

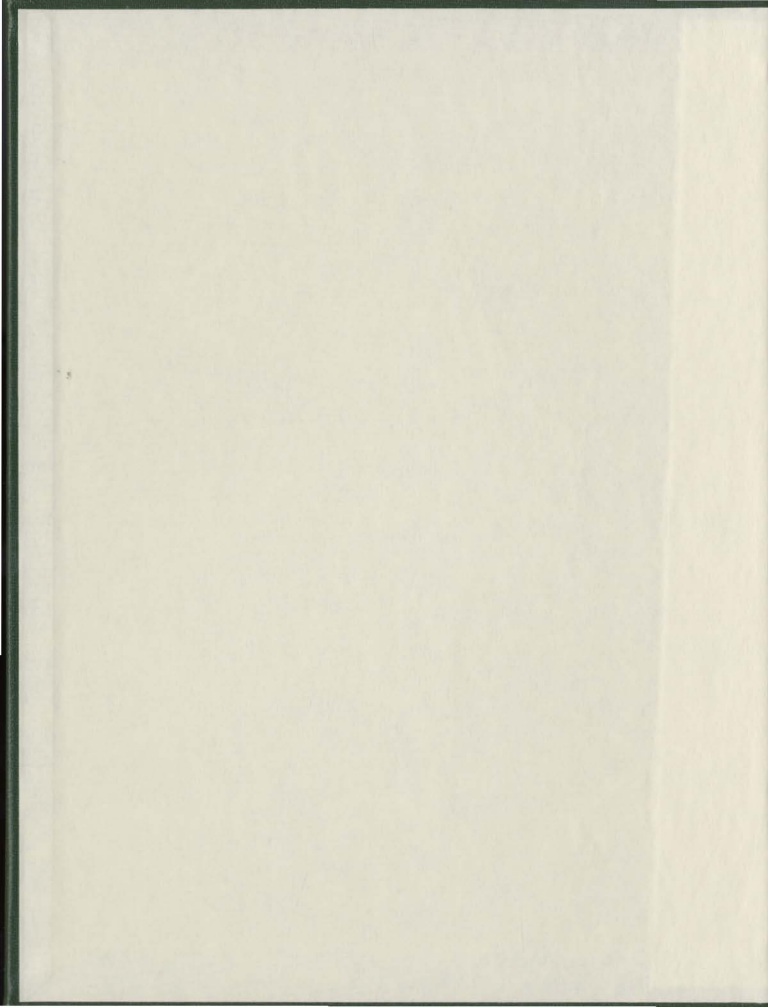
TAKING THE TIGER BY THE TAIL:  
GUIDELINES FOR PROFESSIONAL DEVELOPMENT  
ON IMPLEMENTING TECHNOLOGY  
IN SCHOOLS

CENTRE FOR NEWFOUNDLAND STUDIES

**TOTAL OF 10 PAGES ONLY  
MAY BE XEROXED**

(Without Author's Permission)

JEFFREY CHARLES NOSEWORTHY







## INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

**The quality of this reproduction is dependent upon the quality of the copy submitted.** Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps.

ProQuest Information and Learning  
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA  
800-521-0600

UMI<sup>®</sup>

**TAKING THE TIGER BY THE TAIL:  
GUIDELINES FOR PROFESSIONAL DEVELOPMENT ON  
IMPLEMENTING TECHNOLOGY IN SCHOOLS**

by

**Jeffrey Charles Noseworthy, B. Sc., B. Ed.**

A project report submitted to the  
School of Graduate Studies  
in partial fulfillment of the  
requirements for the degree of  
Master of Education

**Faculty of Education**

**Memorial University of Newfoundland**

August 2001

St. John's

Newfoundland

## ACKNOWLEDGEMENTS

This project has been exciting to start and a delight to finish. However as with many of the challenging endeavors in my life, there existed the middle part... the part of the journey where I would feel lost, confused, and indecisive. During the dark periods of my project there were many friends and relatives who were shining beacons to light my path. Through their support I was able to complete my project. I thank them dearly.

Dr. Bruce Sheppard was instrumental at the initial stages of this project with his intuitive approach and organizational skills that helped to clear my vision.

Dr. Jean Brown with her cheerful smile, receptive ear, and sound advice was a steadfast guide throughout my trials and tribulations. Jean is so resourceful and reliable. She would always find time to help me to align or re-align my efforts with a professional and personal flair that is solely her own... with a twinkle in her eye.

Alison Mews and her kind staff at the Curriculum Materials Centre were so giving of their time and experience in helping me to wade through the waves of searches to find the "right stuff".

To my fellow teachers and former students, I thank you for your input and energy with this study, since it is action research like this that results in action that has real meaning.

Thanks to Randy Murphy, Peggy Wilson and Cathy Gallant for their cheerleading through the rough spots. And Scotty, thanks for beaming me up... you're a solid brud.

To Gilbert Reid for his time, resources, and forever coming through in the crunch! And there have been quite a few crunches.

Thanks to my parents, Marg and Roy Noseworthy, who never doubted me from the start, and to my parents-in-law, Molly and Randolph Murphy, who were with me at the start and are cheering me from above.

At the start I was passionate about technology applications in school... I had a voracious appetite for all resources related to my study. I still do, but this comes with a price. It consumed me, and my family, in many ways.

Yvonne, thanks for your love, perseverance and faith. You helped me to believe in myself, to be true. Liam and Molly, thanks for your drawings when I could not be with you and Mommy, and for all of those special hugs before I would startup the computer to do my university work..... and for asking, "Daddy... are you finished, finished?"

Yes, I'm finished, finished!



## ABSTRACT

This project report provides a description of a learning resource teacher's experiences in developing a staff training project that was more than just a one-shot deal. It describes professional development practices for implementing technology integration at one rural central high school in Newfoundland. Concurrent with the literature review, an action-research project was designed to encourage ownership, input, and collaboration among the staff. The project was designed to assess the needs of the teachers and to give them a voice that could influence their training.

A focus of this project was to create an awareness of technology and to provide ongoing support to meet teachers' needs for using and integrating technology into their programs. The structure of this project allowed the researcher to study the stakeholders involved in technology initiatives at this school. By immersing himself into his study as a participant-observer, the researcher was able to develop survey instruments that measured the staff's needs and feelings about technology. Information collected through these instruments was used to enhance the design of the teachers' *Technotraining* initiatives.

Chapter One gives a brief introduction of the study including the problem, the goals and objectives, and the components of the project; outlines the organization of the report, and explains its writing style. Chapter Two describes the methodological framework used in the project: identifies the action research process, recognizes the

literature review that was concurrent with this process, describes the use of the district's framework for implementation, identifies the researcher as an active participant-observer, and provides a profile of the intended users of the initiatives. It describes the purpose and design of instruments constructed and used. Chapter Three contains the review of literature related to research regarding professional development, change theory, and technology and its implementation, as it relates to schools. It concludes with relevant guidelines that grow out of the literature. Chapter Four includes a reflective journal detailing the school self-study through the use of the action-research model. It gives a chronological account of the project's design and implementation through the researcher's observations and reflections. Chapter Five lists guiding principles that were drawn out of the research and describes lessons learned from their practice. Chapter Six describes the rationale and a copy of the teachers' materials that were developed for this training process. References to other documents from the literature that could be used to enrich the training process are also provided. Chapter Seven presents the results of the project. This includes recommendations, staff reactions and feedback, and revisions and additions to the project. It concludes with a critical reflection, a description of the limitations of the project, the possibilities for further work, and its transferability to other schools. It ends with a discussion of professional development planning as a learning experience.

## TABLE OF CONTENTS

ABSTRACT .....	ii
CHAPTER ONE: INTRODUCTION .....	1
The Problem .....	1
Goals and Objectives .....	3
Components of the Project .....	3
Literature Review .....	3
Teacher Training .....	4
Writing Style .....	4
Criteria for Project Evaluation .....	5
CHAPTER TWO: METHODOLOGY TO DEVELOP THE TECHNOTRAINING SESSION.....	8
Literature Review and Action Research .....	8
The Process .....	10
Developing the “Technotraining Package” .....	13
Participant Observer .....	14
Intended Users .....	16
Surveys/Instruments.....	16
CHAPTER THREE: LITERATURE REVIEW AND GUIDELINES .....	19
Professional Development Research .....	19
Learning Organization .....	25
Implementation - The Change Research.....	28
Collaborative Culture.....	31
Professional Development and Technology.....	32
Professional Development and Technology Integration.....	35
Guidelines from the Literature .....	38
Guidelines on Professional Development .....	38
Guidelines on Change .....	39
Guidelines on Technology Integration .....	40
CHAPTER FOUR: ACTION RESEARCH TO DETERMINE THE SCHOOL’S NEEDS .....	41
The Context .....	41

Action Research Process .....	42
Action Research Project - Needs Assessment, Analysis and Interpretation .....	44
Preliminary Preparation .....	48
Information Package for Teachers .....	62
STELLAR School Project Planning .....	64
Stellar Project 1 - Cyber Globe 3205:	
Integrating Worldwide Connections .....	66
Stellar Project 2 - Writer's Block-Busters: Interactive Writing .....	67
Stellar Project 3 - UPLOAD '98: Hosting an Online Science Fair .....	67
Conclusion .....	67
<b>CHAPTER FIVE: GUIDING PRINCIPLES AND LESSONS LEARNED .....</b>	<b>68</b>
Recommended Guiding Principles .....	69
Technology Lessons .....	69
Professional Development Lessons .....	72
<b>CHAPTER SIX: THE TECHNOTRAINING PACKAGE .....</b>	<b>77</b>
The Rationale .....	77
Preparation and Planning .....	78
The Design of the Technotraining Handbook .....	78
Rationale for the Contents of the Technotraining Handbook .....	79
The Technotraining Handbook .....	89
Teachers' Groupings .....	118
Location .....	118
The Multimedia Lab (The Tiger Zone) .....	119
Incentives .....	122
Delivery .....	123
<b>CHAPTER SEVEN: THE RESULTS .....</b>	<b>125</b>
Feedback and Reactions .....	125
Limitations .....	126
Possible Areas for Further Work .....	127
Transferability .....	128
Professional Development Planning as a Learning Experience .....	128
Concluding Remarks .....	128
Revisions and Additions .....	129
Critical Reflection .....	130
<b>REFERENCES .....</b>	<b>132</b>

## **CHAPTER ONE**

### **INTRODUCTION**

The aim of this project is the creation of a technology training session for teachers. Guidelines to create such a session grew out of an examination of the literature regarding professional development, change theory, and educational technology. As an on-site participant-observer, I engaged in action research to identify the need for such a training session and to involve teachers in planning it. This project report provides a critical reflection on the process and as well shares the results and recommendations for those interested in conducting similar sessions.

#### **The Problem**

Woodley Collegiate is a rural central high school (grades 7-12) in Newfoundland. At the time this project was developed (1996-2000), it had an approximate population of 450 students drawn from six rural communities. The age of the 30-year-old school is reflected in the worn condition of most of the building's structure.

An exception to this statement is the school's new multimedia lab that was opened in 1996. With a new server networked to 15 new workstations, the opening of this WindowsNT 4.0 multimedia lab was long overdue. Students did not have Internet access. Schools across the province were increasing their Internet activities through their involvement with the StemNet *STELLAR Schools Project*. The school's 30 teachers were

just completing a 5-year plan in developing cooperative learning strategies, and had indicated the need for training its staff to use the new technology.

Provincially, the Department of Education's TILE document recognises the impact upon knowledge construction in the shift from text to visual/graphic means of conveying meaning (TILE, 1994). In Atlantic Canada, the Atlantic Provinces Education Foundation (APEF, 1996) identified the Essential Graduation Learnings for graduates of public schools. Two of the six areas identified are communication and technological competence. Graduates, for example, should be able to:

1. Critically reflect on and interpret ideas presented through a variety of media.
2. Demonstrate understanding of, and use, existing and developing technologies (p. 4).

It was clear at Woodley Collegiate that the improvement of learning experiences in the use of technology needed to be addressed. Studies from Glennan & Melmed (1996), McKenzie (1991), Fullan (1993a), Fullan (1993b), and Madian (1995) reveal that too often, training is "tacked on" rather grudgingly, the need for support is severely underestimated and system-wide management plans are non-existent. Most educators agree that successful use of technology in schools depends upon the skills of the teachers in those schools. Yet, there were no school-produced guidelines for the implementation of technology at Woodley Collegiate. My goal was to develop a set of guiding principles that could support and enhance the implementation of technology for this school, and then create an effective training session for teachers.

## **Goals and Objectives**

This project addresses the problem identified at Woodley Collegiate. The intention is to develop a set of guiding principles that would lead to a training session on the implementation of technology for this school. Specifically, the objectives are intended to:

- locate existing practices of technology integration
- inform teachers of existing technological information
- improve teachers' comfort levels with using technology
- promote interaction between teachers
- facilitate collaborative learning
- enhance active learning about technology
- develop self-evaluation in teachers
- guide technology integration

## **Components of the Project**

### **Literature Review**

The project began with a literature review which included: a school-wide action research model (Calhoun, 1994); a study of current principles of change theory (Barth, 1990; Fullan, 1993; 1990; McLaughlin, 1990; Schlecty, 1994; Stiegelbauer, 1994); educational technology issues (Dede, 1994; McKenzie, 1991; Wibur, 1994; 1995); and recent professional development ideas (Barth, 1990; Fullan, 1991; Glickman, 1990; 1993;

Hargreaves & Fullan, 1992; Joyce, 1990). Necessary data was also collected within the school throughout the duration of this project.

### **Teacher Training**

As a result of my observations throughout the project, training resources were designed to help teachers learn the technology. This was implemented with the staff through the development of a technology awareness process. The training session was customized for the teachers who completed 3 surveys, took part in a 2-day interactive training session concerning the technology in their school, and attended follow-up training sessions. Teachers were influential in their own professional development throughout the project.

### **Writing Style**

The writing style in which this report is written varies from Chapter One to Chapter Seven due to the nature of the action-research model used in the study and the purpose of the writing. The APA style is used. Since much of this report is personal, appropriate sections are written using the first person. Chapter Six contains materials that were designed for participants in the training process and its style reflects that purpose.

The school's name and its place name have been replaced with fictitious names solely for the purpose of retaining the school's anonymity with the publication of this document. For the same reason, on the instruments produced for this project, all personal names and the school's website address have been changed or deleted.



## Criteria for Project Evaluation

This report should be evaluated as a project report – not that of a thesis. In light of the nature of this project, there are several items that should be considered. This report provides a description of the process and the product, but the reader is limited in that certain elements have to be experienced in their actual form within the school context to appreciate its full impact.

The project requirements at Memorial University of Newfoundland for a Master's of Education degree indicate that, "The project report would consist of the product plus the articulated need, theoretical basis, justification of the approach used, and a complete description of the product" (Memorial University of Newfoundland, 2000).

Through immersion in my action research I was directly involved with the main clients of this *Technotraining* initiative...the teachers. In "the thick of things", this placed me close to the action. This report will only *describe* the teachers' reactions, feelings, and opinions. It does not recreate the "humpf" sounds or eye-rolls that came from disgusted teachers when, after a long search, they would lose a display on their computer monitor. Nor does this report illustrate the teacher with uplifted arms of victory accompanied with the shout, "I did it!" after he successfully printed a WWII graphic from a CD-ROM. The numerous sights and sounds that I experienced were transient, yet integral to the human side of this project. I have attempted to describe some of them in this report.

Colour was used extensively in the design of all instruments and displays used throughout this project. The staff room displays, the teachers' *Technotraining* T-shirts and handbooks, and the incentives all had been thoughtfully designed for consistency and to be visually attractive. Each of the three written surveys were graphically enhanced

and reproduced on coloured paper for this reason. Various sensory experiences could not all be captured in their true form. In this 2-dimensional black and white report, I have included details to help the reader to picture specific images and active scenes where this took place.

By joining the school's Technology Team (Tech Team), I was able to develop awareness of the needs for technology support for our teachers. This resulted in a unanimous decision to include professional development issues on the agenda of all subsequent meetings. This was elemental in planting the "seeds" to grow support for training teachers about using technology. As an advocate for professional development concerns, I regularly presented my ideas to this team of teachers (of which the school principal was an active member). Sometimes my ideas were applauded, other times they were tempered, and sometimes they were ditched. I feel the outcome resulted in a more realistic application of my goal...to develop a training initiative that was representative of the staff's needs and wants.

In the implementation of this project I was restricted by provincial circumstances. By January 1997 my course work in graduate studies had been completed, I was given approval by my principal and two district administrators to conduct the research in my school, I had conducted a needs assessment of the school's teachers, and I had formally shared this data with the staff. I was ready at this time to integrate and share my *Technotraining* initiatives as a professional development process. However, this was also a time for contract negotiations between the Newfoundland and Labrador Teacher's Association and the Government of Newfoundland and Labrador. The tone was not great. Talks between the teachers and the government had broken off. Teachers were tempting

to “work to rule” and the government cut all funding for teachers’ professional development days. As a result, the execution of my planned project had been postponed due to forces beyond my control. Teachers in my school were bitter. Had this lack of a provision of professional development time occurred for other reasons, it is quite possible that the teachers on staff may have opted to complete the Technotraining on their own time after regular school hours...we had done that before (1990). However, due to these political circumstances, the Technotraining was placed on hold for one year. Despite this setback, a positive side here was that I was able to update my review of the literature and to examine training projects in other schools.

This report will be successful if it explains that school-wide action research can be a positive vehicle in designing technology-training support for teachers. The report should make it clear that a top-down, “one-shot” training session on technology is not effective. Instead, the report should indicate that listening to teachers’ needs helps with finding and delivering appropriate information. Incorporated in a variety of instructional methods throughout the school year, this can provide fun and meaningful experiences for teachers.

## **CHAPTER TWO**

### **METHODOLOGY TO DEVELOP THE TECHNOTRAINING SESSION**

#### **Literature Review and Action Research**

The need to find an all-encompassing plan to implement the new technologies at Woodley Collegiate resulted in a myriad of journeys, each one leading to new action. The method I used was action research, broadly defined (Calhoun, 1990). The process involved following the four basic steps as outlined in *Steps for Action Research* (Appendix A). This required that I should (1) select a focus, (2) collect data, (3) organize the data, and (4) analyze and interpret the data. This cycle was repeated over and over again as the project unfolded. Calhoun (1994) succinctly summarizes the premise of this type of work: "Action research is a fancy way of saying, 'Let's study what's happening at our school and decide how to make it a better place'" (p. 20).

The whole staff served as the action research team as all participated in various aspects of the study. As a work in progress, there was a recognition that this study needed to be continuous, to parallel the dynamic nature of technology development and its infusion into the classroom.

Through the findings of my literature review and my own recent graduate study, I was aware that a generic implementation plan is not easily acquired. Many technology plans exist but each of them has its own shortcomings with respect to the environment in

which it is used (i.e. technical proficiencies of the staff, school population, quality of the computer lab, existence of a school improvement plan and committee, financial resources). I realized, however, that the literature would be valuable in several aspects:

- for a review of previous initiatives from other school's technology plans
- as a source from which successful initiatives could be selected
- to aid with the design of survey instruments to collect staff data.

Through my own reading and practice, and through sharing some of the literature with the staff, I observed the following:

- one-shot institutes/workshops are ineffective; follow-up analysis indicates that a large majority of teachers do not utilize their new techno-knowledge from such ventures
- the role of a facilitator is still a new and unfamiliar role for teachers; training in this method is lacking on many levels
- project-oriented technology projects generally are supported by collaborative learning techniques
- teachers are being trained to use the technology rather than to implement the curriculum; the important ingredient here is the teacher
- to create a solution that works, a collaborative effort is required.

Through my reading of the existing literature, my understanding of the research of current professional development practices, and my own action research within my school, I searched to find existing and developing practices that could guide the effective integration of technology within the school. The place to begin was the school's

professional development initiatives, in order to situate my study with the local district's model of implementation (Appendix B).

### **The Process**

In October 1995 I began to observe the need for teacher support in technology training at my school by talking with teachers using technology. After a series of observations, interviews and surveys, I needed to form a systemic approach to develop a set of guidelines to support staff-development training session.

I began by collecting data based on the teachers' questions and complaints about the existing system. After a series of meetings with the principal and the staff, and a review of the school files on staff development, I initiated the idea with the principal that the position of a teacher support person was needed on the school's technology team. I assumed this role as a participant observer. Since the team met on a monthly basis, I could regularly collect information from the teachers that could be shared and discussed with the staff and the team. The staff had experienced shared decision-making (SDM). With this approach, the basic premise for the project was to incorporate the opinions of all stakeholders at every opportunity. This allowed the staff to participate in a collaborative self-study that allowed the teachers to see the individual efforts, to make changes in their own training, and to collectively organize their efforts to make these changes more effective.

One reason for this study was to use the primary data of the research to drive the design of a two-day staff training session, with integrated support before and after these two days. I assumed that a poll of staff members would provide a list of their needs for

training in technology and that this would result in a better initiative. The aim was to have teachers share practical ideas and to advance the staff's collective thinking about teacher education. This would foster staff ownership of the training design, and thus, result in a more focused group of trainees when the inservice was implemented.

During the course of the project I engaged the staff in a form of self-study at two different levels. At the first level, through self-analyses, surveys (Appendices D, F, & G), interaction and feedback, the teaching staff became involved in improving their own practices in the use of technology. The teachers became researchers themselves as they searched to find their own requirements for technology skills in the classroom. At a second level of self-study, I would regularly step back in order to see the project as it aligned with the District's implementation model (Appendix B). There were numerous times when this model was referenced as it allowed for necessary change and flexibility whenever new data was collected.

Outside of the preliminary literature review, I used numerous data sources for the project: (1) documents designed to gather planning information for the inservice needs, e.g., staff meeting minutes, student polls, staff surveys; (2) descriptive accounts of the staff and technology team meetings; (3) e-mail communications from the Internet forum, (4) pre-/post-interviews with teachers before and after the inservice, (5) statistics on the Tiger Zone booking schedule for the multi-media lab; and (6) my reflective journal.

To help facilitate the eight Tech Team meetings throughout the 1994-95 school year I organized the logistics of meeting places and times, sent reminder memos about upcoming meetings and assignments, served as trouble shooter to head off concerns or problems as they arose, acted as staff liaison for the team, liaised with the director of the

district's Technology Education Centre (TEC), became a cheerleader to applaud the teachers' efforts, and keep up the enthusiasm. I believe having an "in-school" facilitator who was also an enthusiastic and active participant in the process and goals of the project contributed to the successes of the training.

As training needs emerged, the staff was asked, "What now?" This way, the control or power to change was in the hands of the teachers. Teachers were empowered because they had the opportunity to make their own decisions, and were fully part of the decision making process. Through shared decision-making, teachers took ownership. Following the survey collection, a formal presentation was made to the whole staff, to share with them my interpretations of the staff's involvement with technology implementation. Opportunities for direct involvement were made during and after my presentation.

An information sheet, *Making Technology Friendly* (Appendix C) was produced and distributed to inform the teachers of recent technology upgrades and its possibilities for integration. Three surveys (Appendices D, F & G) were developed to collect information about the teachers' needs that could then be incorporated in the design of the training session for teachers. Useful were the exemplary practices noted in the literature, as well as those shared by personnel from schools with successful experiences in technology implementation. My intention was to incorporate as many of the successful practices from the literature and research as I could. My aim was to provide:

- training for the teachers on staff



- promotion of awareness of the technology that exists at the school, the teachers who are successfully using it, and the support that is available
- increased learning opportunities for our students
- provision of technology training to enhance teaching and learning
- training to help increase the individual technology proficiency levels of staff
- opportunities for staff to increase their instructional proficiency, or their ability to teach students to use the technology
- increased technology integration across the curriculum
- the use of action research tools in the design of the training
- opportunities for teachers to increase their comfort levels when: using network access, word processing, using curriculum based software, using mark management software, and accessing the Internet
- the inclusion of major stakeholders (staff, students, district personnel, and community) while developing the process of techno-training.

### **Developing the “Technotraining Package”**

The “*Technotraining Package*” was more than a training manual. Through the literature review and the needs analysis, information was gathered to develop staff awareness of technology, construct a *Technotraining* handbook, and design and integrate support for teachers using technology. This would help to guide the teachers prepare for and take part in a 2-day training session about technology and its potential for use in the classroom. Support leading up to this training would be offered as well as opportunities

to reinforce the learning afterwards. The rationale, preparation, planning and setup for this training is described in detail in Chapter 6 of this report.

If the training session had been designed off-site, without consultation with the intended users and dropped onto the teachers for the 2-day inservice, then it would have been the traditional stereotypical inservice on technology for this school... a one-shot misguided program that operates on its splash value. My intent was quite the opposite.

To truly integrate technology training for our teachers I needed to give them what *they* really wanted... not what somebody else *thought* they wanted or needed. My aim was to develop a series of experiences in which the staff could become engaged to enrich their experiences as life-long learners. Asking the teachers to identify their individual needs with respect to learning technology was fundamental. My interaction with the teachers in this way provided me with rich direction in the design of the training.

Simultaneously, while developing the needs analysis, I brought into place mechanisms (see Chapter 6) that could promote the staff's recognition of the technology present at the school. By doing this I felt that I could increase the staff's awareness of their needs for more support in technology training.

### **Participant Observer**

Through my position as the school's learning resource teacher I was able to take a close, practical, analytical role in the development of the training process for the staff's use of technology. As a participant-observer, I was actively involved in collaborative school-wide improvement. I feel that this motivated me to become one of the driving forces behind this initiative.

At the time I began this project I had been teaching at this school for 13 years. The staff roster had not changed much over this time, providing me with the opportunity to become quite familiar with each of my colleagues and vice-versa. The camaraderie between staff members and myself was quite strong. I feel that the positive rapport that had grown through my interaction with the staff had built their trust in me over these years. Their acceptance of my research was evident through their willingness to participate in the project.

The staff's trust in my research showed up quite strongly in the oral interviews, where I sensed that some of the responses were richer in content than if a person from outside of the school had conducted the interviews. Also, with each of the three sets of surveys, I felt that the staff's quick response times and high response rates indicated a high level of confidence in me. The response rates ranged from 88% (Appendix D) to 100% (Appendix F), and all completed surveys were returned to me within two days of each distribution date.

Another indicator of staff support was the commitment of six teachers to meet with me as I guided them through the *STELLAR Schools Project* proposals. Each of these three projects required the teachers to meet with me for a minimum of 4 one-hour meetings. This provided them with ownership of each of their respective projects and it provided me with the relevant information I needed to design each project (see Appendix E).

During my 13 years at this school I had been exposed to numerous school improvement initiatives and a variety of staff training sessions. These would always have a common impact on me. Each session would certainly have been well planned to deliver

information about a particular topic, for example, from the practice of science safety to the development of the school's mission statement. However the common element was that each one of these training sessions was administered through a top-down approach. Whether it was district or school initiated, the agenda had always been designed without consulting the main stakeholders... the teachers.

### **Intended Users**

Originally this professional development project was planned for launch on a staff of 24 teachers for the 1996-1997 school year. However, provincial budgetary restraints forced me to delay this for one year. This postponement resulted in delivery of these initiatives during the 1997-1998 school year. The 23 teachers taking part in this project were generally unassuming in nature. Previous professional development initiatives were one-shot, spur of the moment tactics that were perceived as "holidays," "a break from class" or "a waste of time." The staff's input, opinions or suggestions were not requested by any formal means to help with inservice planning. The school staff was not usually consulted to help plan or to orchestrate these training sessions. As well, no follow-up sessions were provided to reinforce the training.

### **Surveys/Instruments**

Each of the surveys and instruments used in the project (see Appendices) were created based on the review of the literature. Another influential factor in the design here were the teachers' needs that I became aware of through personal conversations.

The first survey, *What's On Your Mind?* (Appendix D) was administered on the last day of November 1996. It was necessary for me to collect information from the staff so I could integrate their needs into the main training sessions I was planning for in February. I was quite impressed with the quick response time since this was also a monthly return day when all homeroom teachers also had to complete and submit their attendance statistics. All completed surveys were in my staff room mailbox by December 1, 1996.

This project had been originally planned for completion during the current school year. However, the main training component was postponed. Due to many interconnected variables beyond my control, this prediction was "off the mark" by a considerable amount. The action research project actually took two years to complete. Interruption by a teacher-employer job action, and delays due to professional development budgetary cutbacks were the two main reasons for delay.

Though unplanned, this delay provided many more opportunities to enrich the project design and to work with teachers. The need to resample the staff's needs during the second year allowed me to become aware of richer literature on this developing topic and to refine the survey as there was a change in the staff population.

The second survey was administered November 4, 1997, *Professional Development Staff Survey—Teachers making technology friendly* (Appendix F). Question 1 was a direct request asking the staff if they were still interested in receiving some training about the use of computers. Questions 2 and 3 were based on the returns from the first survey in order to prioritize the specific needs of the staff. Question 4 asked

for staff preferences regarding small or large group discussion. Question 5 was open-ended requesting possible suggestions from staff that may enhance the inservice design.

The third survey was administered following the *Technotraining* sessions. The main reason for this one was to poll the staff regarding a training session on the use of the WinSchool Marks Module, a program enabling the teachers to organize their students' evaluations electronically. This program had been approved and accepted by the Department of Education to be used province-wide. I took the opportunity to include several questions that could help inform me about the teachers' current feelings about the technology since the *Technotraining* sessions. Item 1 requested teachers to have their students' marks and comments ready in order to expedite their data entry. Item 2 was designed to help me to organize homogeneous working groups by asking teachers about their frequency of using computers at home and at school. Item 3 listed our software inventory and was designed to inform me which programs were in use as well as their frequency of use. This was included to inform the staff of the broad range of software available to them, and to help me as the learning resource teacher with budgetary concerns. Item 4 was open-ended since I learned from question 5 in the second survey. (*Professional Development Staff Survey—Teachers making technology friendly* in Appendix F), that this type of questioning drew rich, responses from the teachers. I also included several partial sentences here to direct teachers to think about particular training issues and to solicit more specific requests.

## **CHAPTER THREE**

### **LITERATURE REVIEW AND GUIDELINES**

#### **Professional Development Research**

Staff development or professional development is conceived broadly to include any activity or process to improve skills, attitudes, understandings or performance in present or future roles (Sparks & Loucks-Horsley, 1989). Blase and Blase (1994) identify the inclusion of sessions on communication, group development skills, problem solving, decision-making, and teacher leadership. Glickman (1990) distinguishes staff development as the total of learning experiences available to a professional that are both directly and indirectly related to his or her work.

A powerful tool for improvement for classroom instruction, professional development can also “form the foundation for teacher growth and collegial support that results in new, more authentic approaches to teaching and learning” (Blase & Blase, 1994, p. 58). The research by Louis and Miles (1990) indicates that a significant amount of internal assistance is crucial to implementing successful school reform projects.

The need for professional development has been well documented (Brown and Sheppard, 1997; Fullan, 1990; Gusky, 1994; Hixson and Tinzmann, 1990; Shankar, 1990; Sheppard, 1996; Sparks, 1989; Sparks and Loucks-Horsley, 1989). Sheppard (1996) refers to research conducted in 58 schools in Newfoundland, with 1,059 teachers in all districts, which revealed that promotion of professional development was the most significant single leadership activity that was related to increased levels of teacher

commitment, professional involvement, and innovativeness. In another provincial study of school improvement in 19 Newfoundland districts, data indicated that district-sponsored professional development activities were the most influential activities in motivating school improvement (Brown, Button, Noseworthy & Sheppard as cited in Brown & Sheppard, 1997).

Traditionally, inservice training and other professional development workshops have been “one-shot” sessions conducted by district administrators who not only deliver the training, but also decide on its content and timing (Wohlstetter & Buffett, 1992). Too often, the focus has been on helping teachers to develop isolated skills and strategies. This results in fragmented improvement attempts that do not reflect “the complex relationships and interdependency among all aspects of the overall education process” (Hixson & Tinzmann, 1990, p. 1). Researchers recognize the challenges for 21st century professional development planners to “implement new organizational structures that promote shared responsibility, collaborating and continual learning for both students and adults” (Hixson & Tinzmann, 1990, p. 2). If teacher learning takes place within a professional community that is nurtured and developed from both inside and outside the school, significant and lasting change may follow (U.S. Department of Education, 1995).

Teachers need opportunities to learn how to question, analyze and, change instruction to teach challenging context (Darling-Hammond & McLaughlin, 1995 cited in U.S. Department of Education, 1996). “High quality professional development often supports teaching in new and expanded roles as teacher leaders, peer advisors, and teacher researchers” (U.S. Department of Education, 1996, p. 1).



Guskey (1994), more importantly, recognizes that “professional developers are also looking more at the research on professional development to also consider organizational characteristics and structures, especially those that facilitate ongoing professional growth” (p. 1). Also in this research, Guskey (1994) reports of various dichotomies in the professional development literature which contribute to feelings of confusion by reforms, “since researchers and experts in the field cannot agree on what should be done” (p. 2).

Although there is difficulty among professional development on consumers for one right answer, Guskey (1994) contends that the success of these initiatives is contingent upon the context. In reference to this he cites Fullan, Huberman and Miles, and others who suggest that the uniqueness of the individual setting will always be a critical factor; what may work in one setting may not work in another (Fullan, Huberman & Miles as cited in Guskey, 1994).

Guskey (1994) offers procedural guidelines which have been derived from research on professional development and the change process. He suggests that these reflect a framework to search for and develop an “optimal mix of professional development processes and technologies that will work best in a specific context at a particular point in time” (p. 3).

Guskey’s (1994) six major guidelines:

1. Recognize change as both an Individual and Organizational Process.
2. Think big, but start small.
3. Work in teams to maintain support.
4. Include procedures for feedback on results.

5. Provide continued follow-up, support, and pressure.
6. Integrate programs (p. 4).

Similar findings described by Raymond, Butt and Townsend (1992) about contexts and conditions have been shown to promote collegiality, school-based projects and professional development. "Contexts which enable teachers to collaborate in solving common problems in a focused way also appear to enhance teachers' own individual efforts at development" (p. 155).

Hixson and Tinzman (1990) believe that all staff should receive the necessary training from their school districts, but they also note that educational staff at all levels have a parallel obligation to continue their own professional growth and development. This enables teachers to keep abreast of new research, to seek out new strategies, and to share new ideas and information with their colleagues.

Fullan (1993) recognizes that knowledge is important, but equally, if not more important, is the culture of the school. Consideration should be given to the framework of beliefs and the attitudinal infrastructures that guide the numerous decisions that staff must make on a daily basis. Likewise, professional development is less and less an object to be achieved, but instead a continuing journey for individuals operating within the context of their own unique needs and circumstances (Hixson & Tinzman, 1990). Hord and Boyd (1995) recognize the organizational context that supports staff development indicated by Sparks and Loucks-Horsley (1989). However, they clarify this focus in specifying "a context conducive to change" (Hord & Boyd, 1995, p. 14). Shroyer (cited in Hixson & Tinzman, 1990) notes "for staff development programs to effectively change educators' beliefs and behaviours to support school improvement, these programs must be based on

a sound understanding of organizational development and the factors that enhance school change” (p. 4).

According to Fullan (1991), it is central for all staff to work on a shared and deeper understanding of their collective efforts. Professional development can be a collaborative, interactive and systemic experience situated in a given context.

Humphries’ study (cited in Glickman, 1990) on curriculum innovation found that successful programs were related to collaborative planning of inservice (p. 312). Raymond, Butt and Townsend (1992) recognize school contexts that enable teachers to collaborate in solving common problems as also enhancing teachers’ individual efforts at professional development. Hargreaves (1992) supports the development of extended collaborative cultures. He identifies the need to “move away from those binding contrived collegial cultures which preserve the hierarchical separation between development and implementation, whereby teachers deliver others’ purposes rather than developing their own” (Hargreaves, 1992, p. 235).

Along these constructivist lines, Sparks and Loucks-Horsley (1989) present five models on an extensive review of the theoretical and practical knowledge about professional development:

- **Individually-guided**—a teacher develops and carries out a personal plan for professional learning activities.
- **Observation-assessment**—a teacher solicits feedback about his or her teaching practices after an observation by a peer or other observer.

- **Involvement in a development and improvement process**—a teacher develops new programs or curriculum or participates in decision making with regard to problems identified in a school improvement process.
- **Training**—a teacher attends sessions to learn new skills or obtain further knowledge.
- **Inquiry**—a teacher, either alone or with other teachers, follow a problem solving process in which data are collected and analyzed and changes in practice made based on this analysis.

According to Glickman (1990), inservice skills are more readily acquired and used by teachers when there is follow-up into their own classrooms. He agrees with the findings of Joyce and Showers who have shown that inservice programs which use presentation, demonstration and practice as well as classroom feedback and coaching are more successful than those who do not use feedback and coaching (Glickman, 1990, p. 312).

Glickman, Gordon, and Ross-Gordon (1995, p. 340) identify more recent research resulting in new formats for staff development. Several examples follow:

- **Skill development programs.** Consists of several workshops over a period of months, and classroom coaching between workshops to assist teachers to transfer new skills to their daily teaching.
- **Collegial support groups.** Teachers within the same school engage in group inquiry, address common problems jointly, implement instructional innovation, and provide mutual support.

- **Teacher centres.** Teachers can meet at a central location to engage in professional dialogues, develop skills, plan innovations, and gather or create instructional materials.
- **Individually-planned staff development.** Teachers set individual goals and objectives, plan and carry out activities, and assess results.

Although the preceding formats and models are grounded in current theory, Brown and Sheppard (1997) point out that there is no mention of linking professional development and student outcomes. Recognizing inservice as a subcomponent of staff development, Showers, Joyce, and Bennett (1987) in a meta-analysis of nearly 200 research studies caution that most studies of inservice have dealt with relatively simple teaching skills and behaviours and have not attended to the cognitive aspects of teaching.

Glickman (1990) suggests the need for more studies on programs that equip teachers to be better decision makers. He says that “critical components of self-analysis, collegial and open-minded coaching, and reflective group discussion will probably be found to be more important than the already established components of inservice needed to learn behavioural skills” (p. 328).

### **Learning Organization**

Efforts at reform in education should result in improved student learning. For staff development programs to effectively change educator’s beliefs and behaviours to support school improvement, these programs must be based on a sound understanding of organizational development and the factors that enhance school change.

The primary focus for change should be at the school level where continuing growth will contribute most directly to the evolution of a true learning community. If we are to succeed in bringing about meaningful improvement, schools must become "learning organizations" (Fullan, 1995, p.234).

This is consistent with the current research of Brown and Sheppard (1997) who state that the concept of the school as a learning organization allows better integration of the various components of professional development and incorporates results-driven education, systems thinking, and constructivism.

They describe their *Learning Organization Project* as a different professional development model in that it:

- recognizes that implementation is a process that occurs at the school level and requires ongoing support for teachers and administrators;
- is driven by research and particularly student outcomes;
- recognizes that training is but one component of professional development;
- represents a global, comprehensive approach to professional development that requires new images of leadership and school organization, team leadership and professional learning. (Brown & Sheppard, 1997, p. 13)

Brown and Sheppard (1997) indicate that educators must be committed to both individual and organizational learning. Their interactive model of learning recognizes the interdependence between the individual and the organization and points to a new constructivist approach to professional development which requires systems thinking and a focus on student outcomes (p. 15).

This type of systemic and cultural change needed is recognized by Fullan, Bennett, and Rolheiser-Bennett (1990) who indicate "the greatest problem faced by school districts is not resistance to innovation, but the fragmentation, overload, and

incoherence resulting from the uncritical acceptance of too many different innovations which are not coordinated” (p. 19).

Educational reform is largely a local process wherein central support is vital; effective linkage systems between leaders, facilitators, and users within a system are essential. Emphasis is on continuous evolution, with a focus on classroom practices and outcomes (IMTEC, 1992).

In Glickman (1993), to capture the sense of school renewal, the school needs to develop the critical study process. This would allow the school to collect information that could:

- infuse the raising and studying of important questions about student learning
- provide a way of setting priorities for future actions as the basis of self-study
- infuse the school so that critical thinking, generating, consuming, and action become the norms of the organization. (p. 51)

Senge (1994) says, “as the world becomes more interconnected and business becomes more complex and dynamic, work must become more learningful. Successful organizations discover how to tap people’s commitment and capacity to learn at all levels in an organization. Learning organizations are possible because not only is it our nature to learn, but we love to learn” (p. 4).

Dixon (1993) states that organizational learning is the outcome of three overlapping spheres of activity – individual, team, and system learning, which take place simultaneously. People in these organizations continually expand their capacity to create the results they truly desire. As a team, they are continuously learning how to learn together, continually transforming itself to meet its strategic goals.

Learning is a social process involving collaborative reflection on action . Anderson (1993) observes "by analyzing where they are on the continuum of change. stakeholders can see where they may still need to go" (p. 14). Yet, according to Moran, Musselwhite and Zinger (1996), groups of people do not just sit down quietly together and work twice as quickly and efficiently as they did on their own, simply because the organization has adopted the team approach. Senge (1994), Moran et al (1996), Fullan (1993), and Barth and Glickman (1990, 1993) recognize there is struggle involved along with conflict, confusion, and change. The challenges teams face are as varied and numerous as the employees themselves. However, they can achieve extraordinary potential if nurtured properly through the often-difficult growth and learning process.

Sarason (1990) offers the question, " How do you build in self-correcting forms and mechanisms so absent in our schools?" As a guiding principle he suggests that the task is to develop an organizational culture that makes self-correction a norm and not a war (p. 129).

### **Implementation - The Change Research**

In the 1970s, change was viewed primarily as classroom change...one teacher, one classroom, one innovation. Planned educational change in the early 1980s gave an innovation-focussed perspective on the implementation of single changes in curriculum and instruction (Fullan, 1985). Change was linear in those days, and as a result many desired results did not occur.

Change is now approached with an emphasis on process and its context. It affects the very culture of schools (Cuban, 1988; Fullan, 1985; 1993). Cuban (1988) notes that



many of the changes required by current societal and educational demands go deep into the structure of organizations and the ways in which people work together. This type of change is multifaceted, slower, and means changing attitudes, perceptions, behaviors, relationships, and the way people collaborate.

According to Fullan and Miles (1992), in new models for change, organizational capacity for continual renewal and growth points toward the direction of the future and changing the culture of schools, what schools do, and how they work is the real agenda. Renewal implies an organizational culture geared toward continuous learning and improvement (Stiegelbauer & Anderson, 1992).

Fullan (1993b) cites the work of Miles on the identification of some of the factors that are associated with different stages of initiation, implementation and institutionalization of change.

*Initiation factors* (deciding on an agenda; beginning work)

- link between the educational need (teachers) and the political need (district; policy)
- have a clear model (refers to the implementation plan, not to the innovation)
- have a strong advocate (one or more people are needed to get it going)
- take part in active initiation (it is better to get started sooner than later...there's a limit to how much readiness one should do. Ready. Fire...Aim: get ready to do something, begin doing something carefully, and then consolidate that experience with an aim. (Fullan, 1993b, p. 4)

Fullan (1993b) suggests to "get some common principles organized, start implementing, and draw lessons from that" (p. 4).

*Implementation factors* (putting the innovation into action, in context)

- orchestration (coordination that is usually done by the action team, the group that oversees, troubleshoots, and is responsible for working through the implementation dip)

- shared control
- positive pressure and support
- technical assistance
- rewards. (Fullan, 1993b, pp. 5-6)

Fullan (1997) states “in the early stages of implementation the rewards are few and the costs are high...as time passes, the implementation dip goes up...costs are less and the rewards go up” (p. 5).

According to several large studies of implementation, the larger the scope of change and the more personally demanding it is, the greater the chance for success (Crandell, Eiseman & Louis, 1986; Fullan & Hargreaves, 1991). Strategies need to be directed at a number of these factors at once. Simply announcing the innovation is not the same as implementing it.

*Institutionalization factors* (seeing the innovation in place and integrated into the daily life of the school)

- embedding - building the change into the organization
- links to instruction
- widespread use
- removal of competing priorities - the overload problem
- continuing assistance - building capacity, the trainer of trainers notion. (Fullan , 1993b, pp. 5-6)

Going through the three phases of the change process (initiation, implementation, and institutionalization) takes time; three to five years for stable implementation and predictable outcomes (Steigelbauer & Anderson, 1992). Institutionalization succeeds best when all phases of the change process are considered at the beginning (Huberman & Miles, 1984). The bottom line to any change is how it fits within the organization, since it is organizational health that will make the longer-term difference (IMTEC, 1992).

## **Collaborative Culture**

Rosenholtz (1989) recognized two distinctive school cultures: stuck (learning impoverished) schools and moving (learning enriched) schools. In this study of the effective moving schools she identified characteristics of greater collegiality, caring, and collaboration. In effective schools “it is assumed that improvement in teaching is a collective rather than individual enterprise, and that analysis, evaluation and experimentation in concert with colleagues are conditions under which teachers improve” (p. 73).

Fullan and Hargreaves (1991) confirm this in their wide array of supporting research. From their work they have produced a set of strategies for working in a collaborative culture.

### *Strategies for Working in a Collaborative Culture:*

#### *Guidelines for Teachers*

1. Locate, listen to and articulate your inner voice.
2. Practice reflection in action, on action, and about action.
3. Develop a risk taking mentality.
4. Trust processes as well as people.
5. Appreciate the total person in working with others.
6. Commit to working with colleagues.
7. Seek variety and avoid balkanization.
8. Redefine your role to extend beyond the classroom.
9. Balance work and life.
10. Push and support principals and other administrators to develop interactive professionalism.
11. Commit to continuous improvement and perpetual learning.
12. Monitor and strengthen the connection between your development and students' development. (Fullan & Hargreaves, 1991, pp. 64-82)

Fullan and Hargreaves (cited in Fullan, 1993b) identified four cultures of teaching:

- *Fragmented individualism* - the recognition of much isolation and barriers to change and improvement because there is a “ceiling effect” on how much people can learn where there is not much access to each other.
- *Collaborative culture* - here there is much more sharing, trust, and support. Teachers collaborate on instructional issues, and this facilitates growth. You can actually become a better teacher just by being on staff at a certain school.
- *Balkanization* - the teachers’ loyalties are to a subgroup, not to the school as a whole; this description may be used for innovators too, not just for subgroups against change.
- *Contrived collegiality* - collaboration is valued and you see examples of peer coaching, site-based teams and mentoring, all of which seem to be good ideas and on the right track, but they are contrived because they are policies. (Fullan, 1993b, pp. 6-7)

The research indicates that the culture of most schools leaves teachers isolated and does not encourage them to work with others in solving problems or improving student learning. As Joyce, Bennett, and Rolheiser-Bennett (cited in Kane, 1994) suggest:

The culture of the school has proved to be a very tough customer indeed. Proposals both for the “empowerment” of teachers and for an increase in the use of the knowledge base in education depend on the realization of a radically revised workplace with very different relationships among teachers and much greater attention to the application of knowledge than is the norm in educational settings today. (p. 6)

Failure to take into account the power of the school culture in change efforts is a recurring theme in the evaluation of change efforts (Kane, 1994).

### **Professional Development and Technology**

There is a dramatic difference between the ways teachers learned during their training or pre-tenure years in traditional classrooms and effective initiatives of today.

Now, teachers must be actively involved in learning and be given opportunities to discuss, reflect upon, try out, and hone better instructional approaches. If teacher learning takes place within a professional community that is nurtured and developed from both inside and outside the school, significant and lasting change may follow (U.S. Department of Education, 1996).

As teachers identify more and more professional development opportunities within the school, they can resort less often to one-shot inspirational workshops and other traditional forms of professional development (Darling-Hammond, Lieberman, and McLaughlin, 1995). The struggle for excellence in teacher education is one of changing societal values, needs and dispositions (Novak and Berger, 1991). Presently, this is evident in the emphasis placed on the use of computers and related technologies. Teachers are striving to integrate these high-tech tools into the processes of teaching and learning.

According to Strudler (1992), "teachers teach as they have been taught, rather than the way they have been taught to teach" (p. 5). Lieberman and Rosenholtz (1987) state that change is very difficult because of longstanding norms and the lack of collegial interaction. Mann (1994) suggests that the majority of teachers have less than a decade of experience using technology in the classroom. As teachers prepare classrooms that will include technology, at the same time, they must also prepare themselves to use this technology.

Constructivist learning theory indicates that curriculum is content dependant and for students to understand how to use the technology it must be a seamless tool used in their own educational experiences (Jongejan, 1991; Schrum, 1994; Wetzel, 1993;

Woodrow, 1987). Lockard, Abrams, and Many (1994) echo this view in reporting that the proper implementation of computers is “through an invisible integration into the curriculum”(p. 136).

There is a growing consensus that the integration of information technology into the teaching and learning environment can best be addressed through advocating and role modelling (Wright, 1993). Advocacy implies showing others how technology can be applied to enhance their teaching. The use of technology in professional development training sessions may set a role model as well as demonstrate the personal and professional benefits of its use.

An innovative process based on a strong needs assessment foundation can result in an implementation phase in which teachers see the proposed changes as being in the best interest of everyone, including themselves (Ragsdale, 1988). Hixson and Tinzmann (1990) recognize the need for fundamental changes in the content and process of school. They say that the restructuring framework necessary to improve the educational outcomes for students also sets the context for rethinking the role of professional development in the educational structure. They propose that professional development is the primary vehicle through which important educational changes are implemented.

Professional development options should focus on renewing the spirit as well as the skills. Schulman (1987) observes that what we hold to be true for students must, of necessity, hold true for teaching and teachers. It is important for teachers to remain effective , be responsible to continually upgrade their skills, expand their knowledge, and develop new strategies to meet the changing needs of students and parents.

## **Professional Development and Technology Integration**

Wiburg (1994) suggests that the process of developing the training plan is in itself an effective staff development strategy for supporting technology integration. Becker (1993) notes that the idea of teachers learning and working together on a school site to solve problems unique to that site is a powerful one. Rogers (1993) supports this in saying that teachers will continue to use technology in the classroom only if they are successful in designing professional development and instructional activities that employ unique and personalized use of the tools that meet specialized needs.

Mann and Weir (1993) cite recent reports by Crocker, the Government of Newfoundland and Labrador, the Royal Commission of Inquiry, and Withers, which suggest that educators should be investigating new educational products and services. Computer networks like STEM-Net (Weir, 1993) are changing some of the ways in which we teach and learn from one another (Newman, 1993).

Mann and Weir (1993) refer to the technological cultural lag that the research shows about the educators in this province. Changes in the technology are occurring more rapidly than changes in our values and attitudes. Thus, the STEM-Net staff and consultants have implemented a comprehensive training plan, informed by theory, which lies in the belief that "skills training" alone cannot guarantee continued use of STEM-Net. As a result, course materials and delivery strategies include elements of critical thinking, reasoning, problem solving, and living-with-change environments and tools (Mann, cited in Mann & Weir, 1993).

D'Ignazio (1993) describes the cultural lag where businesses have been building electronic highways while education has been creating an electronic dirt road. Peck and

Dorracott (1994) suggest that the number of teachers experiencing the power of technology is increasing. Their definition of technology has "two components: a product (the tool that embodies the technology), and a process (the information base of the technology).

Reference is given to the three stages of technology:

- Stage one: the new technology follows the lines of least resistance.
- Stage two: users improve or replace previous technologies with the new technology.
- Stage three: users discover new functions for the technology based on its potentials. (p. 11)

Teachers in stage two say that computer technologies in the classroom have increased rather than decreased teachers' workloads, thus they have a hard time justifying the computer's existence in the classroom. However, teachers who are moving to stage three search for a paradigm shift using the process of technology to determine needs and to design appropriate solutions. Peck and Corricott (1994) describe the use of technology by these teachers as integral components of learning. They realize that it is what the student does that counts.

According to Ingwerson (1996), students must feel comfortable with the tools of the Information Age. In addition to basic skills, students' technological competence will be paramount to their success as they leave school and enter the workplace of tomorrow. If learning outcomes (APEF, 1994) require students to show a level of computer proficiency, then there must be some direction to the teachers as to what computer proficiency means. Once these goals are clear, then attention must turn to staff development and what Senge (1994) would call a learning organization.



The need for the educational system to empower teachers to make appropriate and effective use of computer-related technology is well documented (Moursund, 1992). Technology-based solutions in education can free the teacher to do the important work that requires human interaction, continuous evaluation, and improvement of the learning environment. Kinnaman (1994) suggests that the human factor is of major importance in any technology-oriented staff development.

November (1993) gives one indication as to why many teachers have not reached stage three level of use: "Part of the reason staff development too often stops with training and never moves on to the important education/thinking level is a lack of respect in the professional culture for the teacher as lifetime learner" (p. 16).

Lockhard, Abrams, and Many (1994) suggest that a lack of teacher training is one of the major obstacles to achieving the goal of computer integration into our schools. This is also supported by Ragsdale (1988) who also states "The values component is often an important determiner of why people support or reject the use of computers in general, in education, or for other specific applications" (p. 229).

Costello (1997) affirms that we cannot underestimate our leadership role in involving staff in the planning stages for staff training. Furthermore, a school's professional development team should be representative of key stakeholders in the learning process. This would solicit a variety of viewpoints and interests, not just the trailblazers. For a school-wide initiative such as this, you need to lead the whole school, not just those who love technology.

The technological revolution in schools depends both on a concerted investment strategy to help educators obtain these technologies and on educators confronting their reluctance to supplement the techniques of the 19th century (textbooks,

chalk, and blackboards) with the technologies of the 21st century (CD-ROMs, modems, and fibre optics). (Kane, 1994)

Costello (1997) succinctly puts it this way:

At issue here is not whether students will learn to use technology, because they will no matter what we do in our schools. The important question for us as educational leaders is whether or not we want to be part of the solution. If we do not become involved as leaders in developing and implementing technology, others will step forward and do this for us. If this happens, the end product might not be something that promotes the best interests of students or education. (p. 58)

### **Guidelines from the Literature**

The ideas collected throughout the research for this project is certainly not all encompassing nor complete for every school or district. Each of the topics covered are timely regarding the dynamic nature of technology in education.

I have collected the main points from the literature review under their respective headings in the guidelines that follow.

#### **Guidelines on Professional Development**

- professional development is the primary vehicle through which important educational changes are implemented
- teacher learning that is nurtured and developed by a critical study process will result in significant and lasting change
- follow a problem solving process in which data are collected and analyzed and changes in practice made based on this analysis
- the concept of the school as a learning organization allows better integration of the various components of professional development
- incorporate results-driven education, systems thinking, and constructivism

- training is but one component of professional development
- professional development can be a collaborative, interactive and systemic experience situated in a given context
- respect in the professional culture for the teacher as a lifetime learner
- professional development is a continuing journey for individuals operating within the context of their own unique needs and circumstances.

#### **Guidelines on Change**

- change is now approached with an emphasis on process and its context
- the change process takes time; three to five years for stable implementation and predictable outcomes
- failure to take into account the power of the school culture in change efforts is a recurring theme in the evaluation of change efforts (Kane, 1994).
- the plan should be based on a strong needs assessment
- seek variety and avoid balkanization
- provide continued follow-up, support, and pressure
- involvement in a development and improvement process
- consider cognitive aspects of teaching
- link professional development and student outcomes
- take part in active initiation ...Ready, Fire...Aim: get ready to do something, begin doing something carefully, and then consolidate that experience with an aim.

- the idea of teachers learning and working together on a school site to solve problems unique to that site is a powerful one

#### **Guidelines on Technology Integration**

- the human factor is of major importance in any technology-oriented staff development
- course materials and delivery strategies should include elements of critical thinking, problem solving, and living-with-change environments and tools
- technology has two components: a product, and a process
- the process of developing the training plan is in itself an effective staff development strategy for supporting technology integration
- uniqueness of the individual setting is a critical factor; what may work in one setting may not work in another.

## **CHAPTER FOUR**

### **ACTION RESEARCH TO DETERMINE THE SCHOOL'S NEEDS**

This chapter contains a description of the action research that I conducted. I used this method to guide my research study and my literature review. This enabled me to construct the information needed to create the training sessions, and to recognize the support required.

This chapter focuses on the methodology of my action research. It describes how I shared my technology interests with the staff, the promotion of technology awareness, the action research cycle (Appendix A), and my data collection process with its analysis. There is an inclusion of elements from the literature reviews that support the thesis of the project. Information from the professional literature was combined with information from the data analysis to design the best options for action.

I have provided the context in which my project is based. From my preliminary study of existing archival information, I prepared an information package to share the school's history of technology with the staff. Data incorporated here included the school's mission statement, minutes from meetings, school assessment reports, school improvement plans, and annual reports, newsletters and staff memos.

#### **The Context**

During the five years prior to the start of this project, the advancement of technology was haphazard at Woodley Collegiate. New computer hardware, repairs and

software were usually purchased based upon the recommendations of one of the three “techie” teachers on staff. This would occur many times throughout the school year when one of these teachers would run into a technical problem specific to his class. After describing the problem to the principal as one that requires immediate attention, he was quickly given the “okay” and the purchase order to fix “whatever it is”.

The previous scenario was fairly typical at this school. It grows out of a situation where the administrative leaders of the school want technology to guide the way, but they lack the technological expertise and are unsure of the overall plan to follow. With this techno-insecurity, a principal or vice principal can easily fall back to trust a computer savvy teacher whose knowledge and self confidence convinces the administrators that his decisions are the only ones. Also, this person trains others on staff to depend on him and develops his own “techno-groupies” isolating themselves and driving away the other staff members who truly want to learn how to use the technology efficiently. This is easily done through technobabble conversations and intimidation.

### **Action Research Process**

As indicated earlier, I based the model of action research used in this study on the work by Calhoun (1994). This was chosen to guide my dissection and investigation of the teachers’ use for technology. In this section I have followed Calhoun’s outline (Appendix A) and I have provided information that was specific to this project.

(i) Select a focus

The main focus was to conduct school-wide research that would improve the school's professional development initiatives. It was felt that if the teachers were taught to integrate technology into their classroom, eventually the students should benefit. Also, agreeing to conduct a needs analysis of the staff would help with obtaining staff consensus with respect to the initiatives.

(ii) Collecting Data

Information would be collected through 3 staff surveys, 8 teacher interviews, records of Tech Team meetings, staff-room sign out records of reading material on technology, computer lab booking schedules, and by monitoring the staff room regarding teachers' comments and behaviours.

(iii) Organizing Data

The data was collected, read, and sorted by the researcher. Some of the data was shared with the staff at the closing of the school-wide professional development day that preceded this *Technotraining* initiative. The data from each of the 3 direct surveys was collated with each relevant survey in the appendices of this report (Appendices D, F, G). Information from the oral teacher interviews was written in this report (Chapter Four).

(iv) Analysis and Interpretation

Analysis of the data provided vivid information about what the teachers really wanted to know in their training, and how they wanted to experience it.

### **Action Research Project - Needs Assessment, Analysis and Interpretation**

In examining my data I would regularly follow the guidelines of Calhoun (1994) (Appendix A), and the district's Process Model of Implementation (Appendix B). Relevant information gleaned from the data was used in the design of the training. Below I have provided some of the key information that was used here for this purpose. Specific data can be referred to in the appendices.

According to the first survey (Appendix D), 16 teachers indicated that they would use the lab if the lab schedule matched their course schedule. Of the 21 teachers that responded, 61.9 percent used a computer at home, and 38.1 percent used a computer at school.

Regarding the main purpose of computer use, 15.4 percent used them for preparing handouts and tests, while 15.4 used them for e-mail. Three other areas that were similar in percentages of use were mark-managing software (9.6 percent), searching the worldwide web for ideas and tests (9.5 percent), and managing student attendance and scheduling (9.5 percent).

Over half of the teachers surveyed (52.4 percent) felt that their inadequacy was their biggest fear preventing them from integrating computers into their classrooms. Various other fears contributed to a 38.1 percent weighting: lack of preparation time to get comfortable with the network or software, problems with running a program successfully, and not enough time to set-up for using the lab properly.



With respect to inservice needs, teachers indicated the following requests: setting up a class for access to the new lab (66.7 percent), saving files to a disk (47.6 percent), and opening programs in Windows (42.9 percent).

Regarding the use of technology to help with teacher planning and preparation, the following three requests had the same weighting (28.6 percent): word processing, using the mark-manager program, and using a program to design and display lesson plans. The decision was made to include word processing skills into the training design, since the use of a mark-manager or presentation software would be included in later training sessions.

Intermediate requests of technology use was topped with using the worldwide web, its potentials and pitfalls (57.1 percent), searching the internet for lesson plans and project ideas (42.9 percent), becoming more familiar with e-mail (42.9 percent), and setting up a class for access to the new lab (42.9 percent). Due to these high numbers, efforts were made to include lessons pertaining to these skills in the training plan.

The advanced requests indicated needs such as troubleshooting WindowsNT 4.0 (28.6 percent), and using the scanner (23.0 percent). Tips on troubleshooting WindowsNT 4.0 were included in the training, since this was the operating system used in the multimedia lab. Scanner information would be demonstrated, but instructions would follow at a later professional development session.

The second survey (Appendix F), "Professional Development Staff Survey," was completed to reaffirm that staff still wanted training in technology implementation, since there was a time lag due to the financial constraints imposed on the inservice budget. A significant 95.7 percent of the teachers indicated "yes," they did want this training. As a

check for specific requests with regard to the training, the teachers indicated the following areas of training were needed: how to use Win95 to save and retrieve files (34.8 percent), bringing a class to the new multimedia lab (21.7 percent), bringing oneself (no students) to the new multimedia lab (21.7 percent), using the Internet (30.4 percent). It was significant that, even though the option of "Other" was included in the survey, there were no selections of that option.

Teacher preferences for the instruction and training indicated that 82.6 percent wanted small groups, while 13 percent requested a combination of large and small groups, depending upon the lesson.

In the open-ended suggestion area on the survey, these common requests were used to influence the design of the training: "Let's use our own facilities (the *Tiger Zone*) so we get used to it," "I want to learn how to print off a hard copy in 10 easy steps;" and "What about training and follow-up after the inservice?"

The first two surveys were instrumental in giving the teachers ownership in the *Technotraining* sessions. Their needs and viewpoints were received and integrated into the sessions.

The third survey, "A Quick Poll for the WinSchool Training Session" (Appendix G), was administered one year after the *Technotraining* session. Several requests from the first two surveys were prioritized for professional development at a later date. One of these items requested training to use the Marks Module section of the WinSchool program. I surveyed the staff to help with teaming teachers in to homogenous groups of two teachers each. This was implemented in a school-wide professional development session in the 1998-1999 school year.

With the positive experience of using open-ended questions in my earlier surveys, I included several partial statements that encouraged teachers to provide detailed responses of their own. These responses were very rich in their content. Many of them provided answers that indicated that teachers were showing a deeper understanding of the technology applications at the school.

Through my observations in the staff room, teachers seemed to increase their collaboration with each other. Use of the staff room computer increased significantly. Comments about the school's webpage screensaver were more frequent. Requests for help were more specifically related to characteristics of the technology. Teachers were more comfortable with technical terminology.

I had provided a sign-out sheet for brochures, pamphlets and website directories. Two teachers had used this sheet. However, there were often times when these resources would be left on the staff room tables. This indicated to me that teachers were using this information, although they neglected to enter information into the sign-out sheet.

I kept a monthly log of the *Tiger Zone* (multimedia lab) sign-in schedule, which teachers had to use, if they were to access this lab. During 1997-1998, seven of the 23 teachers on staff had used it regularly. Three of these teachers were members of the Tech Team. Six of the teachers used it less than six periods. In the following school year, 1998-1999, 13 teachers of the 24 on staff were using it regularly. Four of these teachers used it more than 10 periods each, while seven of them used it three to four periods each.

From the data, I concluded that the *Technotraining* sessions encouraged teachers to use the technology more frequently, and that they could even have fun doing it. To reinforce this point, there was a significant increase in the utilization of the *Tiger Zone*

following the *Technotraining* sessions, as they did not occur until February 1998. The biggest increase in utilization occurred in the 1998-1999 school year.

Another revelation in this project was recognizing the importance of a needs assessment in conducting staff training. Listening to the teachers' needs was paramount to the success of them taking ownership of school-wide initiatives like this.

### **Preliminary Preparation**

To help establish technology awareness amongst the staff, there were several initiatives that I introduced well before the scheduled two-day *Technotraining*. Each of these items is described in the sections that follow.

#### **Tech Team**

The school's computer team was initially made up of four staff members. The principal was on the team as a friendly, administrative organizer. Many times he claimed to staff members that he was naïve and ignorant about technology, however he helped the team with his administrative skills with respect to finances and protocol. The remaining members were the school's "techie" teachers. These were the teachers who ordered, installed, and used the technology most frequently, and to whom staff members flocked whenever they experienced a "techno-glitch". Completing the team were the vice-principal, the computer-technology teacher, and the art teacher.

As the school's learning resource teacher, I modestly insisted, with my knowledge of technology and information literacy skills, and life-long learning patterns, that I could help this team. I joined this "computer" team and attended monthly meetings regularly.

Before my initial meeting, I indicated that the word “computer” denotes a strong emphasis on hardware. There were more than just hardware issues here and I suggested that the team should have a name synonymous with their whole mandate. I proposed that the group be called the Tech Team. This name was accepted.

I attended my first Tech Team meeting on October 1996. Without taking part in much of the discussion, my intention here was to examine the present state of technology at the school. I soon discovered that the main focus was predominantly on the acquisition and installation of computer hardware. As in previous years, this centered on discussions of computer speeds, peripherals, and hardware conflicts. Most of the decisions related to this depended upon the committee’s recommendations about equipment that they deemed necessary for the school.

There were no suggestions to solicit opinions or feedback from other staff members. Certainly, there were no discussions about training teachers to use the technology. I inquired about the types of software needed for specific curricular programs by asking the group, “What do we really need?” This question provided me with the opportunity to share a list of the current software inventory (see Appendix G, item 3) with the group. I described several curricular applications for this technology and mentioned two teachers’ names as well as the programs they were integrating into their classrooms. Each one of the team members was doubly surprised.

First, there was the revelation in the number of various programs on hand. Second, there was the astonishment that several teachers that were technologically inexperienced were using technology in regularly planned resource-based learning units. In this team of “computer experts”, the art teacher quickly admitted that,

"If these "techno-newbies" are going to be walking into "our" labs, then we're going to have to establish some guidelines. Without them, nobody will know what to do in there...who knows what will happen or what state we'll be in if we don't do something here! There's too much invested and I've waited and worked too long to get this lab where it is today, then to go and have somebody 'screw it up'."

An intense discussion about ownership followed. Each teacher on staff certainly should have the right to use the school's technology. However there were major concerns that surfaced here about the following issues: software installation, dismantling computers, and access rights to the network server. Who should be given the green light here? The group discussed minimal staff needs for using the technology with their classes. Suggestions were made to design a basic set of rules and recipes that could be followed by each teacher using the multimedia lab. Nobody accepted the responsibility to do this at this point. The decision was unanimous that only teachers on the tech team who were comfortable using the administrative tools in *Windows NT 4.0* would be given password permissions to do so on the server. Also the same teachers would be authorized to dismantle or move computers to the extent of their comfort levels and experience.

The team discovered that there were many useful software programs on site. Most staff members were unaware of their presence and potential. Even the common packages such as *Corel WordPerfect Suite 8* contains powerful programs that three teachers on the Tech Team were unaware of. I described several features from this package that could be quite useful to help teachers and students to integrate their information skills into their curricular work for truly mind engaging experiences.

*Corel WordPerfect Suite 8* is a software bundle that is housed in most schools in Newfoundland. Many teachers are aware of its word processing functions but are

ignorant of the other programs with this bundle. *Corel Presentations* and *Netscape Composer* are two powerful authoring tools, which would give teachers the potential to develop electronic presentations. Exposure to a document created in *Corel Presentations* can be quite a motivational tool. This program can quickly transform most common text files into a multimedia presentation with quite a professional look to it. The addition of clip art or animation graphics, and the inclusion of sound files can combine to complement the presentation of information with a rich blend of multimedia accents. *Netscape Composer* may be used in a similar way to create a school's Web Page using a user-friendly word-processing interface to create documents in Hyper Text Markup Language (HTML). Such documents may be uploaded to a server networked to the Internet for worldwide distribution, or simply displayed on a stand-alone workstation for local use. Such characteristics in the teachers' control can offer powerful motivation for himself, as well as his students. Lessons can be enhanced with minimal technical effort through the use of online wizards (interactive tutorials that cater to the user's needs).

The realization that programs like these were in limited use due to ignorance lead the team to start thinking about the curricular applications for this software and the appropriate training required for the staff. I felt that I had achieved my goal to create an awareness of the current inventory and to start developing the awareness for training needs.

I proposed at this meeting that a component of successful technology integration should include teacher training. The committee agreed to the inclusion of a professional development section onto the regular agenda of each subsequent Tech Team meeting. I suggested that we should survey the staff to assess their technology needs. It was agreed

upon that I would do this at the earliest possible time. The survey was administered in November (1996) (see Appendix D). As well, I volunteered to provide the staff with a written update about this new multimedia facility and the current projects that several teachers were doing with me. This update was written and included in the information package for teachers at the December (1996) staff meeting (see Appendix C).

### **Staff Room Milieu**

Earlier in this report (Chapter Two) I had described my positive rapport with the staff as beneficial in helping to establish their trust in me. Credit should be awarded to the staff as well, for it was well known in the district (personal communication) that our staff was warm and friendly. Whether newcomers were invited guests or not, strangers to our staff room were usually given a ritual insult within the first five minutes of their arrival. This certainly broke the ice and would allow the visitor to relax and feel comfortable there.

Staff room conversation centered on various issues in the run of the average school day... from sports, to vacations, to students' progress, to retirement. It depended on the time of day, time of year, and the mood of the staff members. Generally though, at the beginning of this project, "talk" about technology and the staff room Internet connection was limited to three main "techies". Most of the teachers avoided talking about the technology in a supportive way. It was usually derogatory, namely about high costs of the equipment and the lack of support teachers receive for it.

### **Staff Room Computer Corner**

I prepared to enhance the area surrounding the Internet workstation in the staff room. As part of an earlier *Lighthouse Schools Project* (1990), this was the only



computer station with Internet access and was for teacher-use only. Only five teachers who had their own Stem-Net Internet accounts generally used it.

The idea here was to draw the staff's attention to recognize that something new and different was happening. For the first time, the staff was provided with a technological help station. Temporary displays were changed weekly. This contributed a refreshing look to the display area so that the staff members would notice that this was an active area. This type of attention could also contribute positively towards each staff member's own inventory of their technological skills.

I felt that this could also help to promote the new technology and to help increase the staff's awareness of issues concerning technology implementation in the school. This could then help the staff to make informed choices when they would be asked for their input through the interviews and surveys I would use in the needs analysis.

It was my intent to promote the staff's awareness of the curricular resources available on the Internet through this computer; to dispel with some of the complexities of the login procedure; and to encourage staff members to apply for their own Stem-Net Internet account. There were five items that I designed to try to accomplish this.

(i) *Tiger Zone Tips* – I prepared a new bulletin board display titled *Tiger Zone Tips*. Displayed under a banner of the school's web address (URL), this contained regular postings of:

- *Internet news in Education*- newsclippings or webpage printouts showing effective uses of Internet resources in the classroom.
- *SchoolNet News* - a quarterly publication describing Internet projects in Canada.

- *WWW Hotlists* – URL Internet addresses for lesson plans online, weather forecasts, and current topics of interest(i.e. Halloween, sports matches, daylight savings info, trivia, etc.)
- *Today in History* – daily webpage printouts of past events
- *Online newspapers*- including regular printouts of local online newspapers

(ii) ***“Don’t Sweat the ‘Net!’”*** – I set up a staff room collection of updated articles, books and magazines dealing with technology and education. Locally produced resources included in this collection were three booklets obtained from the district’s Information Technology Resource Centre:

- *Internet Mail using Eudora Lite 3.0*
- *Computer Basics: Windows 95/NT*
- *Browsing the World Wide Web*

A sign-out system was put in place to track the frequency and type of articles borrowed from the collection.

(iii) ***Staff Room Workstation Screensaver*** – The workstation screensaver was set to display a screen captured image of the school’s webpage

(iv) ***The Tiger Zone Booking Schedule*** – For teachers taking classes into the new multimedia computer lab, The Tiger Zone, a sign-in schedule was set up in the Computer Corner. This would allow me to monitor the teachers and the types of classes using the new technology.

(v) ***Login Scripts*** – From the Stem-Net website resource page I downloaded login scripts which I added to this staff room computer. These login scripts help to

automate some of the Unix login procedure so the user can login to the Stem-Net site with fewer keystrokes.

### **Preliminary Staff Presentation**

I was given an opportunity to present the *Information Package* to the teachers at the regular staff meeting in December (1996). Keeping with the theme, *Teachers Making Technology Friendly*, I designed several overhead transparencies to promote this message.

I invited two teachers on the staff to share in the delivery of this presentation. This would add variety in the delivery and promote the fact that I had others supporting me here. I felt that their philosophies on learning, the staff's trust in them, their positive attitudes, their willingness to share, and their modesty were characteristics that would contribute towards a good delivery.

The first teacher I selected here was the science department head. I had provided him earlier with a copy of *Guidelines for STELLAR School Project Proposals*. His task was to describe the process and to invite any staff member to work with me in developing a *STELLAR School Project*. Although he had never used the new multimedia lab with his classes, he had indicated that his "yearn to learn" was there; he was just never given the opportunity to do so until now. In addition to being a self-proclaimed rookie, this person is influential among the staff. His words and actions are not over-powering, not forceful, nor commanding. However as department head, he is seen as a listener, a caring mentor, and a friendly, pleasant person.

The second person invited to help with the presentation was the computer-technology teacher. Friendly and helpful in his approach to technology, despite carrying a heavy class workload, he is viewed by many staff members as being very efficient in the execution of his duties. Although he is very knowledgeable about technology and its applications in school, he refrains from using complex technical jargon when helping others. Thus I felt would find his approach encouraging as he gave the staff a brief three-minute description on the "how-to's" in using the multimedia lab. He emphasized the fact that it would be very difficult for any staff member to "hurt" the computers. I asked him to stress this point as I had earlier staff room conversations with 3 teachers who felt that they would damage their computers if they made a mistake logging on.

Neither of the two presenters would ever greet the staff with put-downs nor engage in an intimidating technobabble speech. During staff room "prep time", "recesses" and "lunch breaks" these two teachers were quite approachable for any staff member needing assistance or help. In their presentations each of them invited staff members to increase their understanding of the technology that could be used with their students.

Three teachers who had dabbled with this new technology in recent weeks were also included and recognized here. Their attempts to learn computer skills single-handedly were commended. Compliments like this to staff members are confidence builders. As well, it welcomes these people to take ownership of the present initiatives. This helps to expand the network of stakeholders upon which to frame the implementation of technology into the curriculum. It also establishes contacts for others who may want to inquire about or to pursue using technology within their own classes.

The purpose of this preliminary session was twofold: first, to inform the staff about the purposes of my action research study, and second, to invite teachers to become involved with their own training in the implementation of technology.

In addition to contributing their input towards the development of a training session in technology, the staff would be creating a knowledge base through their involvement in the action research. This could also benefit future endeavors of this type. Efforts following this meeting could be the catalysts to stimulate discussions and to influence surveys, thus allowing the staff opportunities to share their views about their expected outcomes for the intended training sessions.

#### **Pre-Inservice Tutorials**

Teachers were offered one-to-one guided tutorials with me in the school's multimedia lab. Four teachers took advantage of this: a special needs teacher, an English teacher and two social studies teachers. I met with each of these teachers individually at times that were convenient for them. This enabled them to ask questions and practise various skills related to what they wanted to use in technology. The use of terminology makes quite a difference to the comfort levels of users of technology. I constantly made use of non-threatening terms to encourage those new to the technology to feel comfortable.

#### **Teacher Interviews**

The staff was formally informed about this project through my presentation at the staff meeting. I requested permission from my principal to interview a portion of the staff to gain more input for the design of the training sessions. I conducted semi-structured interviews with eight teachers. At this point I was trying to get the true, personal feelings

about the staff's perception of technology training. I decided to use oral interviews with this group since all of the staff had just recently completed my first written survey. "What's On Your Mind?" As well, they had just finished a battery of regular paperwork for student evaluations, and many of the high school teachers were preparing their midterm exams. Teachers were busy, so oral interviews were convenient. Using these face-to-face interviews I could usually determine the sincerity of each respondent and their level of conviction to their responses.

Once a teacher agreed to a time and place for the interview, I would begin by using the question list below. Arranging the interviews to be fairly private was facilitated by my flexible timetable as a Learning Resource teacher with 42% of assigned classroom duties. The individual interviews took place in my office in the school's Learning Resource Centre or in the staff room during the teacher's preparatory period. Most interviews were completed in a 40-minute session. There was one exception to this with the interview of a grade nine teacher who was beginning to use the technology. His interview continued into the first 20 minutes of a lunch period as he had questions for me about the technology. Sometimes teachers' responses permitted me to probe for clarification or for examples of specific situations. Each teacher was asked to answer the following four questions:

- Question 1.** *Should we make the effort to use our designated professional development days as part of a bigger plan for technology implementation at our school?*
- Question 2.** *What kinds of training and learning do you need prior to bringing a class of students to our multimedia lab, The Tiger Zone?*
- Question 3.** *What kinds of problems have you experienced (or expect to experience) in using this lab?*

**Question 4.** *Is there a particular request that you have with respect to how you can become trained to use this lab effectively?*

The first two teachers I chose to interview were from the tech team. My reasoning here was to get a grasp of the cutting edge technology we may be heading towards, and to check the validity of my questions. Of the remaining six teachers interviewed, three teachers were moderate users of technology in the school, two were beginners, and one was a non-user. I have included some of the more common and more specific responses below each question.

**Question 1.** *Should we make the effort to use our designated professional development days as part of a bigger plan for technology implementation at our school?*

All eight teachers replied positively to this question. These teachers suggested that energies be spent to increase the level of our technological skills in the classroom. One of the computer-savvy members of the Tech Team answered:

Well isn't it about time that we educators caught up with the corporate world? Not only with our knowledge level in using the technology, but also especially with the way we do our training. Our inservices are sporadic, disconnected, and infrequent. Do you think Bill Gates operates Microsoft like that? *We* have to be trained to teach our youth these new information skills.

One of the teachers beginning to use the technology stated:

Some of my students are training *me*! It is all right to let them see that I am still willing and able to learn, but I need some formal training in using the Internet and the CD-ROM programs here. Yes, we should try to access training for this.

**Question 2.** *What kinds of training and learning do you need prior to bringing a class of students to our multimedia lab, The Tiger Zone?*

One of these teachers noted that the Tech Team demonstrated a committed and enthusiastic approach towards the initiative. She also said that it was refreshing to see

that she was asked for her opinion, and added that many times inservices are put in place without the formal consideration of teachers' wishes or needs.

You mean *my* opinion really counts? That's the first time they've ever done that. So you mean we're not just going to be shoved in a room and have a pile of papers thrown at us? More stuff we don't want to know?

Another teacher had a similar opinion:

How many times are we forced to an inservice without being asked about what it is that we want to learn in the first place?

**Question 3.** *What kinds of problems have you experienced (or expect to experience) in using this lab?*

On the issue of support, one teacher stated his frustration this way:

So here I am, in the lab with a grade seven class, two computers are locked up and a sheet of paper is jammed in the printer. We have about three minutes before the recess bell is about to go, and five students are hounding me to get their assignments printed for them on its due date. What do I do? I end up staying in the lab for most of the recess while I page the office and wait for help from somebody who knows this stuff. Meanwhile, two students stay to get their finished work and the other three... well, you know where they have gone.

A teacher who was a moderate user and familiar with the lack of support had this comment:

I knew what I was supposed to do when it didn't work, as it should. You have been with me and I watched you fix it before. But when I tried to give him a new password, it wouldn't work for me. So, for half of the period, I let him use someone else's... until you came.

Two other teachers referred to the low level of support that presently exists with respect to the maintenance of computer workstations and the local network. Computer malfunctions or glitches seemed to take a long time to fix and that students would often be waiting by a stalled workstation for a full class period without having the problem corrected. Quite often they would have to return to the lab at recess time or after school to



complete work that should have been done during the regular class time. Long periods of waiting to “get-it-fixed” does break the continuity of any instruction dependent on the technology.

**Question 4.** *Is there a particular request that you have with respect to how you can become trained to use this lab effectively?*

One of the seasoned teachers, who was just beginning to use the technology, suggested:

I think it's only right that we get our computer training here at school in the lab where we will be bringing our kids. Why would I go to some centre or lab at a school in the city and use a computer that is different from ours here? I want to get used to the programs we have, and learn how to use them on our own system. That's what I will be using when I bring a class in there.

This teacher gave a similar thought:

I want to know what software we have, where it is, and how I can use it. We need to have a tour and a “hands on” session or two to get familiar with what we have out there. Then I can work some of the bugs out before I bring a class in.

One of the Tech Team teachers indicated where this could go by issuing this question:

So I'm finally going to learn how to put video-clips and PowerPoint lessons into our WebPage? Who will train those of us who have taken the initiative to independently train ourselves? I guess I'll have to pick up a few tips online. Meanwhile, I don't mind helping with demonstrating or tutoring at the inservice.

Recognizing only a small number of teachers on staff were at this upper level of technical competence, this teacher offered his help as a trainer for Internet related sessions.

#### Summary

The results indicate that all eight of those polled expressed a genuine interest in learning about successful ways to integrate technology. Teachers who have used this

technology with their classes confirmed that technical problems, which go on without repair (or support), have a devastating effect on the successful implementation of using computers in the classroom.

An interesting point was made with respect to the surprise of several teachers that their opinions were welcomed and valued in the design of the technology training sessions.

I observed that staff input through these preliminary interviews provided a good springboard that I could use to build my information base about the staff's needs. *What's On Your Mind?* (Appendix D) was a direct survey. My analysis of the responses on this survey was shared with the Tech Team to recognize the staff's needs upon which the training sessions could be designed.

### **Information Package for Teachers**

I prepared the information package to help update the staff's knowledge base about current technology and its potential uses in the school. This included an information sheet about the current level of technology hardware present at the school and a brief description of how several teachers were using it. To complete the package, copies of two related journal articles were added, as were *Guidelines for STELLAR School Project Proposals*.

I wrote the information sheet, *Teachers Making Technology Friendly* (Appendix C), to brief the staff on the current levels of the technology infrastructure and possibilities for its curricular implementation. It informed the staff that support was needed. In addition to the "techies", it recognized other teachers who were active in using

technology. *Teachers Making Technology Friendly* includes a brief history of the school's two computer labs, recent acquisition of Internet service, and the background of present initiatives to integrate the technology into the classrooms. Special recognition was given to the teachers who provided their time and energy to the design and construction of the ten computer desks in this new lab. Two current grade eight projects, which utilize technology, were also identified. The first used CD-ROM software to allow students to find information that supplemented the grade eight Religious Studies unit, "Creation". The program was installed on a single workstation as part of a resource-based learning unit. The second grade eight project was about Latin America. It incorporated a computerized periodical index of the *National Geographic* collection at one workstation and at another a *CNN Newsroom CD-ROM* provided students with maps, facts and video-clips on the subject. Teachers involved with these projects were recognized here.

Two relevant articles from the literature review, *How Computers Live in Schools* (Miller and Olsen, 1995) and *Why Use Technology?* (Peck and Dorricott, 1994) were included in this information package. The first describes current issues in some Canadian classrooms that teachers face when they attempt to integrate technology. The second article illustrates the product of technology integration while emphasizing the process involved.

As decided in the previous Tech Team meeting, I downloaded the *Guidelines for STELLAR School Project Proposals* (<http://www.stemnet.nf.ca>) and included copies with this package. Examples of STELLAR School projects ongoing in two other schools were attached for the teachers' perusal. Teachers were invited to examine the types of Internet

projects currently in progress, and were offered the opportunity to cooperatively plan one of three *STELLAR Schools Projects* with me.

### **STELLAR School Project Planning**

On November 14 (1996) I received a fax from the district's technology coordinator informing us about the *STELLAR Schools Project* and the provision of training sessions in December for lead teachers at the district's Technology Education Centre.

The development of a successful *STELLAR Schools Project* proposal would result in the provision of Internet service for the school. A *STELLAR Schools Project* requires the school to participate in three curriculum-related projects that utilize Internet technology for each of four years of the program. Once the proposal is approved by the district *STELLAR Schools Advisory Group*, the school is required to submit proposals for three projects; two of these may be continuations of the previous years' projects. Only one original project is required in each year of the program.

I proposed to offer a launching point for teachers to use technology. Staff participation in a *STELLAR School Project* would be the first project of this type for the school. A *STELLAR Schools Project* would require the submission of a proposal from the school indicating its commitment to the planning and implementation of three curricular projects that incorporate the use of the Internet in their design.

This type of project has several technical prerequisites as well. Participating schools would be required to provide:

1. a Windows NT server and compatible software

2. a modem with a dedicated phone line
3. payment for a \$110.00 connection fee to Cable Atlantic
4. the designation of a lead teacher to oversee the three projects

The requirement in (1) above was present in the new multimedia lab.

I met with my principal regarding the remaining obligations for the school with respect to developing a project (November 14, 1996). My principal committed to managing the installation of the extra telephone line and paying the associated connection fee. I also told him that I had approached several teachers who had already indicated their interests in working with me on a project. The challenge was to enlist at least three teachers to work with in designing Internet projects to complete our application proposal to Stem-Net. At the December (1996) meeting of the Tech Team I agreed to be the lead teacher for STELLAR School Projects at our school. For our next staff meeting in December, I agreed to make an invitation for teachers to participate in the development of our proposal.

A school benefits in many ways when it develops a successful STELLAR School Project. In addition to a high-speed Internet connection and the access to worldwide resources, there are professional development elements that grow out of the proposal development. Interested teachers met to plan such a project for this school. These meetings became a catalyst to brainstorm unique ways of integrating the Internet (and its associated technology) into the curriculum. The time taken to meet and plan these proposals, established new ties between teachers. The pairing and sharing between individuals contributed to a healthy, dynamic atmosphere of positive and collaborative team planning.

### **Stellar Project 1 - Cyber Globe 3205: Integrating Worldwide Connections**

Early meetings with the Social Studies teacher were a little apprehensive. Neither of us had done this before. However, once we both understood and communicated our needs/goals, good ideas began to form. It was clumsy at first until we both realized that each of us brought different knowledge and skills to each meeting.

He had developed a well-structured Global Issues 3205 course. To the first meeting, he brought the course objectives, a broad knowledge of current world issues, and an open mind. A need for course enrichment was established along the lines of “something else...something that would grab the students’ interests and spark their enthusiasm”. At this meeting I presented the opportunities for integrating the technology that would help the students to meet their curricular objectives. I also expressed my feelings about embarking on such a project. I had feelings of excitement because a colleague was willing to collaborate on the project. There were also feelings of anxiety because of its newness and I did not know how the project would look in the end. I was also tense because I truly wanted both the participating teachers and the students to have positive learning experiences as they met with new information technology and its required skills.

After seven plenary sessions, the *Cyber-Globe 3205: Integrating Worldwide Connections Project* was completed. This was included in the *STELLAR Schools Project* proposal (Appendix E).

### **Stellar Project 2 - Writer's Block-Busters: Interactive Writing**

The English department head, a self-proclaimed technophobe (personal communication, November 13, 1997), agreed to take part in this project if I would look after the technology side, and he would ensure that the course objectives were provided. The end result after four plenary sessions was my development of the *Writer's Block-Busters: Interactive Writing Project*. This was included in the *STELLAR Schools Project* proposal (Appendix E).

### **Stellar Project 3 – UPLOAD '98: Hosting an Online Science Fair**

The plan for this project was to supplement the well-established annual science fair by enabling students to exhibit their science fair projects on the Internet. All students would be given the opportunity for active participation in this cybernetic science fair. Three meetings with the other two science teachers resulted in my creation of the *UPLOAD '98: Hosting an Online Science Fair project*. This was included in the *STELLAR Schools Project* proposal (Appendix E).

## **Conclusion**

My action research revealed to me that it is imperative for the design of the training to be a process rather than a goal. Also, there should be continuous feedback and revision rather than a means to an end. I realized that the design should be monitored regularly, as teachers' needs may change to meet with the current levels of technology. I referred to the teachers as the main stakeholders of the training, but I feel that this would impact on the main stakeholders in our school – the students. This could be the topic for another study at a later time.

## CHAPTER FIVE

### GUIDING PRINCIPLES AND LESSONS LEARNED

Through involvement with school improvement, action research was used as a crucial component in the success of implementing professional development initiatives at one school. An extensive literature review was conducted about action research, change theory, learning organizational theory, information technology, and teachers' professional development.

Information gleaned from the staff's responses to the needs analysis was used to enhance this staff's awareness of issues surrounding technology support and to design a training program on technology implementation that was more than just a two-day "one-shot" staff inservice.

Although this staff usually frowns on research surveys that come from outside, this was a time where they were able to reap the benefits as the data was to be used internally. Extensive planning was in place for February 1997, however, provincial budgetary issues delayed the school's professional development session for one full year. In the following year there was a small change in staff personnel so a review of the initiative was needed. The *Technotraining* occurred on February 19-20, 1998.



## Recommended Guiding Principles

A number of guiding principles grew out of my engagement in this project. I have collected and sorted my learnings into two categories of lessons...technology and professional development.

### Technology Lessons

- Lesson 1: The use of technology should be tied to instructional goals.
- Lesson 2: Technology projects should be connected to curricular objectives.
- Lesson 3: Teachers need to be the guide; the computer cannot do it all.
- Lesson 4: Include all stakeholders.
- Lesson 5: Stay in the know.
- Lesson 6: Be aware of your technological hardware and software inventory.

#### **Lesson 1: The use of technology should be tied to instructional goals.**

Attributes of today's technology can offer students many opportunities to become engaged and interactive with their own learning. Students learn and develop at different rates. Teachers may be trained to integrate the use of multimedia environments to enhance their students' learning experiences. Teachers comfortable with using technology are better able to identify and select technologies that may help their students to reach their individual instructional goals. Multimedia products can be integrated to help match students' various ways of knowing.

**Lesson 2: Technology projects should be connected to curricular objectives.**

When teachers are made aware of the presence of computer programs which may enhance or enrich their curricular objectives, there seems to be a better chance of successful implementation. Revised intended learning outcomes now expect students to be proficient at accessing, evaluating, and communicating information (APEF, 1994). The technology becomes a necessary aid instead of an “add-on” or a special “treat”. In addition, technologies now can enrich resource-based learning units by providing students high-level and high-interest activities that they otherwise could not experience.

**Lesson 3: Teachers need to be the guide; the computer cannot do it all.**

Students become active participants in their own learning. Though the teacher is no longer the “sage on the stage,” students still need the guidance to take them along the learning pathways through today’s local and global networks of information. The teacher can provide students freedom to explore, chances for mistakes, and room to grow. Left with the computer alone could cause confusion or inappropriate viewing. While using technology, today’s students need the teacher’s guidance as they learn to make informed choices.

**Lesson 4: Include all stakeholders.**

The best interest of the student should be connected to any infusion of technology into a school. For successful integration of the technology, effort should be made to inform all stakeholders within the school. District personnel, parents, school administrators, teachers, and students should be in touch with a school’s technology

initiatives. Needs can be understood. Successes can be shared. Opportunities arise. People become involved more easily when there's an overall awareness of a school's initiatives.

**Lesson 5: Stay in the know.**

School leaders should be on top of current technological developments that impact on learning. Information companies are harnessing the technology to increase the speed, capacity, and reliability of their products. Technology can connect students to many resources existing outside the school that provide up-to-date zones of information. Local and global projects allow students to connect to a live world of learning. "It is irresponsible for a school to mobilize, initiate, and act without any conscious way of determining whether such expenditure of time and energy is having a desirable effect" (Glickman, 1993, p. 54-55). Administrators, learning resource teachers, and technology trainers need to be aware of what's new, and be able to make informed decisions that benefit the school.

**Lesson 6: Be aware of your technological hardware and software inventory.**

Modern technology is expensive. Schools have limited budgets. Administrators and teachers often see educational technology as a "money pit" that strains schools' resources. The challenge then, is to develop a comprehensive and versatile plan that keeps the users accountable for the effective use of technology at a school. Teachers need to know what is available, what works, and what doesn't. Awareness of a school's technology inventory and its potential can support meaningful ways of its integration into

the classroom. This can help to soften the urge to always have the cutting-edge expensive products as soon as they are marketed.

### **Professional Development Lessons**

- Lesson 1: Engage in action research.
- Lesson 2: Grant as much support for professional development as for technology.
- Lesson 3: Teachers should be given opportunities to select the types of training relative to their needs
- Lesson 4: Be aware of staff balkanization.
- Lesson 5: Be prepared for change.
- Lesson 6: Follow up.
- Lesson 7: Schools are complex learning organizations.
- Lesson 8: Share your mistakes.
- Lesson 9: Celebrate and reward.

#### **Lesson 1: Engage in action research.**

Action research can be successfully used as a tool to allow a close investigation of a school's professional development initiatives. The process involves selecting a focus, data collection and organization, data analysis, and interpretation. It allows the researcher to get close to the factors which the issue in focus. Within the scope of school improvement, action research becomes part of the solution by engaging teachers in studying their own problems within the context of their own organization. Thus, they inform their own knowledge about their practice and hence improve their teaching.

**Lesson 2: Grant as much support for professional development as for technology.**

Consideration for technology support and teacher training should be included in a school's technology plan. Costly technology can drain a school's budget very quickly. However the cost of integrating technology doesn't always have to be the obvious cash for hardware. Too often hardware is literally "dropped" off to a school with absolutely no consideration for training the teachers. Professional training for teachers can be improved by allowing for expenditures that will enhance and stimulate a teacher's' learning experiences.

Several examples are listed here:

- incentives and rewards
- updated displays of relevant support literature
- well marked signage in the multimedia environment
- pre-inservice training to boost teachers' confidence levels
- tutorials and mini-courses to follow-up and reinforce newly learned skills
- time for sharing successes on the staff meeting agenda
- tours of schools that have successful technology initiatives.

**Lesson 3: Teachers should be given opportunities to select the types of training relative to their needs**

Attention to teachers' requests about their professional development creates a healthy atmosphere centered on learning. Action research surveys or other instruments can measure the staff's needs. Anonymous surveys encourage greater participation and candidness. Teachers are quite attentive to each other's active anecdotes and suggestions. Ownership of the training session is increased when teachers' requests are attended or included into the exercise.

**Lesson 4: Be aware of staff balkanization.**

Teachers training in the use of technology are quite susceptible to staff balkanization. The nature of technology easily lends itself to the formation of sub-groups on a staff that can undermine healthy, well-planned school improvement programs. Maintaining variety can help prevent these "cliques" from forming. Sharing experiences among the staff and with other schools can help to advocate a professional learning environment (Fullan and Hargreaves, 1991).

**Lesson 5: Be prepared for change.**

Characteristics of the technology require a change in one's teaching style. Sustained change requires a non-threatening approach. This can be promoted when the teacher becomes the "guide by the side" rather than "the sage on the stage". Time is needed here as the teacher moves from the role as a lecturer to one as a facilitator. This change can be intense and far-reaching.

**Lesson 6: Follow up.**

Isolated “one-shot” training sessions are ineffective. Support should be provided before and after formal training sessions in technology. Professional development should be continuous and ongoing, as it is a process that develops over time.

**Lesson 7: Schools are complex learning organizations.**

If we are to succeed in bringing about meaningful improvement, schools must become “learning organizations” (Fullan, 1995). “The concept of the school as a learning organization allows better integration of the various components of professional development and incorporates results-driven education, systems thinking, and constructivism” (Brown and Sheppard, 1997).

**Lesson 8: Share your mistakes.**

Teaching has been labelled as a lonely profession. Too often, as teachers we close our doors.... we shut the world from us and we shut us from the world.

“Let’s branch out from our traditional world... and surrender the belief that a person must be in control to be effective. We’re asking you to reveal your uncertainties, to be ignorant, to show incompetence. These are essential preconditions to learning because they set free our innate capacity for curiosity, wonder and experimentalism.” (Senge et al., 1994)

**Lesson 9: Celebrate and reward.**

Have fun creating ways to complement and reward successes amongst staff members. Share your successes with your staff. Celebrate the fact that a teacher has

improved. Award prizes at staff gatherings...during coffee breaks or at the beginning of a training session. Have fun. Recognize improvements. Advertise... in the staff room or on a newsletter, post digital pictures of teachers learning. The positive energy this creates is contagious. Notice change whether big or small. Enjoy and promote learning.



## CHAPTER SIX

### THE TECHNOTRAINING PACKAGE

This chapter includes a detailed description of the professional development *Technotraining* package. It provides the rationale, preparation and delivery of this package.

#### **The Rationale**

The purpose of this project was to support the training of teachers in their integration of technology into their classrooms. Previous initiatives on this theme were done in one-day workshops that were planned without the consultation of the teachers involved. The *Technotraining* for this project was not designed to be a “one-shot” deal. It was planned on the premise that the teachers’ opinions were valued in reflecting their needs; that pre-inservice sessions would be required to increase certain teachers’ comfort levels with technology; that a training session with the full staff will integrate activities based on the teachers’ needs; and that follow-up support will be provided for teachers integrating technology.

## **Preparation and Planning**

### **The Design of the Technotraining Handbook**

A fresh and practical approach was prerequisite in the composition and design of the teachers' *Technotraining* handbook. A blue 3-ring binder was used for several reasons:

- i. its use contributed to the professionalism of this initiative
- ii. it provided another avenue to display the *Technotraining Tiger Zone* logo
- iii. the cover art was a reproduction of the T-shirt logo printed on gold paper
- iv. the cover art was inserted into each *Clear-View*® pocket
- v. the binder's ring function allowed for onsite collation of the handbook
- vi. the binder's ring function eased midstream additions or corrections
- vii. the binder's inside front cover pocket provided a place to hold a customized 3.5" diskette and a highlighter (incentives)
- viii. the binder's inside back cover pocket provided a place to hold notepaper and pen (incentives).

Giving each teacher a binder provided them with a durable handbook that could be enhanced through the teacher's own collection of technological interests. Also, its presence throughout the school (in the teachers' classrooms, satchels, labs, or staff room) would provide a visual reminder of the experience. Follow-up training could be supported through continued references to the training handbook. It was referred to as a handbook throughout the training to reinforce its "hands on" usefulness.

All of the Technology Inservice documents in the main section of the handbook are original designs and were produced onsite. They are a result of brainstorming with the

school's Tech Team, incorporating training to match the requested needs of the teachers, and blending the knowledge of my literature review and research.

To help explain the organization of the handbook, I have included references to specific pages and sections below.

### **Rationale for the Contents of the Technotraining Handbook**

#### **Handbook page (i)**

This page contained a centred quote by Ralph W. Emerson, " Nobody can help everybody, but everybody can help someone." Using a large, simple font (Times New Roman, 30pt), I attempted to set a climate of helpfulness in which teachers of all three levels of technology use may feel comfortable. I was also communicating the reaching out efforts put into the organization of the whole *Technotraining* effort. The teachers were a main stakeholder group for this training initiative. It was my principle focus throughout the delivery of the sessions to share with teachers the process that resulted in the design of the training. I wanted teachers to see that many elements of the training were in place due to their requests and needs. To share this with the teachers could help them see that it was theirs. They had a part in its formation. It belonged to the teachers. Ownership of the *Technotraining* is a powerful motivator and I attempted to take every route available to me to establish this connection.

#### **Handbook pages (ii) & (iii)**

The agenda for each day of the *Technotraining* sessions.

#### **Handbook page (1)**

Handout notes were included to accompany the *Corel Presentations\** slide show designed to guide the staff through the agenda. I felt that using the technology could

provide the staff with some of the concepts and their context that we were dealing with. It was *Technotraining* that they had requested, so delivery of instruction through the use of this technology may demonstrate its potential use in the classroom. During this presentation, the printing functions of this software were explained so the staff could see how the handout notes were produced for their handbook.

### **Handbook page (2)**

Page two focussed on main goals for the *Technotraining* drawn from the feedback received from the teachers' responses to the surveys. Included in each of the "*What is Possible?*" sections were demonstrations of some of the software and peripherals used at the school:

#### CD-ROM

The current edition of *Grolier's Multimedia Encyclopedia* was demonstrated to the staff by one of "The Mouse Shy" teachers. This was a senior teacher who had made it clear to the staff in earlier times that computers were "a waste of time and a tremendous drain on the school's fundraising efforts". As Learning Resource Teacher, I had worked with this teacher in developing a resources based learning unit for her course in which I introduced this CD-ROM. The teacher quickly saw the curricular applications of this software, as well as observing the students' enthusiasm in using it in the *Tiger Zone* multimedia lab.

My choice in asking this teacher to give the staff a brief tour of this CD-ROM was two-fold. First, the teachers would see this leader, already a proclaimed technophobe, demonstrate her recently acquired skills in navigating throughout this multimedia

resource in a positive way. Secondly, it would build on her self-confidence in learning to use technology appropriately.

#### Internet

The member of our Tech Team responsible for designing our school's website provided the participants with a brief visit to our school's homepage. This allowed some teachers to see this for the first time. I selected this person for the task because he is just such a modest, hardworking individual. He never seeks credit for his work, yet he gives 150% all of the time. This is a powerful and motivational demonstration when teachers see their own work, or that of their students displayed to their peers.

#### Digital Photography

Prior to the start of the inservice I had asked two members of the tech team to upload some of my digital photographs to the server. These could then be displayed as wallpaper bitmaps as teachers would logon to the network. I chose to display them on the 27" colour monitor mounted near the entrance to the lab. The photographs were candid shots that I had taken of the staff throughout the days leading up to the training. Also, after the nutrition break the art teacher had "doctored" a photograph of three staff members and had it displayed on this monitor as teachers returned from their break. Using digital tools in the Corel PhotoPaint program he had transplanted the hair from one individual to one that was balding, moved a beard from one face to one without, and removed one person's moustache. The smiles and chuckles from the staff reflected an approval in the positive spirit of tomfoolery. It certainly contributed to the collegiality of the session, enhancing the interactive applications of the technology.

### Periodicals

A particularly useful and practical piece of software is Ebsco Publishing's CD-ROM *Middle-Search*, a monthly index of numerous periodicals. This database has a searchable index that allows students to scan and print full-text articles or abstracts from many current, well-established magazines and newspapers.

Two teachers I had been working with volunteered to share their success stories in using this software with their classes. One was teaching Global Issues 3205, the other was using it in his Language 2101 research course. Both teachers described the powerful search capabilities of the software as well as the relevant articles retrieved through this periodical index.

### Databases

I had asked our guidance counselor to demonstrate the use of *Choices '98* to the staff. This software allows users to search a large database of choice information related to career fields, and the paths of training/education to get there. Skills inventory tests are quickly administered, and saved to the private profile of each student for later reference and retrieval. With a Canadian focus, the student can search particular occupations, job skill requirements and training, as well as the corresponding training institutions with their entrance requirements, services and tuition fees.

Although the guidance counselor was the key person to integrate this CD-ROM into the curriculum, I felt that it was a good opportunity for other teachers to see its potential. We had just completed a recent staff initiative on cooperative learning and the development of student profiles and portfolios.

### Presentations

The potential of enhancing a presentation can be realized through the variety of special effects with most electronic presentation software. The school had received Corel Presentations which was bundled with the *Corel WordPerfect Suite 8* software. This was the first time that the LCD projection palette had been used at the school for any staff presentation. Teachers were curious and interested in the technology. I had installed the stereo computer speakers so the staff could appreciate the medium of prerecorded \*.wav files as well. These could be called up by the application when required and played at the appropriate moment during the presentation.

For our presentation, our lead member of the Tech Team was giving his introductory welcome. During a dry spot of his talk, he reached for a glass of water on the podium. While drinking his water he clicked on through his presentation, which played a sound file of this same teacher in a fit of coughing, followed by an "Excuse me!" in his voice. Teachers exchanged surprised looks and smiles when he explained how this technology allowed him to cough and talk while drinking a glass of water.

The previously mentioned applications and peripherals were used at a level to help reinforce the skills and confidence of teachers who are using technology, and to encourage others to try to use it. Other technology peripherals and possibilities that were present in this lab were mentioned rather than demonstrated. For teachers who may wish to go further, the following applications were briefly explained:

### Scanner

A strong feature here is the Optical Character Recognition (OCR) software that can be used with the scanner. It permits the user to scan text documents so they may be imported into other documents, eliminating the need and time to re-type.

### Text-to-Speech or Speech-to-Text Software

This would be helpful for special needs teachers in helping students with reading problems. Passages can be scanned then read to the student by the computer at a pace selected by the student. Also, students may read their narratives or passages to the computer through the use of a microphone attached to the computer's sound card. These may then be displayed as a text document that can be printed.

### Audio Recording/Editing/Playback

This is similar to using the computer as a tape recorder. Many software interfaces have buttons that actually look like those associated with tape decks and are quite user friendly. Sound bites can be recorded, played back, enhanced with special effects, or even dropped into other applications like an attachment to an e-mail message.

### Video Recording/Editing/Playback

Although no video-editing software is presently at the school, the fact that current digital software exists at a fraction of the analog video suites used in the past, needs to be shared to encourage the techno-savvy teacher who may be inspired to integrate it into the curriculum.

### Animation

The art teacher as a possibility pointed out this application for interested art students or as an enrichment project in almost any course. He stressed the fact that art is



interdisciplinary. Much of the information we receive is visual or auditory. The opportunities for students to create their own animated c-curricular project would be an exciting challenge. He offered his assistance if any teacher wished to try such an endeavor.

### **Handbook pages (3 to 11)**

Each guidesheet included for use during the training sessions is an original piece of work. These were not xeroxed from a training manual. All of the recipe-type guidesheets provided in this section were locally designed during a 7-hour work session I planned with the help of four Tech Team members. By learning to use the screen capture feature in *CorelCapture* (installed with *CorelDraw*), I was able to grab and paste images and icons from the various applications and paste them onto these documents to help guide our teachers through their learning. This way, teachers would be able to follow directions and images that were taken from their own network. Thus, teachers would have hard copies of exactly what they would see on their screens, as they were to complete each task.

Each article was designed to supplement the training requests of the teachers. I designed the *TIGERTIP* notes to complement the customized for the training. The inclusion of these *TIGERTIPS* in the margins would add to the teachers' ownership of the whole training process. I wanted to draw attention, not only to this product, but to its process and development. Each *TIGERTIP* was based on common errors that the Tech Team members had experienced or observed when students were using the Tiger Zone lab. So these tips were not only named after the Tiger Zone theme, but also represented local network glitches and ways to avoid them.

The "Meet the Network" session of the training consisted of skills teachers requested to learn with respect to their ability to access the network. Items covered here were logging onto the network, logging off, changing passwords, and printing. Also, several tips on Windows'95/NT Fundamentals were included to help teachers to become familiar with the desktop display, taskbar and mouse functions.

This was followed by a brief printing exercise to review these new skills. After this, I announced a "Login & Print Race" for which the winner would receive a box of 3.5 floppy diskettes and a *Calendar Organizer* CD-ROM as the prize. The race required each teacher team to login the network, open the Wordpad application, type their name, and send it to the printer. The first name printed was the winner.

**Handbook pages (11 to 13)**

This section of the training demonstrated ways to access three popular reference CD-ROMs: *EBSCO's Middle Search* periodical database, and the *Grolier* and *Infopedia* multimedia encyclopedias. The exercise was designed to show teachers the Windows multitask feature that allows a user to open two applications at once. The ability to "toggle" these applications allows the user to switch between them. These instructions help the teachers to see how selected "open" layers may be displayed on the screen front.

**Handbook pages (15 to 19)**

Here the users are informed about ways to save or locate their own documents using the folder structure in the *Windows Desktop* display. A description of the *Network Neighborhood* functions was described here as well.

**Handbook pages (20 to 22)**

This section, *Murphy's Law for Computer Labs*, was designed as a quick-reference page to help teachers with troubleshooting some of the common problems specific to users in the *Tiger Zone* lab. The main topics of concern here were: *monitor controls, passwords, disappearing TaskBar, when students cannot print, and lockups*. Teachers were guided how to remedy each of these problems.

A very important aspect was the "Others?" section. During its delivery, an open question-answer forum allowed the staff to share their own specific problems and to draw on the expertise of the Tech Team. This was also a learning opportunity for the Tech Team to become aware of the staff's experiences and feelings about using the current technology with their classes.

**Appendix I**

This was a collection of three resource booklets to supplement stages of the *Technotraining*. The first was a *Beginning Windows* booklet that I had obtained for staff use, but did not have copyright permission to include in this report.

The second document was *Internet Searching: with Netscape Navigator*. This was locally produced for our Information Technology Resource Center. The authors granted me permission to use and publish this booklet. This would supplement the instruction for Day 2 of the *Technotraining*.

The third addition, "*How to create a document in Corel WordPerfect 8 with the Internet as a resource*", was designed by the school's art teacher and reproduced with his permission. The inclusion of this article could allow the teachers, at their convenience, to review skills from both days of the *Technotraining*. Its instruction directs one on how to

open *Netscape Navigator* from within *Corel WordPerfect 8*, allowing the user to find an Internet document or graphic and to import it into their own document.

## **Appendix 2**

Here I included copies of Internet tips and tricks, hotlists of *World Wide Web* resources for teachers, and a collection of computer/technology cartoons. All of this was from my own growing library of Internet and computer resources that I have been collecting over the past six years. Although I could not obtain publishing rights to include these documents here, my purpose was to allow the teachers to see how they could use *Appendix 2* as their own collection to which they could add to or weed according to their own interests and needs.

The Technotraining Handbook

TECHNOTRAINING

February 19-20, 1998

Make the connection...



The new **I** of the Tiger

Information  
Interest  
Innovation  
Interaction

<http://www.k12.nf.ca/>

## **NOTE TO USERS**

**Page(s) not included in the original manuscript are unavailable from the author or university. The manuscript was microfilmed as received.**

**90 - 117**

**This reproduction is the best copy available.**

**UMI**

### Teachers' Groupings

Three teachers from the Tech Team were assisting with the delivery of the *Technotraining*. There were 10 multimedia stations usually networked to the NT 4.0 server. Extra workstations were temporarily connected to accommodate our two regular substitute teachers and our two school secretaries. This allowed me to pair the participants according to their technological abilities and comfort levels as indicated on their staff surveys.

I defined three groupings of teachers according to their frequency of computer use at home and at school. The names and criteria for these groupings were as follows:

- *The Mouse Shy* - participants who used a computer once a month or less since the start of the present school year
- *The Toonies* - participants who used a computer twice a month since the start of the present school year

*The Cybernauts* - participants who used a computer three times a month or greater since the start of the present school year.

### Location

The main location for the formal *Technotraining* sessions was onsite in the new multimedia computer lab at the school. This was planned and accomplished for Day 1 of the inservice. The school's dial-up connection was laboriously slow at retrieving information. A new satellite dish had already been ordered to upgrade this service but it would not be functioning in time for the Internet part in the training session. On Day 2 it

was more conducive to conduct the Internet training sessions at the District TEC center to prevent teachers becoming frustrated with slow connection speeds.

### **The Multimedia Lab (The Tiger Zone)**

Most of our teachers walked into the multimedia lab for the first time when they took part in the *Technotraining* sessions on February 19-20, 1998. I wanted them to recognize and feel that they were in a room that was different from any other room in this school of ours. A difference, not only due to the presence of the new multimedia workstations, also because of the way the room had been set up. All workstations were setup on new computer tables that were designed by our own Tech Team. The room was decorated with locally designed signage emblazoned with graphics of *The Tiger Zone* and the URL of our school's website address. The presence and use of technology in context was designed to illustrate the power, potential, and fun in using technology in teaching.

Below, I have included sections to describe some of the preparation that I felt was significant to amplify the message of this inservice: *Technotraining*.

**Workstation Identification Signs.** Designing signs to label each workstation contributed towards successful classroom management in the lab. I integrated the *Tiger Zone* logo, which I had used for the teachers' T-shirts. Every sign contained *The Tiger Zone* graphic, the school's Internet address, and the appropriate workstation ID number. Each sign was printed on 8.5" X 11" gold-coloured paper and centred on 11" x 17" green poster board (green and gold are the school's spirit-colours). All signs were then laminated and displayed near each workstation. This was beneficial for organizing students groups for particular activities in the lab (i.e. easy reference to *Tiger Zone*



Workstation #5; the workstation that was in a central location to attach the LCD projection palette and was also configured to operate the scanner.) (See sample below.)



**LCD projection palette.** This device was necessary for projecting the Corel Presentation slideshows that were used by the facilitators during their instruction. It allows the instructor to project the information shown on a computer screen onto the large overhead projection screen. This enables the instructor to display and refer to elements on the screen that would otherwise be difficult when teaching a large group. Groups of five or more cannot huddle around a computer screen for practical exercises of this type. The school does not own an LCD projector, so I borrowed one from the district's resource centre.

**Projection screen.** Prior to the inservice I had to install the large hanging projection screen. Curtains were hung to darken the room for projection, as the windows in this lab had never had them installed.

**Multimedia speakers.** To allow the full group to experience the sounds of the multimedia presentations, the stereo computer speakers were installed to workstation # 5 with the projection palette.

**Digital Camera.** I used the digital camera to capture special moments throughout the inservice. My goal was to photograph our teachers using the technology. Although there were staged and predictable poses, my most powerful images were those that I captured of staff who were unaware of the camera's presence. These pictures were of teachers who were completely immersed in their learning while trying out their new skills.

Being able to show the teachers images of themselves as learners is a distinct event. The "instant replay and display" features of the digital camera give a spontaneous thrill that can add to the excitement of a training session.

**27" Television with S-video connection.** This is another example of how the computer technology can be used as a teaching tool in the classroom. The large screen display allows the teacher to refer to elements on the computer screen so that the whole class may see the lesson at once, instead of having groups of students hovering over one regular sized computer screen.

**Computer with TV-Video adapter card.** This adapter card is necessary to install the TV-Video adapter card to enable the television to display the information from the computer.

**Modem and Dial-Up Configuration.** To demonstrate the Internet applications, the servers' modem installation and dialup settings had to be configured to operate smoothly. Although the Internet training sessions would be held at the district's TEC Centre on Day 2, this preparation was necessary for the introductory session.

**Teacher Group Set-up on the Server.** It was necessary to provide the network administrator with a list of the staff participants for the training session. Each participant would have to have a profile set up with a user name and a corresponding password for access to the computer network. Up to this point, only the few regular users would already have had this done.

#### Incentives

- Staff Recognition - the use of *techno-newbies*, new users of technology, to present their successes and tribulations to the staff;
- Staff T-shirts - one for each participant;
- *Technotraining Handbook*
  - one for each participant;
  - each handbook consisted of a 3-ring binder with a clear pocket cover and spine
  - a cover page printout of the Tiger Zone logo was inserted in the clear-view pocket of each binder;
  - each binder was personalized for the participants
  - coloured coded round stickers attached to each cover indicated the teachers' partners and assigned workstations;
  - two dividers were included in each binder to separate the *Technotraining* recipe guides from the enrichment support materials in the appendices;

- Digital photography
  - used to document the inservice;
  - WinNT permissions needed to be checked on the server so that the facilitators could upload the digital snapshots of the teachers in action, training with the technology;
  - The digital snapshots would be displayed at key points throughout the inservice to demonstrate the spontaneity of the technology in an instructional context;
- Spotter prizes
  - CD-ROM software:
    - *Calendar/Organizer program*
    - *Family Health Multimedia Encyclopedia and Reference*
    - *Income Tax Software Package*
  - Magazine:
    - *PC Novice: Tips and Tricks to finding Information on the WWW*
  - Floppy diskettes:
    - *2 packages with 25 diskettes/box*

### **Delivery**

Accomplishing the delivery of the formal 2-day *Technotraining* session was a collaborative effort amongst the Tech Team members, the district technology coordinator and the TEC centre director. I was the facilitator throughout this process, as I would run through my checklist to ensure that troubleshooting was kept to a minimum.

The schedule for this instruction was followed according to the agenda that was printed on the first two pages in the *Technotraining* handbook.

## CHAPTER SEVEN

### THE RESULTS

#### Feedback and Reactions

There are various factors that can impact on learning that occurs at a school. Through my involvement with school improvement, I used action research as a component of implementing professional development initiatives at my school. Information gleaned from the teacher's responses to the preliminary surveys was considered and included in the planning for this *Technotraining*. Introducing this human element was a major factor in its success.

I felt that this project met its goals through its design delivery. The outcome was a training process that was different from earlier inservice that the staff had completed. Compliments that I had received from the staff members and district personnel seemed to indicate this. During one coffee break, one social studies teacher patted me on the back and said, "Way to go! It's about time we got something useful out of a workshop." At the end of the *Technotraining* the district's technology coordinator said to me, "This is good stuff! These teachers are excited about learning. Great job!" The success in this project was due to many webs woven together and formed a training process for teachers that eventually could enhance student learning.

## Limitations

To realize more of the potential benefits of technology in education, considerable time and effort must be invested in technology planning. This project was far-reaching. Shared decision-making coupled with long-range planning can play an essential part in making more effective use of technology. A plan of this size and scope should include effective mechanisms that address training, support and management of the technology. Follow-up support is critical.

Technical support and training are important to successful implementation for at least two reasons:

1. Teachers who feel support in technology are less likely to feel threatened and pressured to work in areas where they lack competence; they are likely to develop more positive attitudes toward using the technology.
2. Teachers who receive adequate support and training are more likely to become proficient users of technology in the classroom. Without training and support, growth cannot be expected in this area. (Moursund, 1992)

There are also limiting aspects in this project that are not mentioned in the literature but were discovered in the practice. These points are raised through the questions that follow:

- When is the “right time” for a teacher to share his findings from a study of the professional development initiatives of his staff? How does he do it effectively?
- What techniques should be followed when one sees a blatant flaw in the delivery of the initiative that contradicts what the literature says, yet there is a critical mass amongst the staff that feels they are doing the right thing?
- Could these initiatives work for another staff?

- What indicators could we use to see how this process may continue?
- When will the effects of this implementation affect our students?

### **Possible Areas for Further Work**

Several areas could be explored as a continuation of this project.

A long-term study (3 to 5 years) of this school's staff could result in richer data related to the technology implementation. Partnerships with other schools could be established to "twin" staffs in order to broaden the research base. A shared database of this, and similar research could be made readily available to other schools attempting to train their teachers in use of technology. The development of partnerships between a school and outside agencies (e.g. corporate sponsors, university research projects, Internet providers) could be explored.

Community liaisons may be enriched through setting up links between home and school via the school's webpage. Parents may examine student work, the school newsletter, and e-mail school personnel. Greater efforts could be made to obtain feedback from all stakeholders in the school's initiatives. This may enhance their chances of buying in to the technological efforts of the school.

Instruments could be put into place to measure continued progress of teachers who are implementing technology and to measure the effect it has on their students' learning.



## **Transferability**

School populations, both staff and student, change from year to year... and so does the technology. This research project strongly influenced a staff training process at one school. Other schools will have various factors that can alter the balance of any professional development initiative. There were numerous factors that contributed to the positive outcome of this project, but the following four can be singled out as the determining ones:

- Action research
- Curriculum connections
- A committed team of staff members who support shared decision-making
- Enthusiasm

I strongly feel that the preceding characteristics would be key components if the initiatives from this project were applied in another school.

## **Professional Development Planning as a Learning Experience**

### **Concluding Remarks**

The purpose of this project was to examine the professional development initiatives of one school in Newfoundland as outlined in its school growth plan. Through examination of the literature and established policies on technology in education, and through school-wide action research, a set of guidelines were realized for the development of staff initiatives that are needed to implement technology more effectively.

Increasingly widespread use of technology in schools requires changes in both pre-service and inservice training and, more generally, reform of policies that govern the professional development of teachers. In these changes, technology has two roles: It is the object of skill development (teachers and staff must learn to apply technology effectively for teaching and learning) and it is a means of developing skills (technology can deliver information and training). This research project was concerned with innovation and change and ways that these may be implemented effectively in an ongoing system of staff development.

Action research was a fitting and appropriate method for this study. Specific information was required for a specific group of people in a specific situation. Action research helped to acquire specific knowledge that was needed for the specific problem of staff training in computer technology.

I used a variety of mechanisms to collect reams of data about this process. As well, I designed several instruments to collect information that would be useful in planning the teachers' *Technotraining*. The richest data was collected through casual informal interviews, and especially through staff surveys that were designed specifically for this staff...with open-ended partial statements for the staff to complete.

#### **Revisions and Additions**

Both the action research model and the district implementation framework provided a process that allowed me to revisit and redesign each aspect of this project in teacher training. I would use the same models if I were to try a similar initiative again. Some of the revisions happened due to a long delay in the initial training session because of provincial and district budgetary cuts to teachers' professional development

allocations. This gave me time to further my study of the literature and to investigate successful initiatives in other schools and districts.

### **Critical Reflection**

Personally, I found this experience exciting, exhausting, frustrating, eye-opening, rewarding, scary and fun. Exciting because I was given the support to initiate elements in the project that have never been done at this school before. Exhausting, because I had the omniscient viewpoint that left me as the participant-observer to keep a finger on most all of the buttons. Frustrating because no matter how great a plan is prepared, there are certain things crucial to its implementation, which are always out of your control. Eye-opening because it provided me with many opportunities to work with fellow teachers, my principal, parents, district personnel, university researchers, teachers from other districts, in a unique way that I have never experienced before...new contacts were established in my learning circle of friends. Rewarding because I met with many obstacles throughout the project and was able to overcome the ones that really mattered. Scary because you don't really know how a plan like this will work until you try it...and you can have some pretty anxious moments just waiting for things to turn out. Fun because I witnessed a group of teachers enjoying their learning together. Through the process their collective voices were sounded... and heard... and it made a difference.

My experiences as an active participant and researcher were enlightening. At times I was able to see theory come to life through practice. At other times I have seen it squashed like a bug. Like learning any type of new technology, the training is quite

similar, you have to be able to bounce back, to try it again, and maybe through a different approach, but you still have to try.

## REFERENCES

- Ambrose, D. W. (1991). "The effects of hypermedia on learning: A literature review." *Educational Technology*, December, 51-54.
- Aponick, N. (1993). "Linking teachers and students across networks." *Computers in Libraries*, 13(9), 56-58.
- Atkins, M. J. (1991). "Theories of learning and multimedia applications: An overview." *Research Papers in Education*, 8(2), 251-271.
- Atlantic Provinces Education Foundation (APEF), 1996. *Atlantic Canada Framework for Essential Graduation Learnings in Schools*.
- Barth, R. S. (1991). *Improving schools from within: teachers, parents, and principals can make the difference*. (1st ed.) San Francisco: Jossey-Bass.
- Barth, R. S. (1990). *Improving Schools from Within*. San Francisco: Jossey-Bass Publishers.
- Boyes, E. (1991). "The evaluation of microcomputer systems in education." *Studies in Educational Evaluation*, 17(2-3), 263-73.
- Bradsher, M. (1990). "The teacher as navigator." In: *Learning With Interactive Multimedia (Developing and Using Multimedia Tools in Education)*. Edited by S. Ambron and K. Hooper. Middlesex: Penguin Books Ltd., 311-330.
- Brown, J. (1993). "Leadership for School Improvement." *Emergency Librarian*, 20(3), 8-20.
- Brown, J. & Sheppard, B. (1998). "Teacher-librarians: Mirror images plus the spark!" *Emergency Librarian*, 25(3), 20-27.
- Brown, J. & Sheppard, B. (1997). "Professional development: What do we know and where are we going?" *The Morning Watch*, 24 (3-4), 1-16.
- Bruder, I. (1993). "Redefining science technology and the new science literacy." *Electronic Learning*, 12(5), 20-24.
- Carr, D. (1991). "Living on One's Own Horizon." *School Library Media Quarterly*, Summer, 217-222.
- Clark, R. E. & Craig, T. G. (1992). "Research and theory on multimedia learning effects." In: *Interactive Multimedia Learning Environments: Human factors and*

- technical considerations on design issues*. NATO-ASI Series, Vol. F93. Berlin: Springer-Verlag, 39-45.
- Costello, R. (1997) The leadership role in making the technology connection. *THE Journal (Technological Horizons in Education)* volume 25, November. 58(4).
- Cuban, L. (1988). *The managerial imperative and the practice of leadership in schools*. Albany: State University of New York Press.
- D'Ignazio, F. (1993-94). "Beyond multimedia: Upside-down TV." *The Computing Teacher*, December-January.
- Debique, J. (1992). ATV Ontario Responds to... "In Defence of the Tube: The Boob's Misunderstood." In: *Media News*, 20(1). Etobicoke, Ontario: AMTEC.
- Dede, C. (1994). "Making the Most of Multimedia." In: *Multimedia and Learning: A School Leader's Guide*. A. Ward, ed. Alexandria, Virginia: National School Board Association, 49-52.
- Department of Education, Province of Newfoundland and Labrador. 1994. *Technology in Learning Environments (TILE)*. St. John's, Newfoundland: Queen's Printer.
- Dickson, W. P. et al. (1992). "Exploratory multimedia environments." In: *Adaptive Learning Environments - Foundations and Frontiers*. NATO-ASI Series, Vol. F85. Berlin: Springer-Verlag, 155-171.
- Dipinto, V. & Turner, S. (1995). "Zapping the Hypermedia Zoo - Assessing Students' Hypermedia Projects." *The Computing Teacher*, 22(7), 8-11.
- Dixon, N.M. (1993). *Organizational learning*. Ottawa: Conference Board of Canada.
- Driver, R. (1989). "The construction of scientific knowledge in school classrooms." In: *Doing Science: Images of Science In Science Education*. London: The Falmer Press, 83-105.
- Duchastel, P. C. (1990). "Examining cognitive processing in hypermedia usage." *Hypermedia*, 2(3), 221-233.
- Dumaine, B. (1994). "Mr. Learning Organization (P. Senge)." *Fortune*, 130, October. 147-148.
- ERIC Annual Report - 1992*. (1993). Summarizing the recent accomplishments of the Educational Resources Information Centre. Rockville.

- Franklin, C. & Kinnell, S. (1990). *Hypertext/Hypermedia in Schools: A Resource Book*. Santa Barbara: ABC-CLIO.
- Fullan, M. & Hargreaves, M. (1996). *What's worth fighting for in your school?* New York: Teachers College Press.
- Fullan, M. & Stiegelbauer, S. (1991). *The new meaning of educational change*. (2nd ed.) Toronto: OISE Press.
- Fullan, M. (1993). *Change forces: probing the depth of educational reform*. London: New York: Falmer Press.
- Glennan, T.K. & Melmed, A. (1996). *Fostering the Use of Educational Technology: Elements of a National Strategy*. Santa Monica: RAND.
- Glickman, C.D. (1990). *Supervision of instruction: a developmental approach*. (2nd ed.). Boston: Allyn and Bacon.
- Glickman, C.D., Gordon, S.P., & Ross-Gordon, J.M. (1995). *Supervision of instruction: a developmental approach*. (3rd ed.). Boston ; Toronto: Allyn and Bacon.
- Grabinger, S., Dunlap, J. C., & Jonasson, D. (1993). "Making information possible (part 4): Support links." *Performance and Instruction, March*.
- Guskey, T.R. & Huberman, M. (Eds.). (1995) *Professional development in education: new paradigms and practices*. (1995). New York: Teachers College Press.
- Hargreaves, A. & Fullan, M. (1998). *What's worth fighting for out there?* New York: Teachers College Press.
- Hargreaves, A. (1994). *Changing teachers, changing times: teachers' work and culture in the postmodern age*. Toronto: OISE Press.
- Haugen, H. (1992). "Multimedia learning environment: An educational challenge." In: *Interactive Multimedia Learning Environments: Human factors and technical considerations on design issues*. NATO-ASI Series, Vol. F93. Berlin: Springer-Verlag, 19-30.
- Hawley, W.D. & Rosenholtz, S.J. (1986). *Achieving quality integrated education*. Washington, D.C.: National Education Association
- Haycock, C. (1988). "Coop Program Plan: A Model that Works." *Emergency Librarian, 16(2)*, 29-38.

- Haycock, C. (1988). "Developing the School Resource Centre Project: A Systematic Approach." In: *The Emergency School Library Media Program: Readings*. Englewood, Colorado: Libraries Unlimited, Inc.
- Henri, J. (1987). "The Integrated Approach to School Library Programs". *Emergency Librarian*, 14(3), 9-14.
- Huberman, A.M. & Miles, M.B. (1984). *Innovation up close: how school improvement works*. New York: Plenum Press.
- Ingwerson, D. W. (1996) "A model for technology training." *THE Journal (Technological Horizons in Education)* 24, November, 84(4).
- Jonasson, D. H. (1992). "Cognitive flexibility theory and its implications for designing CBI." In: *Instructional Models in Computer-Based Learning Environments*. NATO-ASI Series, Vol. F104. Berlin: Springer-Verlag, 385-403.
- Joyce, B. (1990). *Changing School Culture through Staff Development 1990 Yearbook of the Association for Supervision and Curriculum Development*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Kommiers, P. A. M. & Ferreira, A. (1992). "(S)GML-based hypermedia: Generic resources for exploratory learning." In: *Instructional Models in Computer-Based Learning Environments*. NATO-ASI Series, Vol. F104. Berlin: Springer-Verlag, 349-364.
- Krimmelbein, C. J. (1989). *The Choice to Change: Establish an Integrated School Library Media Program*. Englewood, Colorado: Libraries Unlimited, Inc.
- Kuhlthau, C. C. (1994). *School Library Media Annual*, Vol. 12. Englewood, CA: Libraries Unlimited, Inc.
- Lam, K. Y. (1993). "Educational resources on the Internet." Paper presented at the annual meeting of the Mid-Western Educational Research Association, October 1993.
- Levine, M. (1992). *Professional Practice Schools: Linking Teacher Education and School Reform*. New York: Teachers College Press.
- Lieberman, A. (1988). *Building a Professional Culture in Schools*. New York: Teachers College Press.
- Lieberman, A. (ed.). (1995). *The work of restructuring schools: building from the ground up*. New York: Teachers College Press, Columbia University.



- Limerick, D., Passfield, R. & Cunnington, B. (1995). "Towards an Action Learning Organization." *The Learning Organization*, 1(2), 29-40.
- Lockard, J., Abrams, P. D., & Many, W. (1994). *Microcomputers for Twenty-first Century Educators* (3rd ed.). New York: Harper Collins College Publishers.
- Lockard, J., Abrams, P.D., & Many, W.A. (1997). *Microcomputers for twenty-first century educators*. (4th ed.) New York ; Don Mills, Ont.: Longman.
- Loertscher, D. (1988). *Taxonomies of the School Library Media Program*. Englewood, Colorado: Libraries Unlimited Inc.
- Locks-Horsley, S. & Hergert, L.F. (1985). *An action guide to school improvement*. Alexandria, VA: Association for Supervision and Curriculum Development ; Andover, Mass.: The NETWORK.
- Madian, J. (1995). "Multimedia - Why and why not?" *The Computing Teacher*, April, 22(7), 16-17.
- Memorial University of Newfoundland, Faculty of Education. (2001). *Graduate Studies Project*. Retrieved August 14, 2001 from the World Wide Web: [http://www.mun.ca/educ/fac\\_web/grad\\_pro.html](http://www.mun.ca/educ/fac_web/grad_pro.html)
- Memorial University of Newfoundland. Office of the Vice-President (Academic). (1992). *STEM-NET: a computer network for science, technology, and mathematics educators in Newfoundland and Labrador part one general needs and model / a proposal on behalf of the Vice-President (Academic)*. Memorial University of Newfoundland; St. John's, NF: MUN Printing Services.
- Miller, E. B. (1994). *The Internet Resource Directory For K-12 Teachers and Librarians, 94-95 Edition*. Englewood: Libraries Unlimited.
- Moore, D. M., Myers, R. J., & Burton, J. K. (1994). "What multimedia might do ... and what we know about what it does." In: *Multimedia and Learning - A School Leader's Guide*. Alexandria, VA: NSBA, 29-39.
- National Association of Secondary School Principals. (1994). "Integrating Technology in Secondary Schools." *Curriculum Report*, 23(4), March.
- Outen, D. (1994). *Increasing the Basic Computer Skills of High School Teachers through Inservice Training*. Doctoral Practicum Report, Nova South Eastern University.
- Peck, K.L. & Dorricott, D.(1994). "WhyUseTechnology?" *Educational Leadership*, 51(7).

- Protheroe, N. & Wilson, E. (1994). *The Internet Handbook for School Users*. Arlington, Educational Research Service.
- Ragsdale, R.G. (1982). *Evaluation of microcomputer courseware*. Toronto, Ont.: OISE Press.
- Roschelle, J. (1994). "Collaborative Inquiry: Reflections on Dewey and Learning Technology." *The Computing Teacher*, May, 21(8), 6-9.
- Rose, M. (1993). "Plugging into the global classroom." *The Education Digest*. January, 36-38.
- Rubin, B. A. & Sorchan, R. G. (1994). "Theme: The Internet." *Training and Development*, 18(8), 24-32, 34-37.
- Sarason, S.B. (1993). *The case for change: rethinking the preparation of educators*. San Francisco: Jossey-Bass.
- Sarason, S.B. (1996). *Revisiting "The culture of the school and the problem of change" Portion of Culture of the school and the problem of change*. New York: Teachers College Press.
- Schrum, L. & Berenfeld, B. (1997). *Teaching and learning in the information age: a guide to educational telecommunications*. Boston, Mass.; Toronto: Allyn and Bacon.
- Senge, P. M. (1994). *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Doubleday.
- Senge, P., Roberts, C., Ross, R., Smith, B., & Kleiner, A. (1994). *The Fifth Discipline Fieldbook*. New York: Doubleday.
- Sheppard, B. & Brown, J. (1997, June). *Organizational learning: connecting classroom practices and team leadership*. Paper presented at the Annual Conference of the Canadian Society for the Study of Education, Memorial University of Newfoundland, St. John's, NF.
- Sheppard, B. (1995). "Implementing Change: A Success Story." *The Morning Watch*, 23(1-2), 1-25.
- Sheppard, B. & Brown, J. (1996). "One school district's experience in building a learning organization." *The Morning Watch*, 24, (1-2), 1-12.
- Smith, J. B. (1995). *Achieving a Curriculum-Based Library Media Center Program*. Chicago: American Library Association.

- Sparkes, D. & Hirsh, S. (1997). *A new vision for staff development*. Alexandria, VA: Association for Supervision and Curriculum Development; Oxford, Ohio: National Staff Development Council.
- Sponder, B. & Hilgenfeld, R. (1994). Cognitive Guidelines for Teachers Developing Computer-Assisted Instruction. *The Computing Teacher*, November, 22(3), 9-15.
- Stebbins, B. (1990). "Using hypercard in Apple classrooms of tomorrow." In: *Learning With Interactive Multimedia (Developing and Using Multimedia Tools in Education)*. Edited by S. Ambron and K. Hooper. Middlesex: Penguin Books Ltd., 223-256.
- Tompsett, C. P. (1992). "Contextual browsing within a hypermedia environment." In: *Interactive Multimedia Learning Environments: Human factors and technical considerations on design issues*. NATO-ASI Series, Vol. F93. Berlin: Springer-Verlag, 95-107.
- U.S. Department of Education. (1996). "Rethinking Professional Development." In: *Improving America's Schools: Newsletter on Issues in School Reform*, May. Retrieved October, 1997 from the World Wide Web: Improving America's School's: Newsletter on Issue Reform, May 1996, <http://www.ed.gov/pubs/IASA/newsletters/profdev/pt1.html>
- Wasley, P. (1991). *Teachers Who Lead the Rhetoric of Reform and the Realities of Practice*. New York: Teachers College Press.
- Watkins, K. E. & Marsick, V. J. (1993). *Sculpting the Learning Organization: Lessons in the Art and Science of Systematic Change*. First Edition. San Francisco: Jossey-Bass Inc.
- Weir, H. (1997, June). *Canadian telecommunications policy and its effect on education*. Speaking notes for presentation to the Canadian Society for the Study of Higher Education, Memorial University.
- Wiburg, K. & Carter, B. (1991). "Thinking with computers." *The Computing Teacher*, 22(1), 7-10.
- Wiburg, K. (1994). "Teaching science with technology: Telecommunications and multimedia." *The Computing Teacher*, April, 21(7), 6-8.
- Wiburg, K. (1995). "Becoming Critical Users of Multimedia." *The Computing Teacher*, April, 22(7), 59-61.
- Willard, B. (1994). "Ideas on Learning Organizations: The What, Why, How and Who. 1994 Annual Leadership Development Prewritek. IBM Canada Ltd.

- Wolcott, L. L. (1994). "Understanding How Teachers Plan: Strategies for Successful Instructive Partnerships." *School Library Media Quarterly*, Spring, 161-164.
- Yeaman, A. R. J. (1994). "A Deconstructing Modern Educational Technology." *Educational Technology*, 34(2), 15-23.





