June and July 2008.

1.3 Organization of the Project Report

This document presents a summary of the overall findings of the Park Street School SMART Board initiative. The report begins with an introduction of the conceptual model, followed by a summary of the intent, methodology and results of the various data collection activities (focus groups, structured classroom observations, and post-teacher evaluation surveys). The final section provides a concise synthesis of the aggregate project outcomes based on the key areas of inquiry for the initiative, as well as recommendations for continuation and enhancement of SMART Board technology within the New Brunswick context.

2.0 Leadership Interviews and Project Framework

2.1 Introduction

The purpose of this aspect of this initiative was to create a project framework to guide the implementation and ongoing application of SMART Board technology at Park Street Elementary School. Key insights and data for this effort were gleaned through monthly planning sessions and leadership interviews with school administration and student services personnel during the fall and winter terms.

2.2 Methodology

Monthly planning meetings were held with school leadership over the course of the project. These meetings were also supplemented by multiple e-mail exchanges and phone contacts with the school principal. The purpose of these sessions and interactions was to ensure effective coordination of project activities and to define a project framework that could guide the initial implementation and ongoing refinement of SMART Board instructional applications at Park Street Elementary School.

A logic model method was adopted as means for designing the overall framework for the project. The key components of the project logic model included:

- Theoretical assumptions - guiding principles and perspectives
- Goals - project targets for positive change
- Inputs - major project components and human resources
- Activities - key actions implemented to meet project goals
- Outputs - products that reflect implementation of project activities
- Outcomes - desired changes in key indicators that reflect attainment of project goals

Upon completion, the logic model was submitted to school administration for their consideration and review. Feedback from this review was the incorporated into the proposed framework and the preliminary draft of the logic model was finalized.

2.3 Results

Key insights and data for this effort, gleaned from monthly leadership interviews with school administration, provided the basis for creation of the visual project logic model (Figure 1). This schematic provided a concise overview of the project framework including underlying assumptions, goals, inputs, activities, outputs and outcomes. With respect to key assumptions, emphasis was placed on development of grade-level professional learning teams among educators, application of evidence-informed practices, incorporation of strength-focused content, and creation of enriched learning environments for students and teachers. The overarching intent

of the initiative was to effectively apply SMART Board technology in the inclusionary education context, with four supporting goals aimed at enhancing 1) educator knowledge and confidence related to SMART Board technology, 2) instructional applications incorporating technology, 3) evidence informed professional development exchanges among teachers, and 4) student engagement in classroom learning activities. To address these goals, key project inputs or human resources included: School Leadership, the School Technology Committee, Professional Grade Level Learning Teams, the Student Services Team, Technology Mentor Support Services and SMART Board Affiliates. The identified activities of each project team and committee were linked with major objectives of the project plan. The logic model also outlined key project outputs which were intended to provide evidence of completed initiative activities including such project products as meeting schedules, interim reports, instructional resources, and professional development material. Finally the project framework outlined key project outcomes to be realized as a result of the implementation of the initiative. These outcomes mirrored the four major project objectives reflecting desired positive changes or developments associated with educator knowledge and confidence, instructional applications using technology, educator exchanges and collaboration, and student engagement in learning.

The resulting framework was subsequently used to structure and elaborate the planned implementation and evaluation activities of the project. It was also recognized that over the course of the project this model would conceivably be adapted or further refined as a result of implementation challenges, emerging instructional needs, and lessons learned related to the application of the SMART Board technology, both during and beyond the time period established for the project. Figure 1 provides a visual representation of the logic model created for the SMART Board Initiative.

Effective Application of SMART Board Technology

Assumptions: Professional learning teams; Knowledge exchanges on better practices; Individualized teacher professional development on technology; Enriched learning environment for teachers and students.

Goals	→	Inputs	Strategic Actions	Outputs	→	Outcomes

Goals

- Enhance Instruction Knowledge and Attitudes
- Enhance Instructional Applications
- **To Effectively Apply SMART Board Technology in the Inclusionary Education Context**
- Enhance Professional Exchanges Development
- Enhance Student Engagement

Inputs

- School Leadership
- School Technology Committee
- Professional Grade Level Learning Teams
- Student Services Team
- Technology Mentor Support Services
- SMART Board Affiliates

Strategic Actions

- Oversee the grade level learning teams, and school instructional activities
- Monitor the overall initiative and its activities
- Meet with the evaluation team to discuss lessons learned from the initiative

- Consult with teachers on professional and operational needs related to technology
- Provide instructional information and on-line resources for teachers
- Plan and coordinate SMART Board professional development activities

- Share instructional methods for curriculum areas
- Explore new application of technology to support student learning
- Monitor the impact of instructional activities on student engagement and learning

- Collaborate with teachers on the development and implementation of SEPs
- Apply SMART Board technology in individualized work with students
- Serve as learning consultant for the professional learning teams

- Carry out individual and small group learning workshops for teachers
- Model effective use of technology in classroom settings
- Provide follow-up to ensure effective application of technology

- Provide orientation sessions to SMART Board Technology
- Respond to school requests for technology assistance and support
- Update the school on new SMART Board resources and applications

Outputs

- Monthly meetings with the evaluation team

- Bi-weekly meetings
- Web resources documents
- SMART curriculum uploads

- Weekly meetings
- PLT progress

- Weekly meetings
- SEP resources

- Professional Development Reports
- Progress reports on technology competencies

- Workshop handouts
- Update summaries

Outcomes

Enhanced Instructional Knowledge and Attitudes
- Increased teacher professional knowledge related to SMART Board technology and its potential applications
- Increased teacher level of confidence and motivation to apply SMART Board Technology within the classroom

Enhanced Instructional Applications
- Increased effective use of SMART Board technology in core instructional and differentiated practices
- Increased teacher application of SMART Board technology to inclusive education and special education planning

Enhanced Professional Exchanges Development
- Increased use of SMART Board and associated technology (e.g. portal, sound field systems) for knowledge exchange among professional learning teams
- Increased use SMART Board and associated technology (e.g. portal, sound field systems) for personal, professional growth & development

Enhanced Student Engagement
- Increased student engagement in small group and individual learning activities
- Increased engagement of students with identified learning needs or challenges

Effective Application of SMART Board Technology in the Inclusionary Education Context

3.0   Focus Group Interviews

3.1 Introduction

The intent of this data collection activity was to elicit detailed descriptive feedback from teachers regarding the implementation and outcomes of the SMART Board initiative. During the initiative two focus group sessions were undertaken, the first in October 2007, and the second in May 2008.

3.2 Methodology

Each focus group session was coordinated by a moderator and research assistant. A semi-structured interview approach was used to engage participants in discussion of key project activities, outputs and outcomes. Sixteen educators participated in the preliminary focus group session and twelve participated in the final one. Both sessions were approximately one and a half hours in duration.

Descriptive notes recorded by both research team members were merged to provide a session summary for each focus group session. With respect to specific areas of inquiry, the preliminary focus group session investigated key themes related to the initial project implementation activities, whereas the second one examined reported outputs and outcomes resulting from the initiative. Upon completion of the two focus group sessions, individual summaries were merged to provide a unified data set. Content analysis was applied to identify major themes and trends arising from the data. Highlighted themes reflected the endorsement of at least four participants from the respective focus group session.

The following provides an overview of the various themes that emerged from the analyses of the two focus group sessions. The outcomes of this effort are organized according to six major headings:

- Project Readiness: Diverse Needs and Strengths Related to Technology,
- Skill Enhancement with SMART Board Technology: Individual Tutorial Support and Staff Mentorship,
- Better Practice Orientation and Professionalism,
- Changes in Instructional Practices,
- Impact on Student Learning, and
- Areas for Continued Development.

3.3 Results

3.3.1 Project Readiness: Diverse Needs and Strengths Related to Technology

Participants indicated that at the outset of the project, the staff team varied significantly in terms of their background, training and confidence regarding SMART Board technology. Some individuals reported having a broad range of skills related to the application of SMART Board methods and other related technologies. In contrast, others indicated that with the exception of the Teacher Notebook Initiative they had not participated in any training or applied learning experiences associated with instructional technologies. With respect to the on-site application of SMART Boards, only one teacher had used a SMART Board in her classroom during the year prior to the school-wide initiative.

The addition of the SMART Board as part of the permanent set-up of the classroom in September was viewed as an important catalyst for encouraging staff members to not only initiate use of this resource, but also to introduce discussion of this instructional method as part of ongoing conversations and dialogue with other colleagues. In the fall term, sharing lessons learned and exchanging curriculum strategies about SMART Board use in the classroom were noted themes of informal discussions among educators in the hallway, classrooms, staff room and during professional grade-level learning team meetings. Overall, active educator participation and staff team collaboration in the project were linked to having daily access to SMART Board technology in their respective classroom settings.

3.3.2 Skill Enhancement with SMART Board Technology: Individualized Tutorial Support and Staff Mentorship

During the initiative, training and skill enhancement opportunities related to classroom use of SMART Boards were characterized as effective and relevant. In particular, the design and implementation of individualized tutorial sessions for educators were regarded as particularly beneficial. These tutorial

> **"Learning was accelerated due to the availability of technology in every classroom."**

sessions were developed and executed by the School Technology Mentor. A preliminary step in creation of this training strategy involved the completion of a needs assessment survey by staff members to determine their respective levels of proficiency related to using SMART Board technology. Based on the individual outcomes of each need assessment, tutorial plans were differentiated for each staff member. Another noteworthy aspect of this strategy entailed the delivery of tutorial sessions during the school day for limited time periods (20 to 30 minutes). Supply teacher relief was provided to facilitate educators' participation in these individualized professional development meetings. The various learning sessions were described as hands-on and targeted to provide immediate application of acquired skills. Participants regarded these sessions as effective for acquisition and generalization of SMART Board competencies because they provided opportunity for asking questions, learning while using their own computers, and receiving personalized feedback on their skills.

In addition to targeted professional development, participants emphasized the importance of the personal support and coaching that many staff members had received from their colleagues over

the course of the project. This collaboration was defined as "useful for refining skills" gleaned from the individualized professional development sessions, as well as "informative" regarding new ways in which to apply SMART Board technology to varied curriculum areas. Participants also commented that individualized professional development, in conjunction with collaborative efforts from the staff team, was beneficial in reducing "feelings of potential information overload" and in fostering positive and optimistic attitudes among grade level team members towards the overall SMART Board Initiative.

> "**Natural mentorships emerged among teachers with higher levels of proficiency and those who were new users.**"

3.3.3 Better Practice Orientation and Professionalism

The participation of all staff members in the initiative was regarded as a school-wide collaborative effort aimed at enhancing instructional practices and student learning. This was not the first school project undertaken to be referred to as a "research" or "evaluation" initiative. Other school-wide projects included the social learning program evaluation, and the creation of an immersion writing enhancement multi-media strategy. According to participants these initiatives, in conjunction with the SMART Board project, reflected continuation of emerging practices at the school to embrace new learning opportunities, to refine current practices and to use school-based knowledge to inform practice and stimulate instructional innovation and change.

> "**We are committed to better practices - this is not our only initiative.**"

3.3.4 Changes in Instructional Practices

Participants highlighted various changes that had been realized in their instructional practices as a result of having access to a classroom-based SMART Board. These included:

Increased use of online resources and other educational technologies
The use of the SMART Board introduced teachers to a range of new technologies and software resources to support student learning. These included online resources, educational DVDs and the linking of technologies such as wireless slates and clickers.

> "**I can't imagine going back to not using SMART Boards with my kids.**"

Demonstration of student learning using the SMART Board
The SMART Board provided an effective means for many students to present multi-media presentations of specific learning outcomes that they had accomplished in various curriculum areas. The sharing of such learning products or accomplishments was undertaken not only for other students, but in some instances was also used as an effective means to communicate learning outcomes to parents or other family members. Parents provided positive feedback to student services personnel when the SMART Board was used to display SEP information during family and team meetings.

Increased use of virtual and interactive methods
The introduction of the SMART Board into the classroom was accompanied by inclusion of new visual content and interactive processes in instructional presentations. Cited examples of "new content" included the use of virtual manipulatives, and multisensory applications for teaching science, social studies, numeracy and literacy.

Timely responses to information gaps and student questions
Immediate access to the presentation of online material to support learning including the use of sound and animated images was described as a "tremendous benefit". One participant referred to the SMART Board as her "window on the world", allowing students to share in the exploration and acquisition of information presented in a dynamic and engaging way.

Application of SMART Boards for SEP development
Participants reported using SMART Boards to develop and present SEPs in a team setting. By developing the SEP visually on the SMART Board, school team members, parents and students themselves were reported to be more engaged in the process, and could readily view the development of interventions and comment on their effectiveness.

Enhanced professional motivation and innovation
Participants described themselves as "invigorated" by new possibilities for content presentation using the SMART Board. Lesson plans were described as less repetitive and more creative than in prior years, and there was enhanced discussion among teachers regarding better practices.

3.3.5 Impact on Student Learning

In addition to changes in instructional practices, participants also noted specific initiative outcomes associated with student learning. These observations focused primarily on student engagement in academic learning activities, and enhanced student knowledge and use of technology.

Increased engagement of all students in learning activities
Participants reported greater ease in engaging all students and maintaining their attention for longer periods when lessons were taught using SMART Board technology.

> **"Students enjoy the process of seeing their efforts displayed on the SMART Board screen."**

Increased academic engagement of students with specific learning needs
Participants reported that students with special needs were more engaged and interactive when SMART Boards were used than when separate computer stations were employed to provide individualized support. They also highlighted the effectiveness of the SMART Board technology in engaging the students with attention and behavioural concerns.

> **"We have one child who struggles to be in a regular classroom environment, but as soon as the SMART Board is turned on, he is very interested and very engaged. His time in the classroom is much more productive and less stressful."**

Enhanced student knowledge and use of technology
Students were reported to be actively engaged in finding resources that could be shared with the class on the SMART Board, and were described as enthusiastic about sharing their ideas and knowledge using the technology. There was an overall noted increase in technology proficiency among students at every level from kindergarten upward, as well as an increase in technology "vocabulary" among both students and teachers.

3.3.6 Areas for Continued Development

Participants also highlighted specific recommendations related to extending and sharing lessons learned related to the SMART Board project. These included increasing use of the Educational Portal, continuing the current model of professional development, targeting SMART Board applications for students on SEPs, and extending the initiative.

INCREASE USE OF THE EDUCATION PORTAL

The New Brunswick Education Portal is a virtual resource accessible to all teachers in the province. Participants spoke of the potential for the portal to become a forum for online professional development, discussion groups, collaboration and support. While the portal is facilitating online collaboration among teachers in some districts, this was described as occurring in "pockets", and not as a province-wide practice. Participants suggested the development of a section on the portal in which they could post innovative SMART Board practices and exchange lessons learned with other educators from across the province. This portal component could also be used to post challenges and solutions related to instructional practices with SMART Board and other related technologies.

CONTINUE THE CURRENT MODEL OF PROFESSIONAL DEVELOPMENT

Participants highlighted the value of continued professional development, applying the individualized tutorial model in conjunction with the existing collaborative structure at the school. Such an approach would be particularly crucial for new staff who join the staff team and who have had minimal exposure or background in preparing instructional approaches with SMART Boards.

TARGET SMART BOARD APPLICATIONS FOR STUDENTS ON SEPS

Participants noted that use of SMART Boards had become embedded within the general instructional practices within the classroom; however, there was also recognition of the need to give greater consideration to the design of specialized applications for targeting the needs of students with specific learning difficulties. Although many of the grade level teams at the school had previously undertaken deliberations related to this aspect of instruction, it was also asserted that targeted individual and small group professional development activities could also be considered to increase instructional competencies related to using SMART Board technology with students on SEPs.

<u>EXTEND THE INITIATIVE</u>

Participants asserted that the SMART Board initiative should be expanded to other schools. This would potentially contribute to opportunities for increased inter-school collaboration, and strategy sharing through the provincial education portal.

4.0   Classroom Observations

4.1 Introduction

This aspect of the data collection involved completion of a series of classroom observations across all academic levels at Park Street Elementary School. The purpose of these classroom visits was to document instructional practices related to the use of SMART Board Technology over the course of the project.

4.2 Methodology

Observations were completed at the outset, mid-point and toward the end of the project (October, January, April). Observations were completed at all grade levels, across curriculum areas, in both French Immersion and Core English programs. Individual classroom observations varied in length from 15 to 30 minutes. In order to cover all grade levels during each project time period, multiple day visits to the school were undertaken.

Two observers with graduate level training in educational supervision and curriculum instruction carried out the various classroom observations. A common coding form was used by both observers to record descriptive notes regarding instructional activities using SMART Board technology within the various grade level classrooms.

Following each school visit, data recorded by each observer were compared to identify similar and divergent descriptive observational themes emerging across the various classrooms levels. At the close of this initiative, observational themes across the three project time periods were merged to provide a final synthesis of descriptive themes related to the application of SMART Board technology within the classroom context.

The following provides an overview of the aggregate themes that emerged from the descriptive analysis of the classroom observations across grade levels and classroom settings. The outcomes of this effort are organized according to six major headings: *Learning Routines and Interactions, Curriculum-Focused Applications, Student Attention and Engagement during Learning Activities, Students with Specific Learning Needs*

4.3 Results

4.3.1 Learning Routines and Interactions

The majority of classroom visits revealed the presence of structured and well-developed learning routines undertaken in conjunction with SMART Board-focused learning activities. Although these learning routines were structured, there was usually evidence of sufficient flexibility for students to feel at ease to ask questions and to interact with their peers. In many instances, SMART Board activities were facilitated directly by the teacher with students gathered in close

proximity to the interactive board, either sitting or standing. This arrangement allowed students to quickly access the SMART Board in order to give individual responses during full class activities. Many teachers actively created pro-social environments related to technology use and the learning process in general. For example, turn-taking with the SMART Board strategies was respected by students. In several class observations students provided individual affirmations to their peers following use of the SMART Board. There were no instances of discouraging comments or oppositional responses observed during learning routines linked with the SMART Board.

Overall, student placement in classes ranged from a traditional "desks in rows" configuration, to small flexible groupings, to stations with movement in each area based on expectations or the structure of the given learning activities. In classrooms with more traditional seating and lecture configurations (i.e. students at desks in rows with the teacher at the front of the room), there appeared to be less overall student engagement in learning and fewer student-initiated interactions linked with the work being presented on the SMART Board. Preliminary observations noted that in such classroom configurations, the SMART Board appeared to be used more as an overhead projector, with less technological innovation being incorporated into teacher presentations. In contrast, more frequent student-initiated interactions and student-to-student conversations about learning was associated with less traditionally organized classrooms (small groups or informal seating areas closer to the SMART Board).

4.3.2 Curriculum-Focused Applications

The use of SMART Boards offered many opportunities in the earlier grades for the development of reading fluency through cooperative reading. Numeracy strategies, including the concepts of odd and even, calendars, and time, were enhanced by access to multisensory resources to introduce and reinforce learning concepts. In French Immersion classrooms, SMART Boards were consistently used to directly support second language training and fluency across subject areas. Language training appeared to be foremost in all observed immersion instruction, with teachers continuously reinforcing vocabulary and grammar in the context of the lesson, aided by visual cues on the SMART Board. General applications of SMART technology for curriculum delivery included:

- Organizing visual and interactive demonstrations of new concepts in math and science,
- Facilitating student participation in manipulating shapes and images on the SMART Board,
- Designing learning activities to support both visual and oral learners,
- Incorporating online aids such as virtual "spinners" to teach lessons on probability,
- Applying SMART Board technology to support bookwork and oral instruction (i.e. teacher-presented graphs, charts and games),
- Using online support sites, and
- Providing virtual displays of individual student progress and areas of study.

Across grade levels there was evidence of efficient use of SMART Board technology to transition seamlessly from one curriculum theme to another, or to respond to students' areas of interest or inquiry by immediately accessing more detailed information on a given topic. One

spontaneous discussion regarding the size of the moon in comparison to the province of New Brunswick resulted in immediate access of an internet search engine to research specific dimensions. This immediate access to internet resources allowed for the "making the most" of a teachable moment, without a lag in instructional time or student interest level.

4.3.3 Student Attention and Engagement during Learning Activities

A general observation across all grade level classrooms was students' positive response to lessons presented in the style of a webpage. This type of interface appeared to be familiar to the majority of students, and was effective in engaging their attention at the outset of the given learning activities. SMART Board delivered or supported learning activities that incorporated both visual and tactile methods, as well as those that provided opportunities for students to manipulate images and text, appeared to be more effective in sustaining students' attention than those that involved only teacher-led demonstrations. Students' attention and engagement in learning activities also seemed to be associated with teachers' expressed enthusiasm about exploring specific curricular themes using the SMART Board.

In earlier grades, there appeared to be increased use of learning opportunities for students to approach the SMART Board and manipulate objects to demonstrate knowledge. Several teachers employed various strategies on the SMART Board to choose which students would participate next (name scramble puzzles, name "randomizer", etc.). Students appeared to attend more carefully and be more prepared to respond when these methods were employed.

Another common observation was students' engagement in using vocabulary associated SMART Board technology both with their peers and other students during classroom learning activities. For instance, one five-year old student requested that the teacher "set it to full-screen" to better view images of icebergs. Students in earlier grades appeared especially confident and eager to interact using the technology, and demonstrated proficiency in its use.

An observable innovation across many classrooms that was related to student attention and engagement was the use of classroom FM systems to enhance sound linked to SMART Board instructional activities. When used in conjunction with the SMART Board, it was noted that students attended carefully and maintained attention for extended periods of time.

4.3.4 Students with Specific Learning Needs

Although there was often evidence of full class engagement with respect to SMART Board focused learning activities, there was also noted incidents when students with specific learning needs were less engaged with the technology than were their peers. For example, students with identified learning challenges were often observed working with teacher assistants on independent instructional activities during the time periods when their peers were involved in a teacher-facilitated SMART Board instructional lesson. In other instances, SMART Board instructional activities that omitted effective use of varied multisensory learning components were not identified as effective for engaging students with noted attention or behavioural difficulties. Finally, in more traditional classroom configurations, there was a clear pattern of "keen" students volunteering answers, while others held back or appeared distracted.

5.0 Post-Initiative Educator Surveys

5.1 Introduction

The data collection activity included administration of a post-initiative educator survey with teachers who had participated in the SMART Board project. The purpose of this task was to document teachers' perspectives regarding the overall initiative and its outcomes, related instructional planning and student engagement in learning.

5.2 Methodology

The post-initiative educator surveys were completed in June 2008 during an after-school session at Park Street School. A total of 21 teacher participants provided written consent to complete the survey. The survey was composed of both open-ended and rating scale questions designed to investigate educator perspectives regarding the specific outcomes associated with the implementation of the SMART Board initiative. Areas of inquiry included:

- Educator Knowledge and Confidence
- Classroom Instructional Practices
- Instructional Benefits
- Differentiation of Instruction

Data from the completed surveys were coded and entered into a project database. Numerically coded data were analyzed using descriptive statistics. Other outcomes required the application of content analysis and identification of theme categories.

5.3 Results

5.3.1 Educator Knowledge and Confidence

Participants were initially invited to rate the extent to which the SMART Board initiative had contributed to their understanding of technology as an instructional method for classroom teaching. All participants reported that the project had increased their knowledge of the general use of technology for instruction "somewhat" to "very much" with over 76% indicating that their level of understanding had increased "very much".

Educators were also asked to comment on their level of confidence in using SMART Board both before and following the initiative. Survey results indicated a significant increase in educators' confidence to use SMART Boards since the beginning of the project ($p< .01$). At the close of the project, approximately 90% of participants indicated a strong agreement that they were comfortable in using SMART Board technology as an educational tool in their classroom. Figure 2 provides a summary of these results.

Figure 2 – Level of confidence with using SMART Board technology
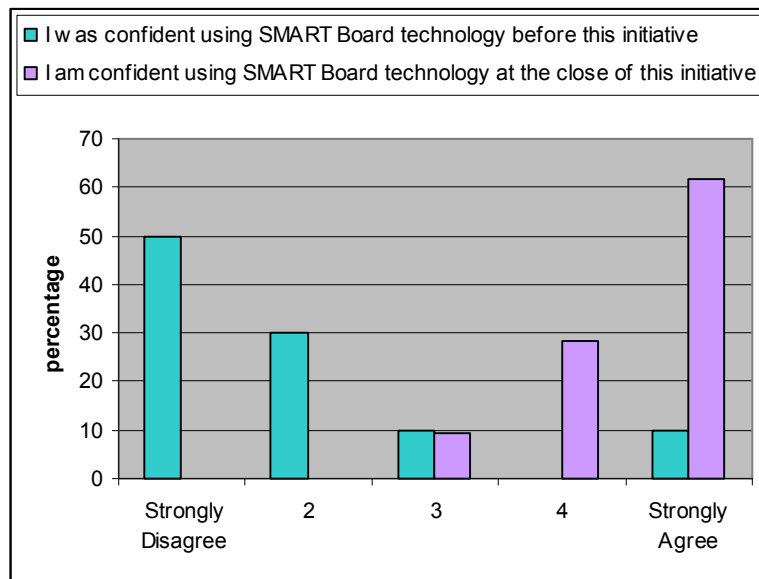
5.3.2 Classroom Instructional Practices

For an average school week this year, 95% of participants reported daily use of their classroom SMART Board to present instructional content or to engage students in learning activities. Educators noted using specific online or supplementary instructional content in conjunction with SMART Board technology, including:

- www.smarttech.com resources (50%),
- Lessons learned or content obtained from school-based professional learning teams, (71%),
- Instructional DVDs (81%), and
- Other diverse educational websites (95%).

Participants were also invited to describe specific examples of how they incorporated SMART Board technology as part of their regular classroom practices. Approximately three quarters of the sample described multiple examples of SMART Board instructional applications they had used in their respective classrooms. These included using SMART Boards to:

- Present and reinforce learning routines or schedules,
- Elicit unique and specialized information for instructional presentations or enrichment projects,
- Facilitate individual or small group learning activities,
- Introduce new vocabulary,
- Investigate themes relevant to students' interests, passions and experiences,
- Incorporate interactive learning games in classroom presentations,
- Create opportunities for students to share learning products with the full class,
- Review curriculum content and

- Practice previously learned skills in literacy and numeracy.

5.3.3 Instructional Benefits

All educators reported strong agreement regarding the benefits of using SMART Board technology in the classroom, and that interactive whiteboard technology should be part of an overall framework for better practices in an inclusionary educational system. Similarly, participants strongly agreed that that their capacity to teach had been enhanced through the use of SMART Board technology and students were more engaged in the learning process when such technology was integrated in instructional activities. Figures 3 and 4 provide a summary of these results.

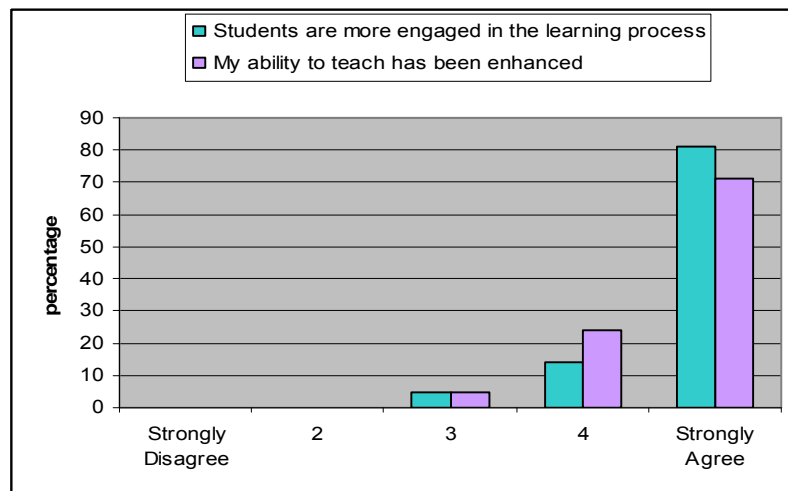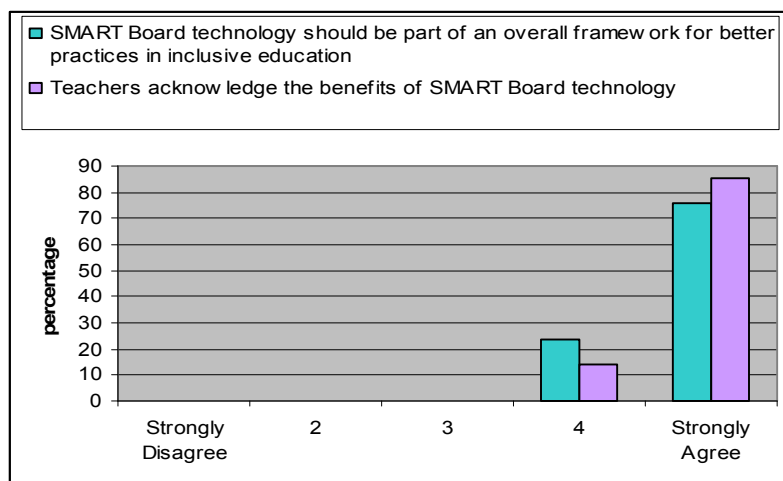**Figure 3 – Enhancement of both teaching and learning engagement**

Figure 4 – Better practices framework and benefits of using SMART Board technology

5.3.4 Differentiation of Instruction

The final section of the survey included various areas of inquiry related to the application of the SMART Board as a tool for individualizing or differentiating instruction for students on accommodated or modified SEPs. More than half of participants (52%) reported that having access to SMART Board technology had contributed "very much" to their ability to effectively differentiate instruction in the classroom (Figure 5). Approximately 62% also reported that they had sufficient understanding regarding the use SMART Boards to plan instructional activities to enhance the learning of students on SEPs. Qualitative responses from several participants underscored the value of continued professional development on SMART Board instructional applications designed to target the needs of students with exceptionalities or specific learning needs.

Figure 5 - Access to SMART Board technology has enhanced my ability to differentiate instruction
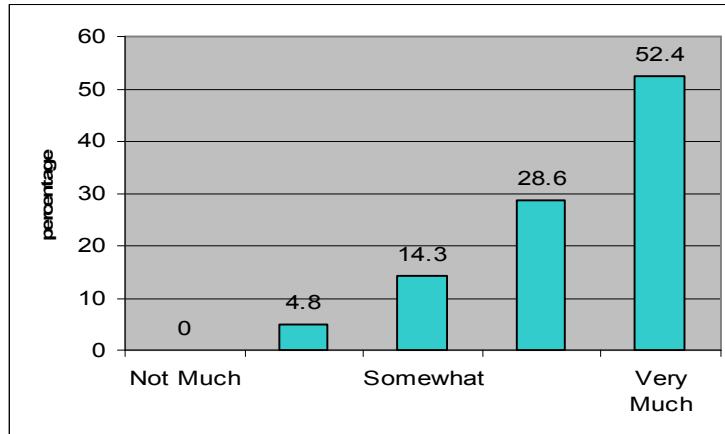
6.0 Summary of Key Findings

In the fall of 2007 the Health and Education Research Group of the University of New Brunswick, in collaboration with the New Brunswick Department of Education, Park Street School, School District #18 and SMART Technologies, Inc. undertook an initiative to investigate the school-wide implementation of SMART Board technology in elementary classrooms in kindergarten through the grade five levels. The intent of this project was to document the conceptualization of the initiative, and to investigate its implementation processes, as well as associated outcomes related to instructional knowledge and practices, student engagement in learning, and staff development and collaboration. The following provides an overview of the aggregate findings according to the major areas of inquiry.

6.1 Conceptual Framework and Consistency of Implemented Activities

What were the key aspects of the conceptual model that emerged as a guiding framework for this school-wide technological initiative? Was there consistency between the project's framework and the activities of the initiative?

The major assumptions of the proposed project framework placed emphasis on development of grade-level professional learning teams among educators, application of evidence-informed practices, incorporation of strength-focused content, and creation of enriched learning environments for students and teachers. Over the course of the initiative, weekly meetings were held among grade level professional learning teams. Similarly, other project-related committees such as the Student Services Team and the School Technology Committee conferred at regular intervals. The technology mentor maintained ongoing contact through individual appointments and tutorial sessions during the project's implementation. Monthly and quarterly communications with the Research Team were maintained with school leadership and SMART Board affiliates. The deliberations and planning processes of these various school groups and committees were critical for launching and embedding SMART technology as an applied instructional approach within the structure and daily learning routines of the classroom settings at the elementary level. Outcomes from the focus group data sessions and leadership interviews provided evidence of the documented activities and outputs related to the work of the various school teams and committees and their link with the overarching intent of the initiative to effectively apply SMART Board technology in the inclusionary education context. Overall, there was adequate evidence to support the consistency of executed project activities with the proposed project framework.

6.2 Teacher Engagement and Project Preparation

Did the initiative effectively engage and prepare teacher participants for implementation of this project?

During the focus group sessions, educators reported that at the outset of the project the staff team varied significantly in terms of their experience, training and confidence related to SMART Board technology. The addition of the SMART Board as part of the permanent set-up of the

classroom in September was viewed as an important catalyst for engaging educators in not only initiating use of this resource, but also for introducing the discussion of this instructional method as part of ongoing conversations and dialogue with other colleagues.

In addition, focus group participants reported that organized training and skill sessions related to classroom use of SMART Boards were effective and relevant. In particular, the design and delivery of tutorial sessions by the School Technology Mentor for educators were regarded as particularly beneficial. These sessions were executed on an individual basis, tailored to the individual learning needs and competencies of educators, and delivered on-site at the school during short time segments to facilitate immediate application of acquired skills. Educators described these sessions as effective for acquisition and generalization of SMART Board competencies because they provided opportunity for asking questions, learning while using their own computers, and receiving personalized feedback on their skills.

On the teacher survey, over 76% of participants indicated that their level of understanding of the general use of technology for instruction had increased "very much". Results also revealed that since the beginning of the project a significant increase in educators' confidence to use SMART Board technology was evident. At the close of the project, approximately 90% of participants indicated a strong agreement that they were comfortable in using SMART Board technology as an educational tool in their classroom.

6.3 Outcomes Related to Instructional Knowledge and Practices

What specific changes or outcomes were documented over the course of the project related to instructional knowledge and practices?

Ninety-five percent of survey participants reported daily use of their classroom SMART Boards to present instructional content or to engage students in learning activities. Survey, focus group and observational outcomes revealed a range of reported instructional practices and changes in classroom learning routines that had been realized as a result of having access to a classroom-based SMART Board. These included:

- Organizing visual and interactive demonstrations of new concepts,
- Presenting and reinforcing learning routines or schedules on the SMART Board,
- Introducing and reviewing new vocabulary, curriculum content or skills,
- Eliciting unique and specialized information for instructional presentations or enrichment projects,
- Investigating themes relevant to students' interests, passions and experiences,
- Incorporating interactive learning games and multisensory instructional applications for a range of curriculum areas,
- Facilitating student participation in manipulating shapes and images on the SMART Board,
- Organizing individual or small group learning activities,
- Creating opportunities for students to share learning products with the whole class,
- Providing virtual displays of individual student progress and areas of study, and
- Providing timely responses to information gaps and student questions.

With respect to observed curriculum-focused applications, the use of SMART Boards offered opportunities in the earlier grades for the development of reading fluency through cooperative reading. Numeracy strategies, including the concepts of odd and even, calendars, and time, were enhanced by access to multisensory resources to introduce and reinforce learning concepts. In French Immersion classrooms, SMART Boards were consistently used to directly support second language training and fluency across subject areas.

Observational data also revealed varied classroom setups from traditional "desks in rows" configuration, to small flexible groupings and to stations with movement among each area based on the expectations or the structure of the given learning activities. In more traditional classroom configurations there were generally fewer technological innovations incorporated into teacher instructional presentations, with the SMART Board being used similar to an overhead projector.

Focus group and survey results also revealed increased use of online resources and other educational technologies. Specific online or supplementary instructional content used in conjunction with SMART Board technology included: www.smarttech.com resources, lessons learned or content obtained from school based professional learning teams, instructional DVDs, wireless slates and clickers and diverse educational websites. Across grade levels there was observational evidence of efficient use of SMART Board technology to transition seamlessly from one curricular theme to another, or to respond to students' areas of interest or inquiry by immediately accessing more detailed information on a given topic.

6.4 Outcomes Related to Student Engagement in Learning

What specific changes or outcomes were documented over the course of the project related to student engagement in learning?

Focus group participants reported greater ease in engaging all students and maintaining their attention for longer periods when lessons were taught using SMART Board technology. Similarly, survey results also revealed that over 90% of participants reported that students were more engaged in learning activities when SMART Board technologies were incorporated into instructional activities. Observational data also supported increased engagement of students when SMART Board applications were used in conjunction with classroom learning experiences. In particular, SMART Board-based activities paired with flexible interactive routines (small group approaches, conversational style interaction between teachers and students, informal seating in close proximity to the Board) were associated with more frequent student initiated interactions and student-peer dialogue about learning.

An observable innovation across many classrooms related to student attention and engagement was the use of classroom FM systems to enhance sound linked to SMART Board instructional activities. When used in conjunction with the SMART Board, it was noted that students attended carefully and maintained attention to for extended periods of time.

6.5 Outcomes Related to Staff Support and Collaboration

What specific changes or outcomes were documented over the course of the project related to staff support and collaboration?

Focus group outcomes supported the notion that active educator participation and staff team collaboration in the project was linked to having daily access to SMART Board technology in their respective classroom settings. Early in the fall term sharing lessons learned and exchanging curriculum strategies about SMART Boards use in the classroom were noted themes of informal discussions among educators in the hallway, classrooms, staff room and during professional grade-level learning team meetings. Mentoring relationships also emerged during the fall term and continued throughout the project with more experienced staff members providing personal support and coaching to peers who were less experienced with SMART Boards and other instructional technologies. Mentoring interactions were described as beneficial for "refining skills" and "informative" regarding new ways in which to apply SMART Board technology. Participants also highlighted that "feelings of potential information overload" were reduced as a result of staff collaboration and the support provided through individualized sessions with the Technology Mentor.

Overall, the commitment and collaborative interactions of staff members were focused on enhancing instructional practices and student learning. This project effort, as with other school endeavours, was regarded as a means for embracing new learning opportunities, and for using school based knowledge to inform practice and stimulate instructional innovation and change.

6.6 Challenges, Gaps or Areas for Continued Development

What challenges, gaps or areas for continued development were identified with respect to instructional practice and student learning?

Although there was often evidence of full class engagement with respect to SMART Boards focused on learning activities, there were also noted incidents when students with specific learning needs were less engaged with the technology than were their peers. Students with identified learning challenges were often observed working with teacher assistants on independent instructional activities during the time periods when their peers were involved in teacher facilitated SMART Board instructional lessons. In other instances, SMART Board instructional activities that omitted effective use of varied multisensory learning components were not identified as effective for engaging students with noted attention or behavioural difficulties. Approximately 62% of survey participants reported that they had sufficient understanding regarding the use of SMART Boards to plan instructional activities to enhance the learning of students on SEPs. Qualitative responses from several participants underscored the value of continued professional development on SMART Board instructional applications designed to target the needs of students with exceptionalities or specific learning needs.

6.7 Recommendations for Future Applications

What specific developments or recommendations might be considered to enhance the effectiveness of subsequent applications of similar initiatives in other jurisdictions?

During the final focus group sessions, participants highlighted specific recommendations related to extending and sharing lessons learned related to the SMART Board project. These included:

Increasing the use of the Education Portal
Participants suggested the development of a section on the portal in which they could post innovative SMART Board practices with other educators from across the province.

Continuing the current model of professional development
Participants highlighted the value of continued professional development, applying the individualized tutorial model in conjunction with the existing collaborative structure at the school.

Targeting SMART Board applications for students on SEPs
Participants noted that use of SMART Boards had become embedded within the general instructional practices within the classroom; however, there was also recognition for the necessity to give greater consideration to the design of specialized applications for targeting the needs of students with specific learning concerns.

Extending the initiative
Participants asserted that the expansion of SMART Board initiative would potentially contribute to opportunities for increased inter-school collaboration, as well as strategy-sharing through the provincial education portal.

6.8 Final Reflections

The intent of this project was to document and investigate the implementation processes of the Park Street SMART Board initiative and its associated outcomes. The findings of this effort provided adequate evidence to support the consistency of executed activities with the proposed project framework. Although this project did not employ a comparison group, the outcomes of this initiative did suggest the realization of positive changes in instructional practice, student engagement and staff collaboration associated with the project's implementation. Such outcomes were attributed to data gathered from both teacher and leadership perspectives, as well as those noted from classroom observations. Overall, it is hoped that this final report will serve as a useful resource for other educational jurisdictions that plan to undertake similar initiatives.