Health & Education
Research Group

Groupe de Recherche
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New Brunswick Department of Education
Teacher Notebook Initiative
Evaluation Report

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Executive Summary

This research endeavour was undertaken by the University of New Brunswick's Health and Education Research Group on behalf of the New Brunswick Department of Education, and was completed between February and July 2007. The objective of the evaluation was to provide relevant feedback regarding the implementation of the Teacher Notebook Initiative, as well as potential impacts on educational service delivery practices.

The evaluation process involved both process and outcome evaluation components, and was comprised of three specific research phases: project design and instrument development, data gathering, and analysis and report preparation.

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1.0 Introduction

1.1   Teacher Notebook Project Evaluation Initiative

The New Brunswick Department of Education has been proactive in encouraging the use of technology in education through the provision of notebook computers to each teacher in the province. The Teacher Notebook Initiative was fully implemented in the fall of 2006. The objective of this program was to apply technology as a model for enhancing a range of key educational and professional activities within the New Brunswick Educational system, including inter-professional collaboration, teacher professional development and advancement, curriculum planning and delivery, and instructional and inclusive approaches.

In February 2007, The New Brunswick Department of Education, in collaboration with the Health and Education Research Group of the Faculty of Education at UNB, undertook a post-initiative evaluation of the Teacher Notebook Initiative. The objective of this evaluation was to provide relevant feedback regarding the initial implementation of the project, and potential impacts on educational service delivery practices. It was anticipated that this evaluation effort would also provide lessons learned that could assist with ongoing and future technology initiatives across the province.

1.2   Evaluation Focus and Data Gathering Activities
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The evaluation initiative involved both process and outcome evaluation components. With respect to the process aspects of the evaluation, areas of investigation focused on the processes associated with the initial implementation of the initiative. These included the consistency between project objectives and reported activities, the preparedness of educators to participate in project activities, the level of satisfaction of school-based and district-level personnel, identified challenges, as well as corresponding responses undertaken during the preliminary implementation. In terms of the outcome aspects of the evaluation, a range of potential impacts was investigated, encompassing areas of change related to curriculum planning, classroom practices, technology competencies, and professional growth.

Data collection activities were undertaken between February 2007 and June 2007. These efforts included completion of a literature scan, delivery of 88 focus group sessions and the administration of an online survey to 2840 educators. During June and July, data entry and analysis tasks were undertaken for both qualitative and quantitative data gathered, with completion of the final report on August 24, 2007.

1.3   Organization of the Report

This report provides a summary of the methods and outcomes resulting from this evaluation initiative. The second section provides a succinct review of literature themes related to the use of technology in the educational context. The third section provides a synopsis of the feedback

received from educators who completed the online survey on the Department of Education's portal. The fourth section documents the results of the focus group sessions pertaining to the major perspectives of educators on the implementation and outcomes of the Teacher Notebook Initiative. The final section outlines convergent evaluation themes and results arising from this initiative, as well as specific implications that may be relevant to the design and implementation of future technology initiatives within the New Brunswick education system, and beyond.

2.0 The Literature

2.1 Introduction

This phase involved the completion of a scan of current research literature relevant to application of technology in the educational context. This effort resulted in the formulation of a concise summary highlighting recent research related to effective use of technology, areas of identified impact and challenge, and implications for future investigation.

2.2 Methodology

The research activities for this phase included a scan of relevant published and unpublished documents, including professionally-reviewed articles, summary and literature review reports, as well as key expert/theoretical literature relating to promising practices. The scope of this search was limited to pertinent documents published or written between 2000 and 2006. Searches for this review were completed using several social science and educational databases. Although this review is not exhaustive, it does provide an introduction to some of the major themes related to the use of technology in education emerging in current literature. The key findings of this scan are organized according to six major headings: *Structuring the Use of Technology in the Educational Context; Technology Preparedness of Educators; Technology and Academic Performance; Technology and Special Education; Technology and Instructional Practice; and Research Challenges and Implications for Future Investigation.*

2.3 Results

2.3.1 Structuring the Use of Technology in the Educational Context

EFFECTIVE USE OF TECHNOLOGY

Students today have grown up with technology as an integral part of their daily lives (Crawford 2006, Wighting et al., 2006). They bring to class expertise in the use of iPods, cell phones, blogs, podcasts, video games, computers and many more technologies. The challenge for educators is to effectively structure the use of technology in education and instructional practice to ensure a positive impact on student learning. As asserted by Knezek et al., (2006) learning with technology "should not be about technology itself but about the learning that can be facilitated through it". According to these writers, technology enhances instructional methods and student learning when it:

- Directly supports the curriculum objectives being assessed
- Provides opportunity for student-peer collaboration
- Adjusts for student ability and prior experience, and provides feedback to the student and teacher about student performance or progress
- Is integrated into the instructional day

- Provides opportunities for students to design and implement projects that extend the curriculum content
- Is used in learning environments in which teachers, the school community, and school and district administrators support the use of technology (Knezek et al., 2006).

LINKING TECHNOLOGY WITH EXISTING INSTRUCTIONAL CAPACITY

The use of technology should also consider ways in which new innovations may be linked with or build upon on existing instructional capacity. For example, Wall, Higgins and Smith (2005) provide support for the linking of interactive white boards within current classroom instructional approaches to enhance curriculum presentation and student engagement. They point out that interactive white boards can be effective resources for initiating and facilitating the learning process, especially when "pupil participation is utilized" (2005). They also assert that, "the way in which information is presented, through colour and movement in particular, is seen by the pupils to be motivating and reinforces concentration and attention" (Wall, Higgins & Smith, 2005).

Another important consideration in structuring the use of technology is the provision of equitable access to students and educators through distance or on-line educational opportunities. Livingston and Condie (2006) conclude from their research efforts that on-line learning programs can act as powerful catalysts for transforming classroom practice. On-line technology allows for courses that districts could not have offered locally because of insufficient enrolment or other constraints, and the numbers taking such courses are growing substantially (Sener, Imbriale, Glower & Jones, 2006).

CHALLENGES IN THE APPLICATION OF TECHNOLOGY

Structuring the use of technology in education also requires recognizing the potential challenges that may be experienced by educators and students. Potential obstacles to effective application of technology in education include lack of classroom access to computers, as well as scheduling problems, or inconveniences related to moving students when computer labs are the sole source of technology (Adelman et al., 2002). Other challenges include lost time related to outdated and inadequate technology capacity in schools. In some instances, when problems are encountered as a result of these issues, valuable instructional time is lost and planned instructional processes are impeded (Leonard, 2004).

STRATEGIC PLANNING

In addressing potential challenges, formulating strategic plans for implementation of technology initiatives has been recognized as a critical consideration. According to Gahala (2001), the initiation of such efforts requires a shared vision among personnel at all levels (e.g., educators, administrators). Creation of a shared vision involves the execution of collaborative efforts that contribute to assessing the technological needs of the given educational context, determining the purpose and scope of specific technological application, and ensuring that critical resources and appropriate evaluations are included as part of strategy plans (Honey, 2005; Wurster, 2006).

Closely linked with strategic planning is the provision of leadership at the local school and district levels. Anderson and Dexter (2005) completed an analysis of over 800 schools examining leadership characteristics and their impact on the effective use of technology in the educational context. The outcomes of this investigation suggest that leadership may be an even more important factor for ensuring effective use of technology than is technological infrastructure. In this regard, they asserted that to be effective in supporting effective application of technology, school administrators must be active with technology - assessing the school's needs related to technology, setting goals for its application, establishing policies and guidelines for its use, and personally demonstrating efficient use of technology.

2.3.2 Technology Preparedness of Educators

Michels and Johnson (2004) assert that teacher preparedness is critical for increasing teacher capacity to embrace new technologies and potentially use such applications to impact learning. As Fitzpatrick and Faux (2002) underscore:

> *The absence/existence of a robust professional development support strand for technology-implementing teachers may significantly influence the success of <teachers'> implementation efforts. This research calls for sustained professional development to facilitate a teacher's exploration of the alignment between the instructional affordances of the educational technology innovation, the teacher's current instructional strategies, and management controls on the teacher's classroom instruction.*

According to Gahala (2001), professional development targeted at incorporating technology within the educational context should ensure sufficient allotted time for educator training, use hands-on learning activities, provide practical example applications, and sustain learning opportunities through peer-mentorship relationships. Structured professional development has been regarded as a critical aspect of both small and large scale school-based technology initiatives. Such workshops should focus, not only on providing educators with basic knowledge about education uses, but also assist them in integrating technology in their instructional approaches (Peneul, 2006).

In a study of 350 teachers in K-12 schools, use of technology was related positively to exposure to technology in teacher education programs, knowledge of software programs, and evidence of constructivist beliefs. In addition, access to technical support was also linked with frequency of technology use (Hernandez-Ramos, 2005).

2.3.3 Technology and Academic Performance

Application has also been linked with academic performance and learning attitudes. Chou & Liu (2004) carried out a quasi-experimental study to compare the performance and attitudes of junior high school students' (n=211) outcomes in computer-based instructional classrooms with those in traditional classroom environments. Students in applied-technology educational settings

achieved higher overall term outcomes than did their counterparts in the regular classroom contexts. In addition, students in computer-based classrooms reported higher levels of overall computer self-efficacy, learning satisfaction, and positive perceptions associated with the learning context.

In another quasi-experimental study, 259 middle school students in laptop and non-laptop program schools were compared academically at baseline and one year following implementation of the program. At baseline, no significant academic performance differences were noted among control and intervention schools. After one year, students in the laptop program achieved higher academic outcomes than did their control counterparts in almost all achievement areas. Cross sectional analysis also rendered similar results for years two and three following the initiative (Gulek-Cengiz & Demirtas, 2005).

META-ANALYSIS INVESTIGATIONS

A meta-analysis of 26 studies focusing on technology and literacy completed between 1992 and 2002 found that the use of technology assisted in enhancing students' quality and quantity of writing compared to those in learning environments without computers. This research effort also concluded that students who used technology when learning to write were more engaged and motivated in the learning process (Goldberg, Russell & Cook, 2003). In another meta-analysis of 20 studies, Pearson, Ferdig, Blomeyer and Maron (2006) reported that a wide range of applied technologies in the classroom was linked to enhanced reading performance of middle school students. In explaining their results, they indicated that effect sizes were larger for interventions targeted at the general student population than for those student cohorts with specific learning needs.

INTERNATIONAL INVESTIGATIONS

In 2004 Fuch and Woessmann published a statistical analysis of the relationship between technology and student achievement, employing 2000 data from the Programme for International Student Assessment (PISA). They analyzed data for reading, math and science from 31 countries. Their preliminary analyses revealed significant positive relationships between computer access and academic achievement; however, when family and school characteristics were controlled, mixed results were obtained with academic performance, being both negatively and positively related to varying conditions of computer access and use in the home and school.

In discussing the outcomes of the PISA investigation, Bielefeldt (2005) asserted that "mixed findings for overall effects of technology are the norm"; however, there is also considerable evidence that technology can have a positive influence on student achievement. He noted that studies that demonstrated positive effects for technology often involved well-defined interventions that detailed the specific conditions associated with their implementation.

2.3.4 Technology and Special Education

Use of technology in the classroom has also been identified as potentially beneficial for students with exceptionalities. In particular, Cengiz and Demirtas (2005) emphasized that computers facilitate access to and use of learning materials that are specifically designed to meet the

individualized needs of learners. A study by Edmonds and Li (2005) investigated the approaches employed by teachers in working with students identified as at-risk for not being successful in the school context. These students included student participants with both learning disabilities and emotional behavioural conditions. Specific practices included providing students with: choice of working in technology-based environments; diverse ways for communicating, learning and completing work; varied means for structuring work and learning plans (emails, webpage, postings, calendars); and safe individualized and peer-learning activities in which learners were accepted and supported. Practitioners have also cautioned that students with special educational needs may require specific support to ensure their effective use of technology. For example, students with low literacy levels may experience difficulty with independent on-line learning or distance education formats without targeted support or guidance (Chen and Hirumi, 2004).

With respect to reported impacts on learning, Harris and Smith (2004) reported that educators' rating of special education students' adaptive behaviour increased when laptops were introduced and used in the classroom. Areas of rated improvement included increases in appropriate behaviour, learning, independent work and retention of content and interest/engagement in learning.

2.3.5 Technology and Instructional Practice

In addition to academic performance, specific research efforts have also been directed at identifying changes in instructional practice related to the introduction of technology in the school or classroom settings. Owen, Farsaii, Knezek and Christensen (2005) evaluated a four-year student laptop project for secondary students across an urban school district. In this investigation, 66% of students were identified as economically disadvantaged. The outcomes of this study suggested that the implementation of the laptop project had contributed to changes in instructional approaches among teachers. For instance, before the laptop initiative, educators indicated that students worked in groups 48% of the time, whereas following the project, 58% of class time was devoted to such activities. After the initiative, the most frequently reported daily instructional strategy was guiding-facilitating learning (38%), exceeding whole class instruction (28%). The authors of this study concluded that the incorporation of technology had played a role in increasing teacher use of small group participation and collaboration as an effective instructional approach.

In another study, 250 teachers were asked to describe their use of electronic tools, networks and resources as part of an information technology audit of elementary and secondary schools. The results of this investigation indicated that use of technology was an accepted aspect of classroom instructional practices among teachers; however, educators in the sample generally viewed technology as a means for supporting existing educational practices, rather than as a means to support change or encourage innovation. The authors of the study speculated that the adoption of new technologies does not always contribute to changes in instructional practices because participants are not fully aware of the reasons or rationale for new technology nor are they convinced of its actual benefits (Carmichael & Procter, 2006).

2.3.6 Research Challenges and Implications for Future Investigation

Schrum (2005) highlighted some of the challenges associated with carrying out research on the academic effectiveness of educational technology. These include the ethics of withholding potentially effective educational strategies from students who serve as control group participants. In addition, the dynamics of the classroom setting may impede the logistics necessary to ensure experimental control and to take into account influences of technology beyond the classroom context. Other criticisms of current research have included the abundance of educational research sponsored by technology companies or developers, as well as the lack of independent investigations of technology within the educational context.

In spite of these challenges, the need for further research to investigate better practices associated with application of technology in the educational setting is warranted. The challenge for investigators is to recognize the varying conditions that may influence the effective application of technology, including individual differences among student populations being studied, the types of programs being implemented or the nature of the instructional context (Palozzi & Spradin, 2006). To date, current evaluation and research efforts have focused primarily on the general application of technology practices in the classroom, school or wider educational context. In the future, research efforts should be expanded to address areas of inquiry related to the effective use of targeted technology and assistive technological applications with students with varying or specialized learning needs.

3.0 On-line Educator Survey

3.1 Introduction

The purpose of this data collection effort was to investigate individual educator perspectives regarding the implementation of the teacher notebook initiative, as well as areas of identified change or impact. Areas of inquiry focused on obtaining feedback related to technology readiness, professional development and support, educational practices and differentiation, and satisfaction with the initiative.

3.2 Methodology

The initial task of this phase involved the creation of an on-line survey to be posted on the New Brunswick Education Portal. This portal is accessible to over 5000 teachers serving in the Anglophone Districts across the province. Survey items included a series of rating scale questions, followed by several open-ended ones. Rating scale questions employed a 5-point scale where "1" denoted strongly disagree, "3" indicated neutral and "5" referred to strongly agree. Open-ended questions provided participants with the opportunity to highlight example technology applications they had implemented as a result of the Teacher Notebook Project and to suggest potential actions that should be considered in conjunction with the initiative. Specific themes investigated included:

- School Demographics
- Implementation Considerations: Goals, Preparedness, Consistency, Consultation
- Knowledge of Technology Use and Ease of Application
- Impact on Classroom and Inclusive Practices
- Impact on Administrative and Communication Functions
- Professional Development and Research Activities
- Suggestions for Continued Development

The survey was posted on the New Brunswick Education Portal in March 2007. In conjunction with the survey, a letter of description outlining the purpose of the project was also included. Of a potential population of 5535 teachers in the Anglophone sector, 2840 teachers posted completed surveys, for a response rate of 51.3%. With respect to quantitative data analysis, descriptive statistics were applied to provide group means and percentage outcomes for each of the survey questions. Percentages and means presented in the body of the report are rounded off to the nearest whole number.

In addition, analysis of variance and post-hoc tests were employed to investigate potential mean rating differences among participants based on educational school level (elementary, middle and high). An alpha level of $p<.01$ was applied to determine potential significant mean differences. In terms of qualitative data, individual survey responses were merged into a unified data base. This data set was analyzed to identify key themes related to the focus of the evaluation. Themes were subsequently sorted and organized into meaningful categories. The

findings for this aspect of the endeavour are organized according to the major areas of investigation.

3.3   Results

3.3.1 School Demographics

Of the 2,840 educators who completed the on-line survey, 45% of participants identified themselves as professionals at the elementary level, whereas 23% and 31% indicated that they worked respectively at the middle and high school levels (Figure 1). In terms of district involvement, all Anglophone districts were represented with the percentage of participation varying from 6% to 20%. In terms of school size, approximately 17% of participants were from school sites that included fewer than 200 students, 45% of participants reported working in schools with between 200 and 500 students, with the remaining 38% identifying with school populations that exceeded 500 (Figure 2). Fifteen percent of the total sample indicated they had also participated in the Student Notebook Initiative.
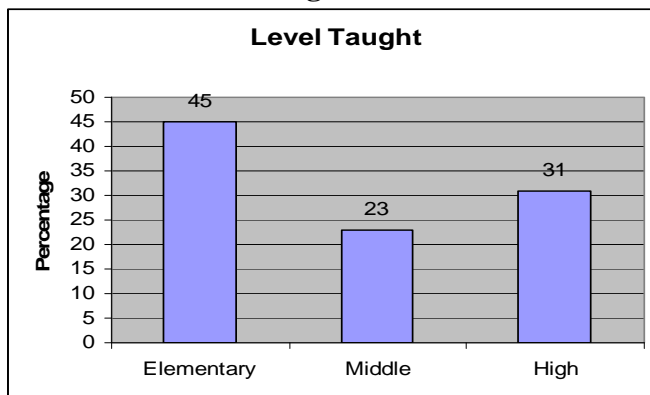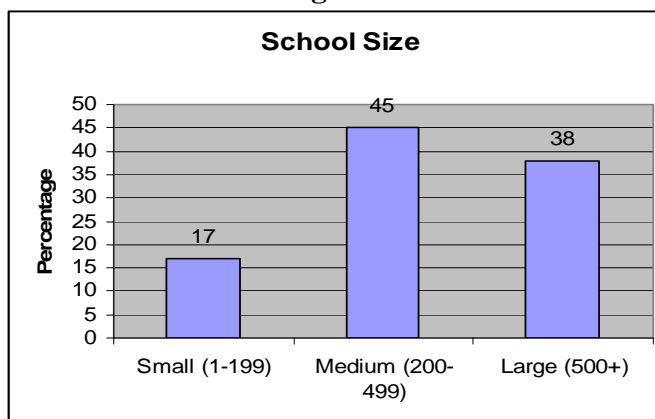
Figure 1

Figure 2

3.3.2 Implementation Considerations: Goals, Preparedness, Consistency, Consultation

Fifty percent of participants agreed that they had a clear understanding of the goals of the Teacher Notebook Project. For this question, mean ratings of agreement for elementary

(M=3.7) and middle school participants (M=3.7) were significantly higher than those for educators at the high school level (M=3.5) (Table 1). Fifty-four percent affirmed that they had received sufficient training to prepare them for initial use of their laptop. In addition, 63% indicated that they had had sufficient technical support to address problems that they encountered in using their notebooks. With respect to perceptions of preparedness, there was no indication of any significant differences related to school level; however, elementary level participants reported a significantly higher level of mean agreement than did high school personnel regarding the adequacy of technical support to address difficulties using their laptop (Table 2).

Participants were also asked to indicate whether there was consistency between the objectives of the Teacher Notebook Project and the actual activities of the initiative. Seventy-eight percent of the sample agreed that there was congruence between the intent of the initiative and the implemented aspects of the project. With respect to consultation between the Department of Education and schools regarding this initiative, 48% of the sample indicated that they were satisfied with this process.

Table 1- Mean Ratings: Understanding Initiative Goals

School Level	Mean	Std. Deviation
Elementary	3.7	1.0
Middle	3.7	1.1
High	3.5	1.1

Table 2 - Mean Ratings: Adequacy of Technology Support

School Level	Mean	Std. Deviation
Elementary	4.0	1.1
Middle	4.3	1.0
High	3.9	1.2

3.3.3 Knowledge of Technology Use and Ease of Application

Eighty percent of the sample agreed that having access to a laptop had increased their understanding of the use of technology as a tool in the educational setting. In addition, 74% affirmed that they were more comfortable with the use of technology in the classroom since the implementation of the initiative. Highest means ratings for increases in knowledge of technology and ease of its application were associated with the middle school level participants. Middle School outcomes were significantly higher than were the mean outcomes for high school participants for the same two areas of inquiry (Tables 3 and 4).

Table 3 - Mean Ratings: Increases in Knowledge of Technology Use

School Level	Mean	Std. Deviation
Elementary	4.3	0.9
Middle	4.3	1.0
High	4.0	1.2

Table 4 - Mean Ratings: Ease of Application

School Level	Mean	Std. Deviation
Elementary	4.0	1.1
Middle	4.2	1.0
High	3.9	1.2

With respect to the introduction new technologies, 64% of participants affirmed that in-service training should be mandatory for all educators. Although participants indicated that the initiative had contributed to their knowledge of technology and to their comfort in using it, 83% also affirmed that they would benefit from additional in-service training.

3.3.4 Impact on Classroom and Inclusive Practices

Sixty-seven percent of participants affirmed that their teaching practices had changed since receiving a laptop. Mean rating outcomes were significantly higher for middle school participants than for elementary and high school participants (Table 5). Eight-five percent of the sample also indicated that their notebook computer was used a means for improving the quality of their curriculum presentation or delivery to students. All means for this area of inquiry exceeded a rating of 4 (Table 6).

Table 5 - Mean Ratings: Changed Practices

School Level	Mean	Std. Deviation
Elementary	3.7	1.2
Middle	4.0	1.1
High	3.8	1.2

Table 6 - Mean Ratings: Curriculum Presentation

School Level	Mean	Std. Deviation
Elementary	4.3	1.0
Middle	4.5	0.9
High	4.4	1.0

Sixty-six percent of participants affirmed that technology was a key aspect of their planning and execution of effective inclusive practices. With respect to the initiative, 54% reported that the having access to a laptop had been beneficial in the development of SEPs. Fifty-three percent also agreed that their notebook had assisted with the implementation of effective methods for differentiating learning activities within the classroom context. With respect to SEP development and differentiation of instruction, significantly higher mean ratings were noted for middle school participants than for elementary or high school participants (Tables 7 and 8).

Table 7 - Mean Ratings: SEP Development

School Level	Mean	Std. Deviation
Elementary	3.6	1.2
Middle	3.8	1.1
High	3.6	1.3

Table 8 - Mean Ratings: SEP Differentiation

School Level	Mean	Std. Deviation
Elementary	3.6	1.1
Middle	3.7	1.1
High	3.4	1.2

Participants were also asked if they had learned more about technology applications for students with exceptionalities as a result of the notebook initiative. Only 28% agreed that they had acquired new knowledge or skills related to assistive technology (Figure 3). For this area of inquiry, all mean outcomes across all grade levels were below a rating of 3.

Figure 3.3

13
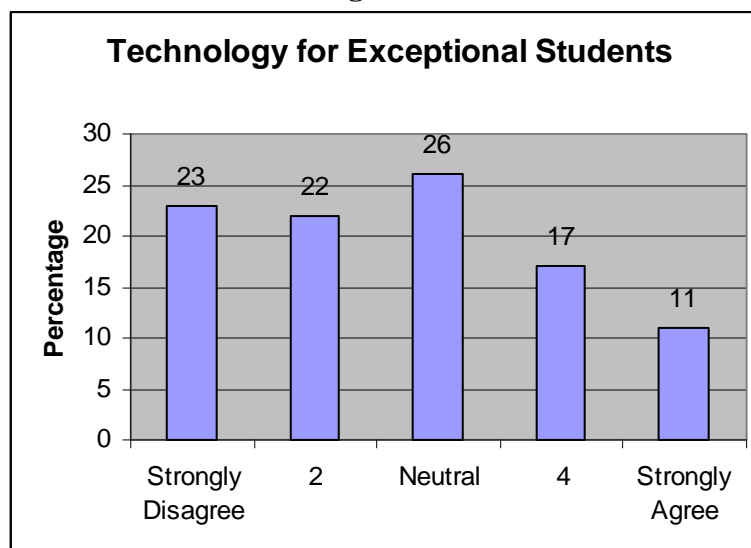
Participants were also invited to identify specific examples of educational applications they had either piloted or regularly used in their classroom as a result of the implementation of the Teacher Notebook Project. The most frequently-cited activities included: posting marks; lesson of the day; homework or announcements on-line for parents and students; communicating with and providing support to parents through e-mail; using the laptop as a means for students to demonstrate their work to their peers or parents; completing research on-line for lesson preparation or accessing on-line teaching resources; designing visual lesson presentations and hands-on demonstrations; and linking the use of the laptop with other technologies; such as scanners, digital cameras, and smart boards. In sharing specific applications of technology, participants highlighted a range of benefits associated with the use of their laptop as part of their activities, including increased organization in lesson planning and student progress recording, enhanced student engagement, greater teacher-parent communication, and more frequent collaboration among educators both within and beyond the immediate school context.

3.3.5 Impact on Administrative and Communication Functions

Eight-six percent of participants agreed that the introduction of the Teacher Notebook Initiative had contributed positively to their ability to communicate with teachers and administrators. In addition, 82% affirmed that having a laptop had resulted in increased efficiency in carrying out administrative functions associated with their current positions (Figure 4). With respect to communication and administrative efficiencies, there were no identified mean differences related to school level.

Figure 3.4
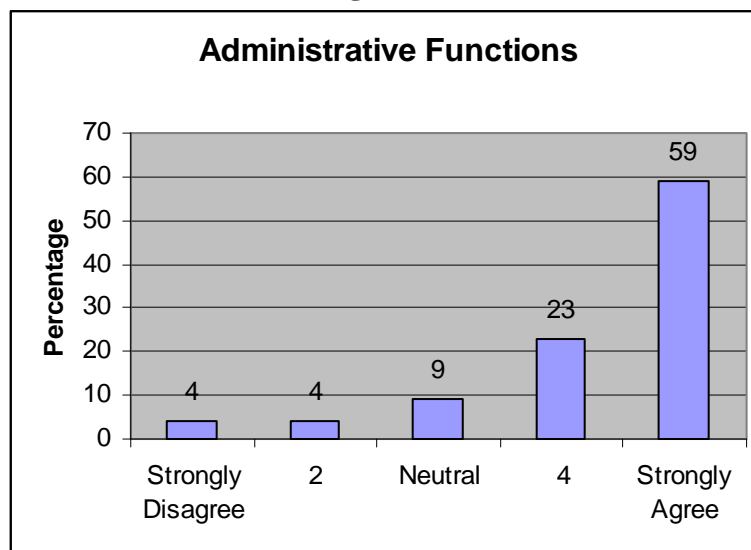
With respect to established policies for downloading content or programs to their laptop, 57% of participants agreed that they were efficient and suitable to their needs. For this question, significantly higher mean outcomes were indicated for participants at the elementary level than for those at the middle and high school levels.

Table 9 - Mean Ratings: Efficient and Suitable Policies

School Level	Mean	Std. Deviation
Elementary	3.7	1.2
Middle	3.5	1.1
High	3.3	1.4

3.3.6 Professional Development and Research Activities

With respect to professional development, 66% of participants agreed that having access to their own laptop had facilitated the possibility of participating in a wide range of professional development activities. For this area of inquiry, significantly higher mean outcomes were associated with the elementary and middle school levels than for the high school level. Eighty-nine percent also reported that they use their laptop as a tool for educational research. For this question, mean outcomes across all grade levels exceeded a mean of 4.

Table 10 - Mean Ratings: Facilitating Professional Development Opportunities

School Level	Mean	Std. Deviation
Elementary	3.9	1.1
Middle	4.0	1.1
High	3.7	1.2

Figure 3.5
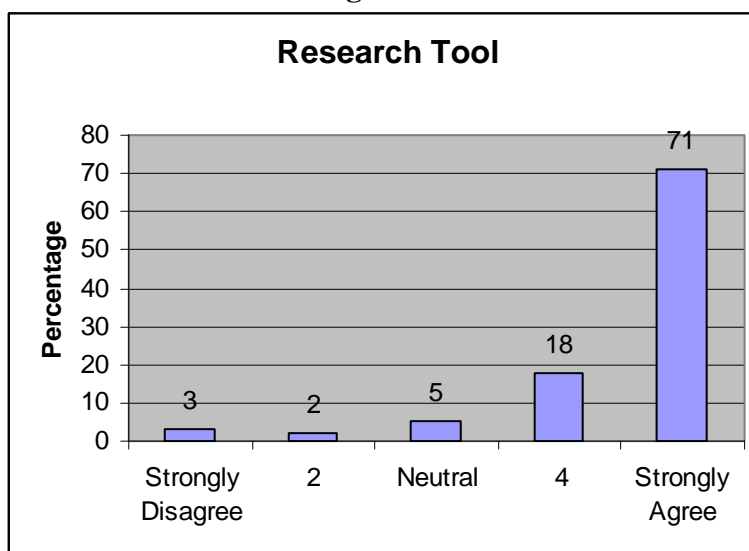
3.3.7 Suggestions for Continued Development

Participants were also invited to identify areas for continued development related to the Teacher Notebook Project. The majority of responses received underscored the importance of continued professional development on applied technology for teachers. Frequently-cited suggestions included: designing on-line courses or individualized tutorials, delivering specialized sessions for using technology with specific curricular areas, providing instructional workshops on linking teacher laptops to other technology (e.g., SMART Boards), and elaborating methods for applying technology to approaches for working with students who have exceptionalities. Other suggestions focused on the importance of sharing lessons learned regarding the application of technology across schools and districts, as well as consulting with teachers on a regular basis regarding professional needs related to technology.

4.0 Focus Group Sessions

4.1   Introduction

The purpose of this aspect of the initiative was to elicit the perspectives of a range of departmental, district and school level personnel who participated in the Teacher Notebook Initiative. Focus group sessions were held across all Anglophone Districts in New Brunswick. For these data collection activities, areas of inquiry focused on obtaining feedback regarding the preliminary implementation processes, as well as areas of impact or change noted as a result of the project.

4.2   Methodology

Data collection locations were selected to ensure participation from all school districts, as well as the widest possible regional representation. Specific attention was given to including both urban and rural areas of the province. Overall, 88 focus group sessions were held with an average participation of eight individuals. Participants included teachers, administrators, technology mentors, district consultants, and representatives from the Department of Education.

A team of five researchers organized and executed the various focus groups sessions from March 2007 to May 2007. A semi-structured discussion format was used to facilitate each focus group. Digital recordings, descriptive notes and session summaries provided the basis from which to create a written outcome summary of each focus group exercise. Individual sessions varied from 45 to 90 minutes in length. Upon completion of the focus group exercises, individual written summaries were merged to provide a unified data set. This data set was analyzed to identify theme statements related to the focus of the evaluation. Themes were subsequently sorted and organized into meaningful categories.

The following sections provide an overview of the key findings associated with this research effort. The data represented below are comprised of aggregate information provided by focus group participants. Where comments are attributable to an individual or to one focus group only, they are indicated as such. All other comments represent opinions, statements or recommendations that were raised by a minimum of 10 of the 88 focus groups.

4.3   Results

4.3.1 Readiness for Technology Integration

Teachers, technology mentors, and departmental staff were asked to comment on their perceived readiness for the integration of laptops into general teaching methods. A broad gap existed among teachers in terms of readiness. The speed of the implementation initially left this gap unaddressed, and provided a challenge for schools and districts in creating in-service training to meet the needs of all teachers.

Teachers who were initially uncomfortable with technology, however, reported increased comfort in using technology as a result of the laptop initiative. Participants from many schools reported that a natural "mentorship" had evolved between teachers with technology experience and expertise, and those without. These partnerships have led to a greater sense of teacher collaboration and empowerment.

> "There is still a considerable gap between teachers that have grown up with computers in their lives and teachers that received the notebooks without a lot of previous technical experience. I could use a scheduled monthly tune-up."

Teachers' perceptions of the purpose of the initiative varied and indicated potential gaps in communication with staff. Reported perceptions of purpose include "money left over in the provincial budget", recognition of teachers as professionals in need of work-related resources and tools, recognition that teachers work from home, and a departmental push to encourage the use of technology in the classroom.

Participants expressed that teachers often believe that universities are not offering an adequate range of courses related to technology in the classroom. They indicated that although schools might hold assumptions that newly-trained teachers are prepared to use educational technology, student teachers are not typically arriving in schools with adequate technical expertise.

4.3.2 Initial Implementation

Teachers and technical support workers were generally pleased with the timing of the summer roll-out, which allowed for both technical set-up and practice before classes resumed in the fall. A number of participants indicated that they would like more time to prepare for such a major change, especially those who described themselves as intimidated by technology. Teachers believed that they might have benefited from the provision of clear guidelines and suggestions on how they were expected to use the technology for direct instruction in the classroom.

School administrators indicated their intention to prioritize time to prepare staff for the implementation of major initiatives. Administrators also suggested that, where possible, the Department should consider a stage-based implementation strategy.

4.3.3 Technical Support

4.3.3.1 EDUCATION PORTAL

Teachers suggested the development of a section on the New Brunswick Education Portal where they could post IT problems and challenges, which would be monitored and addressed by departmental technology personnel. Technical support staff members indicated that teachers might not be taking full advantage of the Portal, and would benefit from orientation on its capacity, potential and purpose.

4.3.3.2 INFRASTRUCTURE

Several school-based focus groups reported a need for more electrical outlets in classrooms so that laptops can be more conveniently placed. In this regard, docking stations that were already wired to other technologies (e.g. In-Focus and SMART Boards) would save set-up time during class. Currently, teachers indicated they must plan for up to ten minutes to connect the laptops to in-class technologies.

4.3.3.3 TECHNOLOGY MENTORS

Participants described the Technology Mentor program as very well received. Teachers were enthusiastically supportive and appreciative of the services provided by mentors. Many teachers indicated that the initiative would not have had nearly the level of success without the support provided by the mentors, and expressed their belief that this component would be an essential piece of the overall, ongoing initiative.

> "Without the Tech Mentors, the notebook initiative would never have been successful."

4.3.3.4 TECHNOLOGY VS. PEDAGOGY

Some teachers expressed concern over a perceived disconnect between departmental technical directives and issues of pedagogy, including patterns of interaction characterized by conflict rather than by support. There was consensus among participants that the Department had a role to play in designing initiatives involving technology, and in assisting districts with their implementation. Such "top down" input would help ensure consistency in policy among districts and schools.

4.3.4 In-Service Training

4.3.4.1 CUSTOMIZED TRAINING OPPORTUNITIES

There was some concern that in-service training pertaining to technology did not effectively address the gap between teachers with a high comfort level and those who were beginners. A need for small group, step-by-step instruction designed for the new user was reported. Initial in-service training focussed on two areas (as reported by a participant group of technical mentors): administrative and pedagogical. Those with prior knowledge of email and computer maintenance were prepared to consider pedagogical issues in these sessions. Others needed assistance to understand the functions of the computer, and how communication would take place via email.

> "In-service should take the 'Nintendo approach' – get it up, get it started, have some fun! Make this an actual strategy. If you make training mandatory, you set up a resistance paradigm."

Participants reported that some districts had been proactive in pairing teachers who had more technology expertise with beginners, during and following in-service sessions. This provided an additional level of technical support, encouraged teacher collaboration, and increased comfort levels among teachers who were less confident in using technology. A

majority of participants reported increased effectiveness in general in-service training due to the laptops portability. The use of laptops facilitated note-taking on technology-based approaches and web-site content, as well as the actual application of strategies during in-service sessions.

4.3.4.2 DISTRICT PRACTICES

One district's technology mentors reported that teachers were allotted fifteen minutes per week, in addition to regularly-scheduled preparatory time, to visit other classrooms and observe how teachers were using technology. This has led to an exchange of ideas and opportunities for partnership in lesson planning. They also emphasized that in-service training should build skills in using computers for file management.

Participants indicated that in-service sessions were offered at varying times across districts. Teachers suggested that in order to be most effective, time must be provided during the teaching day for training. The location of in-service training was also important to teachers, with many suggesting that these sessions should take place in individual schools, and not at central district locations.

4.3.5 Professional Development

4.3.5.1 CONTINUING EDUCATION

Teachers reported increased access to continuing education through distance learning and WebCT at various universities. Many teachers expressed interest in seeing the summer institute program redesigned so that courses taken could be credited toward a Masters' Degree. There was consensus that the Department should work more closely with local universities in order to design and offer creditable courses in educational technology that are available to teachers over the summer months.

> "Even initially resistant teachers are now taking small steps. Once you see what others can accomplish with technology, everyone wants in on professional development."

4.3.5.2 RESOURCE GATHERING AND SHARING

By using the laptops, teachers were able to access professional development websites within specific curriculum areas and fields of study. In many cases, when a teacher attended a professional development event, the information was shared with all teachers in the school via email. Further, teachers were able to immediately access resources shared at professional development sessions, increasing the likelihood that such resources would be used in the classroom.

Teachers reported that they were spending more time developing their portfolios, since the implementation of the laptop initiative. For many the process was no longer paper-based, but digital. Several school-based focus groups reported increased incidences of teachers conducting their own research and resource identification. In this regard, participants reported that before having access to their own laptops, they had been unaware of the power of conducting personal research.

4.3.6 Administrative Rights

There were differences in the assignment of administrative rights across districts. Some districts provided few downloading privileges or none at all; however, others opened the process to all teachers within the boundaries of the official departmental downloading policy. Information Systems staff expressed concern with respect to security, and indicated that at the departmental level the restriction of administrative privileges is an essential component of a responsible technology program. In this regard, all teachers might be adversely affected by a more open policy that risked the introduction of viruses to the system.

In contrast, teacher participants indicated that with rare exceptions, administrative rights should be granted to teachers, with some controls in place. All focus groups reported an understanding of the rationale of the Department's downloading policy, and were in general agreement with its principles; however, teachers expressed concern over the inability for those without administrative privileges to connect home printers to their laptops, install or download educational software, use digital camera technology, update programs already installed on the computers, or even change the time on computer clocks. In this regard, focus groups representing districts that did not grant administrative privileges expressed concern that they were not trusted or respected as professionals.

"When teachers are blocked from entering educational websites, or cannot download necessary programs, the wait time for having a technician do this – even just a few days – robs them of teachable moments."

"We're already told what we can and cannot download. The risk is well-understood by all teachers."

Certain districts that initially blocked administrative rights subsequently allowed them following teacher feedback. All districts reported low incidence of abuse or technical problems stemming from teacher downloading. Some districts reported that no problems had occurred. One district that did not provide administrative privileges to teachers reported that a virus was transmitted to the network via a memory key, technology that is accessible to all teachers. Two focus groups reported issues with teachers downloading music to laptops. This was tracked and addressed with the individual teachers. In general, teachers and administrators reported that while some problems may be inevitable, very few were caused by a direct violation of the departmental downloading policy.

4.3.7 Communication

Teachers from all districts reported posting marks, assignments, and homework on-line so that both students and parents could view them. Many teachers expressed a preference for communicating with parents via email, avoiding unnecessary long phone calls to deal with smaller issues, while parents were still contacted directly on urgent or sensitive matters. Some teachers reported a reluctance to share email addresses with parents, fearing the potential for intrusive levels of communication. Of the majority who did communicate with parents via email, none reported challenges that could not be overcome.

Teachers reported the ability to respond more quickly and more often to email messages from parents than to telephone calls, given the need to schedule time and quiet space for such calls. Communication with parents via email had led to increased frequency and timeliness of contact related to student progress.

4.3.7.2 COMMUNICATION WITH STAFF

Most participants reported increased communication between administration and staff. Many principals used email exclusively for memoranda and notices. Discipline problems were communicated to administration offices immediately via email.

4.3.7.3 COMMUNICATION WITH STUDENTS

Many teachers used assessment programs on their laptops to show students the marks they had earned, and which ones they might have been missing. Computer programs allowed students to see how assignments affected their marks, and the weight the assignments had on their overall grade. Teachers could also give students an up-to-date grade based on assignments completed.

4.3.8 Student Engagement

4.3.8.1 INTERACTIVE MEDIA

A number of participants reported using computer *blogs* (web logs) and *wikis* (internet authoring tools for publishing on-line) to enhance student engagement and communication, and for posting comments on assignments.   All who used this medium reported that students responded well and participated with enthusiasm.

> "An unexpected bonus has been that since students are much quicker at learning new technology, they feel empowered in the classroom when they can help the teacher. The two-way learning has been great for student engagement."

4.3.8.2 HEIGHTENED INTEREST

Many teachers reported that they were able to capture and maintain the interest of students more effectively by using computer technology in the classroom. The projection of material covered in the class allowed students to follow more closely, and teachers to cover lessons more quickly. Teachers were able to find topics of interest to students more easily, and to present them in ways

that engaged them. Many focus group participants indicated that the use of technology in the classroom was decreasing the incidence of off-task behaviours.

Focus group participants reported that lessons appeared more "real" to students when teachers could directly demonstrate processes via the internet, as opposed to simply describing them. Teachers indicated that without this technology being readily available, they would be effectively distancing themselves from the students' world, making it difficult to find ways to engage students in the educational process.

4.3.8.3 COMPETENCY

There was a variety of responses to the issue of teacher versus student competency around the use of technology. Some teachers reported feeling intimidated about using new technologies when students were clearly more adept. Others reported an unexpected new dynamic in the classroom,

> "Bringing technology into the classroom gives students the right to be better than the teacher. This is an adjustment for some teachers, but those who embrace it realize that this is the engagement we've been looking for."

whereby students recognized that they had something to contribute to the educational process. Many participants referred to students who had been previously unengaged, defiant or apathetic, now beginning to take a leading role in helping both the teacher and other students to master in-class technology. The sense of reciprocal learning – teachers learning from students, students learning from the teacher and from each other – has made education a more participatory process.

4.3.8.4 ADAPTING TO STUDENT CULTURE

A common theme among participant groups was the need to avoid competition with the realities of students' lives – their "screen time" with computers, video games, television, and movies; and that projecting images and having immediate access to information in the classroom was the teacher's best hope of holding students' attention and captivating their interest. Many teachers reported using their laptops to "link to students' knowledge and culture". As one teacher shared, "You cannot teach 120 high-tech Grade 8 students from a textbook and an overhead projector; they are so far beyond that in their daily lives that if you lose the ability to interact with them at their level, you're going to be in trouble."

4.3.9 Challenges

4.3.9.1 MODERATION

Some teachers expressed concern that the technology would be relied on too extensively. As one teacher asserted, "Technology is not an end in itself, and after a while, children need a change. There needs to be a balance between teaching with and

> "Laptops are just the stepping stone to other technologies that enhance education for all students."

without technology." One group's participating teachers cautioned against the excessive use of technology in the early grades. They contended that since younger children need more emphasis on social interaction and pro-social activities.

Many school-based focus groups reported that there were sometimes insufficient technologies with which to link laptops. Teachers from schools with limited numbers of in-focus projectors or other technologies indicated experiencing frustration with long wait times when booking the equipment. Some reported "giving up", and planning lessons that did not require technology. Many

> "The reality is, many of us work in communities that are economically depressed. We have to make sure we don't leave our students behind."

teachers identified the challenge of the time it took to set up equipment such as SMART Boards with the laptops each day. Participants asserted that leaving the laptop connected and stationary would defeat the purpose of having a portable computer. In contrast, they indicated that teachers would benefit from having a classroom computer that was always connected to the available technology. The lack of wireless capacity in all schools and districts also limited the use and portability of the laptops.

4.3.9.3 FRENCH IMMERSION

A small number of immersion teachers reported challenges with the French interface on the laptops. Emails that were typed in English were automatically translated into French for the receiver. Problems related to the French interface had also been experienced while submitting marks, networking, and logging into wireless systems. Technology mentors reported difficulties in working with the French interface, and noted that teachers sometimes had to work with the mentors to translate the language on the computer in order to have problems addressed.

4.3.9.4 ECONOMIC REALITIES

Participants pointed out that teachers must be sensitive to the needs of children who do not have computer access at home, avoiding homework assignments that require web research. For this reason, teachers expressed concern over a global move toward technology integration and email.

4.3.9.5 OTHER CHALLENGES

- In some districts, long-term supply teachers were not provided with laptops, placing limitations on their ability to ensure consistent, effective teaching.

- Some schools had older portable technology carts that did not connect to newer technologies, including the laptops and SMART Boards.

- Some participants reported limitations with the 500 MB of memory provided with the laptops.

- Teachers reported concern with the removal of classroom PCs, which limited students' ability to access technology in the classroom.

- Technical support personnel reported that schools were not yet fully wireless.

4.3.10 Special Needs

Classroom teachers, as well as methods and resource teachers reported that general classroom teachers had become more involved in the SEP process, and had experienced increased collaboration among stakeholders due to more accessible and efficient methods of designing, recording and updating SEP information. Participants tended to see this as a direct result of both the laptop initiative, and the Department's transition to electronic SEPs. One teacher stated, "When SEPs were filed on paper, they tended to stay on that paper and not be adapted or updated as often. Changes weren't always carefully documented."

Methods and resource teachers reported that laptops were effective for recording case conference notes. Prior to the provision of laptops, teachers would write case notes by hand, then type and distribute minutes; whereas they could now type during meetings and distribute notes to stakeholders immediately via email, enhancing timely communication and implementation of plans.

Some teachers reported that students with special needs, including visual and hearing impairments, learning disabilities, and attention deficits were benefiting from the visual and auditory nature of projected lessons and multi-sensory media. In schools with access to SMART Boards, the engagement of students with special needs was enhanced. One teacher indicated the effectiveness of using larger fonts on SMART Boards or projected documents for students who could not read cursive writing or small print. In cases where it was not possible to adjust an overhead to make letters clear enough for students to see, this feature of technology enhanced engagement for students with special needs and led to more active participation.

"For students who have a difficult time staying organized or remembering, the laptop and SMART Board provide visual cues to the previous lesson."

A small number of teachers reported using the laptop for increased and timely access to information on specific syndromes and disabilities, and to identify creative ways to engage students with special needs using technology; however, this research practice was more typical of methods and resource teachers. Some teachers reported the ease with which they could alter assignments or tests and tailor them to students on modified plans. In this regard, it was possible for teachers to create assignment sheets that "looked the same" to students, even though content had been modified or adapted.

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It was notable that the majority of focus group participants (with the exception of methods and resource teachers) were not using their laptops for research, information, or practice pertaining to special needs and/or assistive technology.

4.3.11 Connecting to Existing Technologies

Schools with SMART Board technology were much more apt to report the laptops' impact on direct instruction. Teachers with access to few (or no) SMART Boards or data projectors reported struggling with using the laptop for direct instruction. Many participants reported using the laptop with digital cameras to create lessons, record field trips, and customize learning experiences. Teachers widely reported that pod-casting and the use of digital cameras enhanced student interest.

> "What people don't understand is that I don't do anything with the SMART Board – I do everything with the computer. The SMART Board is just there to ride on. Everything that I do comes from here *<points to his laptop>*."

Participants indicated that access to various technologies allowed them to act as facilitators of learning in a more creative manner. Several focus group participants expressed concern over limited access to complementary technology that would facilitate their use for classroom instruction.

Many teachers reported that they did not utilize the resources of the NB Education Portal. Teachers in one focus group reported that the completion of the survey attached to this research represented their first experience in accessing the portal.

4.3.12 Teacher Collaboration

All focus groups included teachers who used email on a daily basis to confer with other teachers and administrators, share resources, and ask for assistance. Many reported the ability to take advantage of teachable moments due to this access to immediate collaboration.

4.3.12.1 LESSON PLANS AND RESOURCES

Most focus group participants reported an increase in sharing lesson plans. Some schools and/or districts were making use of the portal as a tool for sharing resources; however, others reported that the portal was seldom accessed, and collaboration

> "Staff members help each other with the technology – we've begun to feel like a true professional learning community."

was taking place on a case-by-case, teacher-to-teacher basis. There was consensus that the sharing of resources among districts had increased since the laptops were provided.

There were widespread reports of the emergence of natural mentorship relationship among teaching staff around issues of technology and teaching resources. One district identified a core group of lead teachers, established to serve as liaisons, or "go-to" people for their school sites. These teachers liaised with technology mentor staff to ensure that positive momentum continued in their schools. They presented initiatives and strategies to other teachers in their schools, as well as to others at the district level.

Technical support personnel identified District Learning Specialists as key stakeholders in the process of modelling technology. They indicated that if Learning Specialists in all curriculum areas embraced technology in their presentations to staff, teachers would move more quickly toward expertise.

4.3.13 Direct Instruction – Examples

Teachers in all focus groups provided examples of the impact of the laptops on direct instruction. The following points represent many of the innovative and creative ways that teachers have been integrating technology with teaching practices since the implementation of the laptop initiative:

"Delivery of curriculum has totally changed for me. The laptop is now securely embedded in daily instruction."

- Teachers used interactive websites to enhance teaching and learning.
- Video clips and pictures were used for discussions of national and international landmarks.
- Students benefited from the use of a virtual math library, which provided visual representations of math problems.
- Math mentors distributed quality websites to district math teachers.
- Teachers used laptops to translate French material for students.
- French immersion teachers accessed French websites to enhance and vary the information and perspectives available to students.
- Educational DVDs were presented to the class via the laptop and SMART Board or projector.
- One physical education teacher reported using the laptop and projector to show a video lecture and demonstration of badminton instructions. "Students were much more engaged than they would have been by a verbal lecture from me."
- Geography teachers used online GPS, Geo-caching, and Google Earth to enhance instruction.
- A math teacher reported that using math software for lessons had engaged previously disinterested students with attention challenges.
- Many teachers showed digital pictures of field trips on the next day of class,

"Showing students the flip and rotation of a triangle is easier with the computer than with paper and pen. Students can get up and manipulate figures, which really connects with them."

reinforcing lessons learned and student interest. Pictures could also be sent to parents, increasing family engagement.
- Many math teachers reported the effectiveness of using virtual manipulations. Students with fine motor challenges were better able to manipulate pieces, using broad motions on the SMART Board.
- A social studies class worked in groups and filmed skits about the Confederation Bridge. The teacher edited the skits together on the laptop and screened the complete video for the class.
- A music teacher used music software for students to compose music with the Note Worthy program, and also recorded another teacher playing an instrument.
- In a shop class, one teacher used his laptop to size patterns to cut on the wood, which he could do with precision with the computer.
- Teachers accessed online resources on a unit on racism. Students could see and hear the stories of others, which brought realism to the lessons.
- Technical support staff reported international collaborative projects with the Netherlands and Australia.

4.3.14 Other Benefits

Participants were asked about the perceived benefits of the laptop initiative and the move toward increased use of technology in the classroom. They indicated the following benefits had been observed:

- Paper conservation
- Enhanced access to information
- Effective and detailed planning
- Addressing diverse learning styles
- Portability
- Test organization and presentation
- Efficiently arranged and better-informed parent-teacher interviews
- Enhanced access to resources
- Timely access to current events
- Access to the portal
- Increased recognition by out-of-province staff
- Opportunities for creativity

4.3.15 Sustainability

"My father would remember the inkwell. I remember the ball point pen, and now there's a SMART Board. So within one lifespan there's quite a bit of change, and it's not going to stop there. It's moving even faster. So if a district or the Department wants to keep up with what's out there, they need to provide schools with resources to do so, because these kids are entering a technological world and they need to be prepared for it. The more that they have at their fingertips in school, the more able they will be to cope in our society."

Teachers expressed concern over the lack of a plan for sustaining the provision of laptop technology over the long-term. Each focus group's participants conveyed a desire to be informed of a plan for sustainability that is longer than the life of the laptops.

> "Technology must continue to be integrated into the way we teach and the way our students learn. We can't go back."

Regarding the previously-initiated student notebook pilot program, two focus groups shared that they would rather see available funds directed toward technologies that directly relate to teaching, such as maintaining teacher laptops or implementing SMART Board technology for the benefit of all students. The use of technology is perceived to have become an integral part of classroom teaching – its loss would affect the quality of education, and would increase the time that teachers would need to spend in school after hours to maintain the current quality of lesson planning. Several focus group participants suggested that all new teachers and long-term supply instructors must receive laptops in order for educational processes to be consistent.

> "Teachers have bought into the use of technology, but the reliability and ongoing availability of the laptops determines how confidently teachers make use of technology."

Nearly all focus groups commented on the evolution of the teaching profession, and the need for transition, with students, to the technological age. As one teacher expressed, "We've all gone through the process of change, and we've adapted to use this as a tool. Why go backwards?"

5.0 Summary of Findings

5.1 Process and Outcome Areas of Inquiry

The objective of this evaluation was to provide relevant feedback regarding the initial implementation of the Teacher Notebook Project, and its potential impact on educational service delivery practices. Several process and outcome evaluation questions were considered during the course of the program review. The following provides a summary of the findings of this investigation for each area of inquiry based on aggregate participant responses and perspectives arising from the on-line survey and focus group sessions.

1. *Was there consistency between initiative objectives, reported implementation activities, and documented outputs? (Process)*

   Seventy-eight percent of survey respondents indicated that there was consistency between Department objectives and outputs. During focus group interviews, both teachers and technology personnel reported that while the speed of the initiative implementation challenged their ability to address gaps in teacher, administration, and infrastructure readiness, schools and districts have adapted well. A lack of clear understanding of specific Departmental goals for this initiative did not appear to hinder general enthusiasm on the part of teachers and other personnel. However, 51% of respondents expressed that the consultation process between the Department and schools regarding the initiative could have been improved.

2. *Were school-based and district-level personnel adequately prepared to participate in the implementation of the initiative? (Process)*

   Information Systems personnel and Technology Mentors both reported that despite challenges related to the provision of wireless technology in all schools and other infrastructure concerns, they felt adequately prepared to put the implementation process in motion once the initiative was announced. While some existing initiatives (e.g. student technology carts, IT literacy programs) were "put on hold" in order to meet the timeline of the laptop initiative, this was seen as a reasonable short-term sacrifice, balanced with the importance of preparing schools for this initiative. Teachers reported a broad range of existing technology skills at the onset of program implementation. While there remain a few teachers described by themselves or others as "resistant" to the move toward technology integration in the classroom, 74% reported that they had an increased comfort levels in using technology since the initiative began, and 66% identified technology in the classroom as a key component of effective inclusion practices. These outcomes appear to indicate that issues pertaining to readiness and preparation for the initiative have been addressed to a great extent through training, support and teacher buy-in over the first year of the initiative.

3. *Were school-based and district-level personnel satisfied with the implementation process? (Process)*

Focus group participants expressed general satisfaction with the timing of the summer roll-out, which allowed time for both technical set-up and practice before classes resumed in the fall. Both teachers and Information Systems' personnel felt that the implementation and subsequent activities would not be possible without the support of dedicated technology mentors. Adequacy of training during and since implementation was an issue of concern for 37% of survey respondents.

4. *What challenges were identified in the implementation of the initiative? (Process)*

Readiness for technology integration was a concern for many teachers in the province who felt unprepared to fully utilize technology in their classrooms. Each focus group representing school districts that restricted administrative privileges expressed strong concern about the discrepancy in policies and practices across districts. While Information Systems' staff reported that restriction of administrative rights was an essential component of system management, few focus group participants agreed with the level of restriction that existed in districts that had not been extended administrative privileges. Other identified challenges included access to linking technologies in all classrooms, and problems with the French interface on the laptops. All focus groups indicated that a plan for sustainability should be part of any technology initiative, and expressed concern that the laptops may not be replaced or upgraded as needed.

5. *What solutions were developed to address challenges? (Process)*

A natural mentorship evolved in many schools and districts between teachers with technology experience and expertise and those without. These partnerships led to a greater sense of teacher collaboration and empowerment. Some districts instituted programs to encourage the creative use of technology, and to provide ongoing professional development pertaining to its use. All districts developed in-service training opportunities to meet the needs of users with varying levels of ability and expertise.

Districts responded to teacher concerns regarding administrative rights in varying ways. Some districts relaxed or removed restrictive policies while others still required teachers to use technical support personnel for all administrative functions. There was no disagreement among focus group participants regarding the Department's downloading policy, which was understood and fully-supported by teaching and technical staff.

6. *What were the perceptions of school-based and district-level personnel regarding the effectiveness of this initiative? (Outcome)*

Although focus group participants indicated that they would have benefited from the provision of clearer guidelines on how they were expected to use the technology, they regarded the initiative as having had a positive impact. Both teachers and department personnel expressed a high degree of satisfaction with the services of the technology mentors, and 65% of survey respondents were satisfied with level of technical support.

Eighty-six percent indicated that the initiative had contributed in a positive way to their ability to communicate and collaborate with other teachers and administrators, and 66% felt more prepared to take advantage of professional development opportunities. Administrative functions were positively impacted, with 82% reporting increased efficiency in the discharging of these duties.

7. *What areas of change were identified with respect to curriculum planning and general classroom practices? (Outcome)*

Focus group participants reported an encouraging increase in student engagement with the integration of technology into classroom practices. Teachers indicated that students began to incorporate their own expertise with computers and technology into classroom activities, and often took the initiative to mentor other students (and at times the teacher). In addition, some students who had been previously unengaged or even defiant, began to participate in organized learning activities and model their technological expertise to others in the class.

Focus group participants shared the perspective that schools with SMART Boards and full access to other linking technologies were experiencing the greatest levels of change in classroom practices. Although all teachers perceived benefits in planning and administrative functions, those without access to linking technologies were challenged to find ways to impact direct instruction.

Quality of teaching was considered improved by 67% of survey respondents, and 80% reported an increased understanding of the use of technology as a tool in an educational setting. Classroom practices changed for 68% of respondents, and 53% reported that laptops had contributed in a positive way to the effective differentiation of instruction. The laptops were used as educational research tools for 89% of teachers.

8. *What areas of change were reported with regard to SEP planning and implementation? (Outcome)*

Only 55% percent of survey respondents indicated that the initiative had contributed in a positive way to SEP development. This outcome may suggest a need for additional training and guidance in the development and maintenance of electronic SEPs. In addition, 71% of respondents did not feel that they had learned more about assistive technology for exceptional students since the implementation of the initiative. Methods and Resource teachers who participated in focus groups reported an increase in personal research pertaining to accommodations for special needs students; however, general classroom teachers rarely reported linking their laptops to research, information, or practice pertaining to special needs and/or assistive technology. During the initiative, benefits to special needs students appeared to emerge incidentally as a result of increased student responsiveness to the visual, auditory and tactile nature of implemented classroom technologies.

9. *What reported impact did the initiative have on teacher professional development and collaboration? (Outcome)*

When discussing the benefits of the initiative, the areas of professional development and teacher collaboration were identified as consistent themes among focus group participants.

Since the implementation of the project, 66 % of survey respondents reported feeling more prepared to take advantage of professional development opportunities and 86% reported increased ability to collaborate and communicate with other teachers.

10. What changes were noted in teachers' professional knowledge, attitudes and skills related to technology and better practices in education? (Outcome)

Focus group participants reported that the first year of the initiative resulted in a positive transition, even for educators who were reluctant to embrace technology. Modelling of strategies by technology champions in schools led to increased enthusiasm and openness among teachers to the use of technology and new classroom practices. Learning new skills associated with the laptops also contributed to increased interest in other technologies that could be used for direct instruction with students. Eighty-nine percent of survey participants reported widespread use of their laptops for research, and 66% reported being more prepared to take advantage of professional development opportunities.

5.2 Recommendations

In addition to addressing the various areas of inquiry, participants made specific suggestions regarding actions that could be taken to enhance the effective use of technology in the educational context in New Brunswick. The various recommendations are organized according to the following categories: *Training, Portal, Administrative Privileges, Communication, Exceptionalities, and Technological Concerns.*

5.2.1 Training

- In recognition of the varying levels of expertise related to technology, future initiatives could prepare teachers based on their individual training needs through the provision of preparatory workshops at the introductory, intermediate and advanced levels.
- A digital video series covering a range of in-service themes on technology could be created and launched on the Department of Education Portal. Training videos could thereby be easily accessed and used by individual schools and teacher as needed throughout the school year.
- At the outset of each academic year, it may be beneficial for districts or schools to provide basic skills workshops on such computer maintenance topics as email archiving, file and folder organization and the defragment function.
- Schools could provide opportunities for teachers to increase technological expertise by observing ways in which technology champions in the school utilize these tools for the purposes of teaching and learning.
- Districts could also offer workshops to school administrators designed to increase their comfort level with the use of technology, as well as to increase their knowledge of effective methods for integrating school-wide technology efforts.
- Universities should collaborate with the Department of Education to design courses for student teachers that introduce the fundamentals of educational technology, as well as the programs and software currently used within the provincial system.

5.2.2 Portal

- Teachers could benefit from additional orientation and training related to the purpose, structure, and capacity of the NB Education Portal.
- The Portal could serve as a forum for the development of on-line models of modified / accommodated curricula accessible to all teachers.

5.2.3 Administrative Privileges

- The development of consistently applied policies to address the realities of technology use and the limitations associated with restricted administrative privileges could be considered. Competency assessments could be carried out with teachers requesting administrative rights. Procedures could also be implemented to remove the administrative privileges of those who do not carefully adhere to established guidelines.

5.2.4 Communication

- The Department and districts could consider developing and communicating a unified vision regarding technology as a pedagogical tool, with the intent of increasing teacher buy-in and participation in future initiatives.
- The goal and purpose of future technology initiatives should be clearly communicated to districts prior their implementation. This would allow for increased opportunity for teachers to become involved in providing their input in setting directions for educational change in their respective jurisdictions

5.2.5 Exceptionalities

- Teachers would benefit from individual guidance and training regarding instructional methods for applying technology to meet the needs of students with exceptionalities.
- It may be beneficial to consider the development of targeted workshop sessions that address technology as a tool within an inclusive educational system, and general and specialised applications of assistive technology for students with physical, sensory or learning disabilities. In-service sessions could also be developed for teachers on how to link laptops with assistive technology, and on the availability of technology applications to assist students with exceptional needs.

5.2.6 Technological Concerns

- Districts should ensure that long-term supply teachers have access to needed technology (e.g. laptops) to support the continuity and quality of instruction to students.
- Schools would benefit from the provision of wireless services in all areas of the province. This would provide equal access and ease of use of the Internet for all districts.

5.3   Limitations and Implications for Future Research

This post program evaluation provided a synthesis of the major perspectives of individuals who developed, implemented and participated in the New Brunswick Teacher Notebook Project. For this evaluation, data collection activities applied survey and focus group methods to elicit relevant data regarding the implementation and outcomes of the initiatives. In terms of limitations, this investigation used a post-program design, and did not include the establishment of a comparison group or incorporate collection/analysis of observed behavioural outcomes. A scan of the literature revealed the need for additional research to evaluate the use of technology as a pedagogical tool, especially in addressing the needs of students with exceptionalities. Future research initiatives might benefit from a focus on the analysis of empirical data, the use of experimental design, or the inclusion of methods to measure behavioural shifts in educational practice or changes in student learning/achievement following an extended period of program implementation.

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