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.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

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

University of Alberta

Technology Mentorship: A Staff Development Opportunity for Educators

by

Barbara Brown

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Education

Secondary Education

Edmonton, Alberta

Spring 2000

University of Alberta

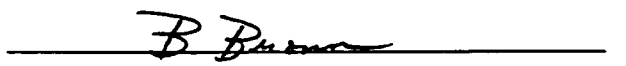
Library Release Form

Name of Author: Barbara Brown

Title of Thesis: Technology Mentorship: A Staff Development Opportunity for Educators

Degree: Master of Education

Year this Degree Granted: 2000



13343-154 Avenue
Edmonton, AB
T6V 1G2

Date: December 24, 1999

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Technology Mentorship: A Staff Development Opportunity for Educators submitted by Barbara Brown in partial fulfillment of the requirements for the degree of Master of Education.

Dr. Norma Nocente

Dr. Maryanne Doherty-Poirier

Dr. Susan Gibson

December 8, 1999

Abstract

The purpose of this study is to examine the experiences of teachers participating in the Technology Mentorship Program, a program designed to empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum. Subjects in this study were participants in a Technology Mentorship Program offered by a large urban school division. Through examination of the experiences of the technology mentors, the school division will be able to define the role of the technology mentor specifically in the areas of planning, implementing and supporting staff development.

This case study research employed three data collection techniques:

1. Questionnaires that were completed by participants in the program,
2. Semi-structured interviews at three school sites, and
3. Journal reflections with documentation of the program and observations.

The data analysis helped develop a clearer identification of the characteristics and role of the technology mentor. It is believed that with a better understanding of the technology mentor's role, the school division will be able to plan a more effective Technology Mentorship Program.

Acknowledgements

I would like to thank everyone that assisted me with the completion of this work, with a special thanks to:

- The school division and my colleagues for having faith in my abilities and allowing me to facilitate a staff development program.

- The technology mentors who volunteered to complete the questionnaire.

- The technology mentors, administrators and teachers at the sites who agreed to participate in the personal interviews for their time, cooperation and contributions.

- Dr. Norma Nocente, my supervisor, for her ongoing assistance, advice and motivation.

- Finally, I wish to thank my husband Tim and my family for their encouragement and understanding throughout the study.

Table of Contents

List of Tables

List of Figures

Chapter I: Introduction

Program Context

Teachers in Alberta are facing the challenge of implementing the 1998 *Information and Communication Technology Interim Program of Studies*, a technology curriculum for students in kindergarten to grade 12, and are seeking staff development in the area of technology-based learning. Staff development is a crucial part of implementing any innovation or change (Fullan, 1991). A large urban school division initiated a Technology Mentorship Program in September, 1997, to support educators in curricular technology integration. The mission of the Technology Mentorship Program was to empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum to enhance students' learning needs and to inspire and prepare students for a society with emerging technologies.

In the first year of the program, I worked closely with two other school division employees to organize and facilitate the Technology Mentorship Program activities. Since the program was in a prototype stage, the meetings were planned on a monthly basis, and documentation was minimal during the first year of implementation. However, in the second year of the Technology Mentorship Program, I was assigned as primary facilitator and kept a more detailed account of my involvement in the program. Enrollment in the program continually increased over the two-year period from only 35 schools involved in the first year to 75 schools by the end of the second year.

Each principal in the school division was invited to participate in the Technology Mentorship Program by nominating a teacher on staff to represent the school as the on-site technology mentor. The technology mentor was responsible for attending a series of meetings throughout the school year, provided during the school day at a location used for staff development and equipped with meeting rooms and computer training labs. There was no cost attached to participating in the program other than providing release time for the technology mentor. A year plan was developed with topics for each meeting and shared with all school

principals prior to the beginning of the school year for approval and feedback. In September, 1998, all the schools in the school division were provided with a list of preset dates and topics for 12 meetings throughout the school year on Monday afternoons from 1:00 - 4:00 P.M. The technology mentors and school administrators received a copy of each meeting agenda at least one week in advance to prepare for the meeting by reading recommended literature and articles in educational research. The meeting agendas were also publicly available on the Technology Mentorship Web Site.

Presentations were organized with the assistance of a steering committee comprised of 10 volunteer technology mentors. Throughout the year, presenters included technology mentors, school division consultants, administrators, teachers, students, parents and technical experts as well as university professors, Alberta Learning consultants and educators from other school divisions. Most of the meetings involved some whole-group presentations and concurrent hands-on workshops for the technology mentors. Generally, concurrent sessions were offered to meet the needs of the participants working with different grade levels and subject areas. The workshops in the program covered a variety of topics. Some of the workshop titles included the following: becoming a technology mentor; successfully planning professional development at the school site; collaboratively developing school technology plans; teaching strategies with technology; initiating multimedia and project-based learning; introducing the technology outcomes for students and illustrative examples; using electronic mail; discovering web development for curricular purposes; participating in Internet and online collaborative projects; viewing school division approved software and many other curriculum applications. The year-end session was a showcase of school successes, which showed how schools were integrating technology, how mentoring worked to share knowledge and trends and how schools involved parents and the community in projects.

The steering committee was not only helpful in planning the Technology Mentorship Program sessions but also helped with setting up equipment for presenters, handing out materials to participants, keeping attendance records,

collecting evaluation forms at the end of the sessions and managing other organizational tasks. These volunteers were also considered lead teachers who acted as advocates for all technology mentors by voicing concerns and issues and even writing letters and petitions on behalf of the group. In addition, five cohort groupings were established in the second year of the program, with two members of the steering committee leading each group in discussion. Cohort group sessions were offered regularly throughout the year and provided technology mentors time to network in a smaller group setting and to discuss the purpose of the Technology Mentorship Program, the role of the technology mentor and issues or concerns.

The technology mentors were encouraged to return to their schools and share information and training ideas with staff by organizing staff development opportunities. The Technology Mentorship Program provided teachers with effective staff development that was accessible, ongoing and meaningful. Mentors had the opportunity to attend workshops to learn information that could be shared with other staff members at the schools. In addition, teachers could integrate technology into the classroom with the support of an on-site technology mentor and could, therefore, share their successes with colleagues. Ultimately, students benefited from the professional growth of these teachers as they implemented new teaching strategies, skills and knowledge into the curriculum. The motto of the Technology Mentorship Program, "It takes a whole community to raise a child," illustrates the collaborative nature of the program.

Purpose of the Study

The purpose of the research is to examine the experiences of teachers participating in the Technology Mentorship Program, a program designed to empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum. Through examination of the experiences of the technology mentors, the school division will be able to define the role of the technology mentor specifically in the areas of planning, implementing and supporting staff development.

The main intent of the Technology Mentorship Program was to develop lead teachers in technology and to effectively and efficiently communicate information and provide staff development for all schools in the school division. The study will identify strategies employed by schools and technology mentors to cascade staff development from a school division level to a school level.

Significance of the Study

Mentoring programs have been successfully used in the past to support beginning teachers (Webb & Sherman, 1989). Educators continually strive to find methods for supporting technology integration in schools. The Technology Mentorship Program is considered a viable method of dealing with an increasing demand for staff development to support technology-based learning (MacArthur, Pilato, Kercher, Peterson, Malouf & Jamison, 1996). Also, the Alberta Association for Supervision and Curriculum Development (ASCD) recognized the value of this staff development initiative and presented the Technology Mentorship Program with an award to celebrate educational successes (1999). Through the course of two years, summative evaluations were conducted to improve the program. However, the purpose of this study is to examine the experiences of the technology mentors and to utilize the information in further developing the Technology Mentorship Program. Therefore, the role of the technology mentor and a description of the conditions in place for planning, implementing and supporting staff development are explained and analyzed in this study.

Researchers discovered that it is inaccurate to assume that, once an innovation has been introduced and training has been provided, then users will integrate the innovation into their educational practices (Brand, 1998; Sandholtz, Ringstaff & Dwyer, 1997; Wiburg, 1997). This case study describes an ongoing inservice structure that may be utilized by other school jurisdictions in planning for technology integration in the curriculum. King, Morris and Fitz-Gibbon (1987) contend that looking at program implementation "creates a historical

record of the program that may be of value to others who want to implement it or a similar program, particularly when the program itself no longer exists" (p.11).

Research Questions

This thesis describes the experiences of technology mentors in a program designed to facilitate a shift from instruction to construction or discovery learning with emerging technologies. The questions that are addressed in this study include:

1. What is the role of the technology mentor?
2. What are the experiences of teachers participating in the Technology Mentorship Program? More specifically:
   - How do technology mentors plan for staff development training in their schools?
   - What are the educational practices of technology mentors for implementing staff development?
   - What support is available to the technology mentor at the school level and at the school division level?
   - What challenges do technology mentors face as they facilitate curricular technology integration in their schools?
   - What are the positive aspects of participating in the Technology Mentorship Program?

Terminology

The intent/meaning of terms as used in this study are described in this section.

Help Desk - a service provided to all schools in the school division to answer technical questions and contact individuals in the Technology Services Department. A technician works at the help desk and uses voice mail and electronic mail to route inquiries to other technicians or consultants as required.

School Division - also known as a district, board or jurisdiction under study and refers to 84 schools, each with administrators and under the direction of one superintendent and a board of trustees located in an urban area.

Staff Development - learning opportunities or professional education for teachers. Some researchers use the terms professional development, inservice or training.

Technician - one who works for the Technology Services Department in the school division under study and is responsible for maintaining technological equipment at any site that is part of the school division. An on-site technician has an amount of time per week dedicated to a specific school.

Technology - in this study, the term technology refers to the use of computers and other peripherals such as printers, scanners, digital cameras, projectors, modems, networks, electronic communication devices and other emerging technologies.

Technology-Based Learning - technology integration in the curriculum. Technology-based learning is the use of technology in a constructivist learning environment for purposeful activities or meaningful tasks.

Technology Mentor - an educator selected by the school and/or the school administration to participate in the Technology Mentorship Program provided by the school division.

Technology Mentorship Facilitator - as facilitator, I coordinated the Technology Mentorship Program and was responsible for arranging the workshops and contacting presenters for the meetings in cooperation with a steering committee. In addition, I traveled to the schools to work with the technology mentors to provide guidance and support.

Technology Mentorship Program - a staff development program organized by school division personnel designed to empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum.

Chapter II: Literature Review

Overview

Once educators identify the impact emerging technologies can have on learning, they can begin to predict the restructuring of education to enhance student learning in the future. The purpose of this chapter is to discuss staff development opportunities that are available to educators that support technology-based learning. It is necessary to review literature and identify the elements of successful staff development models incorporating technology-based learning to determine how staff development can be revitalized.

Background

Technology in education is not a new idea although, in recent years, it has become one of the most controversial topics at conferences, board meetings and staff meetings. In 1980, Seymour Papert, a pioneer in technology and learning, wrote *Mindstorms*, which is about "how computers can be carriers of powerful ideas and of the seeds of cultural change, how they can help people form new relationships with knowledge that cuts across the traditional lines separating humanities from sciences and knowledge of the self from both of these" (p.4). Today, almost two decades later, we continue to wonder whether technology will directly impact learning.

Technology alone is not a cure-all and will not automatically lead to better teachers and a better education system. However, technology in combination with educational expertise, can direct revolutionary changes in schools in the 21st century with positive cognitive and social effects. The challenge, as stated by Don Tapscott, author of the International Bestseller, *Growing Up Digital*, is that "a whole generation of teachers need to learn new tools, new approaches, and new skills" (1998, p.149). Educators recognize the importance of using technology in the classroom. "There is a feeling that, given all the improvements in technology and epistemology, we could be doing much better" (Tapscott, 1998, p.130).

Research indicates that technology is not a panacea; instead, the key to successful results in education with technology integration is the well-trained teacher (Banks & Renwick, 1997; Kerr, 1996). Wenglinsky's study on technology's effectiveness in teaching math confirms that technology can raise student achievement (1998). Eighth graders whose teachers used computers for higher level thinking tasks performed better than students whose teachers used computers for "drill and practice" activities. It is interesting to note that students whose teachers had professional development in technology outperformed their peers whose teachers did not have technology staff development (Wenglinsky, 1998).

The teacher's attitude toward technology may impact how technology is used for teaching and learning. Becker (1999) surveyed Internet usage of elementary and secondary teachers. The teachers surveyed seemed to have a positive attitude toward technology, and nearly 90% reported that having a teacher's computer station with electronic mail access and having World Wide Web access in the classroom was either a valuable or essential resource. Becker found that "teachers who attended ... staff development activities were more likely to believe the Internet to be an essential classroom resource and more likely to use the Internet than other teachers, by a fairly large degree" (1999).

It is imperative to recognize the importance of integrating technology into classroom practice before we engage teachers in staff development. It is necessary for educators to be critical and to question purposes of technology-based learning. Once we consider technology to be a support to intellectual inquiries, it is likely that we will see more studies indicating that technology has a positive effect on student learning. At this time, we are only beginning to understand the possibilities available to educators in reforming teaching and learning processes.

Why should educators integrate technology in the curriculum?

There are researchers who believe that technology is only a tool and is limited in its potential to make educational improvements (Levine & Donitsa-Schmidt, 1997) or that technology is merely serving the interests of the private sector. In fact, some argue there may be a negative effect or no effect at all on education when technology is used. For example, a study in 1996 of word processing and the effects on student essay writing found "students with less experience using word processors scored considerably higher on our writing assessment when their writing was done with pen and paper" (Wolfe, Bolton, Feltovich & Bangert, p. 269).

However, other researchers have found technology is a benefit to teaching and learning. Riel (1990) shows there is an increase in the quality of composition when using technology, especially if the writing task is authentic and meant for a real audience. Another study analyzed grade eight students' writing and revision using both holistic and analytic assessment scales and found favorable ratings for compositions based on approximately one hundred hours of composing time using technology (Owsten, Murphy & Wideman, 1992).

Barron and Goldman (1994) reported that topics can be investigated and issues can be studied from multiple perspectives using a nonlinear linkage of material. This study promotes the concept of hyperlinks and hypermedia as an important technology tool in inquiry, problem solving and decision making. "When appropriate tools are available in the system, learners can create their own integrated media products, thus becoming involved in interpreting or producing knowledge" (Barron & Goldman, 1994, p.87). Educators need to consider "why" and "how" the technology is being used or the teacher's pedagogy prior to assessing the educational value of technology integration in the classroom.

Researchers agree that technology can be used to facilitate teaching and learning using higher level thinking skills (Newman, 1994; Jonassen, 1996). Newman (1994) recognized the power of telecommunications in problem solving and conducting scientific experiments. Jonassen believes that "mindtools [computers] are intellectual partners that enhance the learner's ability to think"

(1996, p.19). In order to reach higher level thinking skills, it is crucial for constructivist learning to take place. Current technologies, such as sending and receiving electronic mail and World Wide Web browsing, allow educators to engage students in activities with significant real world data. Constructivist learning is not a new concept; researchers such as Papert (1980) recognized the purposeful use of technologies long ago:

> The child programs the computer and, in doing so, both acquires a sense of mastery over a piece of the most modern and powerful technology and establishes an intimate contact with some of the deepest ideas from science, from mathematics, and from the art of intellectual model building (p.5).

A growing number of researchers advocate the constructivist approach toward learning (Collins, 1991; Dwyer, 1994; Jonassen, 1996; Means, 1994). This constructivist approach may be simply defined as a rich environment of information and experience where students work cooperatively in small or large groups and use technology for meaningful tasks. Collins suggests that "using computers entails active learning, and this change in practice will eventually foster a shift in society's beliefs towards a more constructivist view of education" (1991, p.36).

Jonassen (1996) advocates the use of technology to engage learners in reflective thinking, ultimately resulting in knowledge construction. There are times when technology is used for authentic and purposeful tasks. Students can be engaged in a problem, reflect on previous experiences and knowledge, deliberate solutions or implications and reason about the solution. This type of thinking can be encouraged with technological resources. Means (1994) also describes this orientation based on the constructivist view of learning which promotes teaching basic skills within authentic and complex contexts so that students can achieve intellectual accomplishments they could not attain on their own.

Technology is not intended to dismiss other methods of learning, such as dramatizing a scene from a play or participating in an oral debate. Instead, technology offers another strategy teachers can use to explore areas otherwise not possible. Becker (1999) found that constructivist teachers used the Internet more regularly with students, had a more positive outlook on technology integration and were more likely to seek staff development. In evaluating the success of a Multimedia Specialist Program, Kittler (1994) found that "teachers who were already comfortable with facilitation found that technology reinforced their orientation and offered students more ways to be in charge of their own learning" (p.8). A teacher's pedagogical beliefs may impact the likelihood of participation in staff development regarding technology and, ultimately, their usage of technology for teaching and learning.

Furthermore, if educators are exposed to constructivist approaches through increased staff development opportunities, then purposeful uses of technology may result. Educators may encourage students to use technology to simulate an event that may be impossible to produce using paper and pencil. The simulation then becomes a "purposeful" task, a task otherwise impossible or time consuming without technology. The ultimate goal is to have a meaningful and beneficial impact on students (Means, 1994). Most writers have experienced writing stories and revising and editing compositions several times before publishing. Revising and editing in the writing process becomes significantly less tedious when using a word processor in comparison to rewriting the same piece of work many times before reaching the publishing stage. Using a word processor for this purpose is a meaningful task. Technology can and should be used for tasks it does best.

Perhaps, with an increased awareness of the extensive nature of technology, educators will shift teaching practices from traditional methods to a more constructivist approach. Collins suggests that "using computers entails active learning, and this change in practice will eventually foster a shift in society's beliefs towards a more constructivist view of education" (1991, p.36). Staff development is an essential ingredient for educators towards increasing an

awareness of technology-based learning and evaluating teaching and learning practices.

What are the requirements for effective staff development?

Berman and McLaughlin's study in 1978 indicates that implementations initiated top-down typically fail (cited in Means, 1994). Tapscott (1998) also discusses the top-down, teacher-centered approach and defines this authoritarian method as "broadcast learning" (p.129). He argues that educators should have an opportunity to shift to "interactive learning" described as a more effective learning paradigm. Understanding the shift from broadcast learning to interactive learning is necessary when planning and implementing staff development. "Decisions often get made too quickly, only to be regretted later on when forces are set in motion that could have been avoided if the implications of one's actions had been thought through more fully" (Apple, 1991, p.76). There is no advantage in forcing technology use without acceptance from the staff and their willingness or desire to learn.

The Sunnyvale Elementary School District successfully integrated technology by creating a Multimedia Specialist Program (Kittler, 1994). Principals nominated one teacher to participate in the five-day training program, which took place during the summer. A mentor was assigned to each teacher and made weekly contact for ongoing support. In addition, the teachers were provided with five days of follow-up training during the school year. A program evaluator identified several positive changes in the classroom from increased teacher motivation and risk-taking to a notable change in adoption of different teaching styles. Kittler (1994, p.9) identified the following elements as necessary components to this successful program:

1. The primary focus is on the curriculum and instruction, not on technology.
2. Teachers are active participants in planning, implementing and expanding the use of technology in the classroom. It is not a top-down, district-dictated program mandated without regard for teacher individuality.

3. Hardware and software are linked to staff development. Teachers keep the equipment they learn to operate for their duration in the school district.
4. Training is supported by detailed follow-up and support with additional workshops and assigned mentors.
5. Communication among teachers is encouraged. A sense of community and bonding between the multimedia specialists occurs.
6. Formal commitment to the program, in terms of money or time, is received from all involved parties: the teacher, principal, school district and community.
7. Qualitative and quantitative evaluation is planned into the program.

Brand (1998) echoes some of Kittler's (1994) ideas and describes the elements of effective staff development for the technological development of teachers. Table 1 summarizes Brand's suggestions for a well-structured staff development program.

Table 1

Elements of Effective Staff Development for the Technological Development of Teachers

Element	Suggestion
Time	Provide sufficient learning time so teachers will use computers effectively for personal and instructional uses.
Individual differences	Address varying needs and supplement individual strengths, being sensitive to each teacher's expertise and experience.
Flexibility	Allow flexibility in programming and instructional learning opportunities.
Provisional support	Invest in individuals who are experienced in both technology and curriculum at either the school or district level.
Collaborative development	Design instructional environments around collaborative problem solving and cooperative learning.

Remuneration and teacher recognition	Support and celebrate a teacher's commitment to educational computing by providing incentives, remuneration and recognition.
Sustained staff development	Provide training and related instruction that allows time for continued, ongoing learning and on-the-job support.
Link technology and educational objectives	Avoid isolating technology as a separate discipline. Provide an instructional focus that illustrates how technology can support educational objectives.
Intellectual and professional stimulation	Design instruction and activities that engage a teacher both intellectually and professionally.
Clear administrative message	Develop school administrators who encourage the technological development of teachers.

Time is needed.

Inadequate time is always a barrier in providing successful staff development. Zeitz (1995), an instructional technology coordinator, describes a series of workshops designed to provide a range of technology experiences and to provide staff with assistance and encouragement while learning new technologies (p.62). Following a needs assessment, workshops were arranged for staff before and after school hours. The workshop series was generally successful, but Zeitz concludes, "If educators are expected to improve their skills in technological areas, the administration should show its support by scheduling professional development instruction during the school day" (p.63). Hawkins (1994) opposes after hour staff development and suggests that release time should be provided by the school or school division where educators are given sufficient time to explore new technologies (p.17).

Similarly, Goodson (1991) recommends that teachers be supported by providing sufficient time to become familiar with the use and impact of technology on learning. Teachers require adequate time to use technology and to assess the educational strengths and weaknesses of technology-based learning. Educators already have many resources to evaluate and consider before they are

used. If we add another element that needs to be evaluated, we will certainly increase a teacher's workload. "Teacher's work is increasingly becoming what students of the labor process call *intensified*" (Apple, 1991, p.69). It is important to be aware of *intensification* or what we might call *burnout* and to consider giving teachers opportunities to try new technologies and make evaluations during staff development workshops.

Support can be in the form of time as well as acknowledgement that time spent on staff development is beneficial and important. Well-designed staff development programs require generous amounts of time for training and follow-up. "Because teamwork and cooperation are essential, one of the most important things principals can do is to provide time and opportunities for all staff to work together while using the talents of the more experienced," rationalizes Raff (1995, p.49), a school administrator.

Money is needed.

Money is spent on school technologies and could be spent on other resources, such as textbooks and athletics (Banks & Renwick, 1997). Educators need to be involved in funding decisions. All items being purchased, from basketballs to whiteboards to wiring for a computer network, need to be analyzed and correlated to the school's objectives. Effective planning should at least answer the following questions: What are the school objectives? What resources are required to support those objectives? Who is responsible to acquire the resource(s)? What is the expected date for the acquisition? Every purchase made should have evidence of sound educational objectives demonstrating the necessity of the purchase.

However, schools usually spend extraordinary amounts of budget funds on hardware and often neglect to allocate money towards developing technology-based teaching skills (Meltzer & Sherman, 1997). The number of computers in a school or classroom will not measure the success of technology in the school or implementation of technology in the curriculum. Conversely, a common obstacle for schools and jurisdictions planning for technology staff development is the lack

of resources or inadequate resources in the classroom. Tinson (1996) and Kittler (1994) recommend that access to technology devices and resources are provided for every staff member when implementing staff development. In many cases, staff development takes place with the use of different or newer equipment than what is available at the school or in the classroom. Meltzer and Sherman (1997) point out that "insufficient access is a primary reason why educational technology initiatives fail" (p.30). It is necessary to make equipment accessible and keep it maintained and, at the same time, provide funding for staff development.

It is evident that there are many elements necessary in order to facilitate technology integration in the curriculum with time and money as the two most sought commodities. It is worthwhile to describe some examples of educational models that utilize many of the required elements for effective staff development.

Examples of Staff Development

The Apple Classrooms of Tomorrow (ACOT) project is a well-known study of seven elementary and secondary schools using traditional methods of teaching and technology-based learning. "... A four-year longitudinal study of these students showed their greatest difference to be the manner in which they organized for and accomplished their work" (Dwyer, 1994, p.8). It was found that these students regularly demonstrated higher-order cognitive skills. Coley (1997) indicates there is a need to observe the social context of how technology is used. He indicates that educational technologies alone do not have a chance of being effective. Staff development, education or training is required to make a difference in teaching and learning.

Researchers argue there may be no significant change in practice when teachers return to the classroom following one-time staff development sessions (Fullan, 1991; Oppenheimer, 1997). Educators recognize the value of staff development, yet one-time staff development sessions continue to be the most common method of training for educators. While some educators agree that staff development at various levels is necessary for successful technology integration

in schools, others believe there has been little progress, and new models for staff development are required (Kephart & Kinnaman, 1998).

Shelton and Jones (1996), instructional technology specialists, from an urban district with almost 4200 teachers, developed three types of staff development programs for educators. Each teacher participating in any of the staff development levels was supplied with a computer for classroom use. The following examples demonstrate some innovative approaches to staff development in supporting technology integration:

1. **Teacher Technologist Training Institute for Campus Trainers** - each campus was eligible to have one teacher trained as a Level I Teacher Technologist with a recommendation by the principal. Prior to acceptance into the program, the candidate had to complete an assessment of basic technology skills. Participants received 65 hours of training and agreed to replicate 36 hours during the next school year. Teacher Technologist Level II training included advanced applications with specific multimedia training and additional Internet training. Level I was a prerequisite.
2. **Technology Bootcamp for Novice Computer Users** - this program, which included five days of intensive basic technology training, was designed to provide staff development for teachers with little or no computer skills. Teachers were expected to present two technology-based lessons they developed at Bootcamp follow-up meetings.
3. **TECHS Seminar for Experienced Computer Users** - experienced computer users with outdated or no computers in the classroom were eligible to participate. The focus was on curriculum integration. Teachers were expected to present a technology-based project they developed to other technology-using teachers (Shelton & Jones, 1996, pp.101-104).

Wiburg (1997) conducted an action research project to help teachers in elementary and secondary schools learn how to use multimedia and telecommunications in the classroom through a staff development model involving faculty or university graduate students as mentors in the schools. A

mentor was assigned to each of the three pilot schools for three to six hours per week to work with teachers collaboratively. Several strategies were used to support staff development, including a meeting with all participants at the start of the project to discuss objectives followed by monthly meetings with a focus on technology as a learning tool and the support of an on-site mentor throughout the project. It was later determined that teachers required more time to establish communication and cooperation at their own schools so researchers began alternating monthly workshops with individual training sessions at each school site. Wiburg (1997) contends that "for true integration to occur it will be necessary to invest in people, specifically teachers skilled in using technology in classrooms and able to work with other teachers at their school" (p.182).

Similarly, Browne and Ritchie (1991) describe a cognitive apprenticeship model for two staff development cases. One case describes the cognitive apprentice as a one-on-one model, and the second case describes the cognitive apprentice in a cooperative group approach. The cognitive apprentice in the one-on-one model is similar to the on-site mentor described by Wiburg (1997), and the cooperative group approach embodies elements of Wiburg's monthly meetings. Teachers were able to "internalize thinking processes and performances modeled by an expert, eventually acquiring a level of expertise for themselves" (Browne & Ritchie, 1991, p.33). There are four key components of staff development in the cognitive apprenticeship model: to instruct, to model, to coach and to empower. Browne and Ritchie (1991) found that cognitive apprenticeships help:

1. Conditionalize knowledge so that teachers understand the uses or purposes of the knowledge they are learning,
2. Provide a conceptual framework for interpreting knowledge and skills,
3. Develop fluency for gaining automaticity and expertise, and
4. Develop self-monitoring and correction skills used in successive approximation (p.33).

Van Horn (1990) noticed "Teachers often feel more comfortable about asking colleagues for help rather than outside experts" (p.52). Another mentoring program was used as a solution to providing on-site support for teachers

(MacArthur et al., 1996). "The Computer Mentor Program was designed to provide long-term, on-site support focused on teachers' individual needs and the resources available at particular schools" (MacArthur et al., 1996, p.120). Each mentor participated in a training course and worked with one to five proteges from his or her school. The mentor met with the proteges on a regular basis and was available informally for assistance. In some schools, the mentor modeled lessons for the protégés, helped with troubleshooting and worked together with staff in technology planning. This seemed to be a highly effective program because it was able to address a broad range of needs and provide staff development with existing technologies in the schools.

Through careful analysis of many studies in the area of staff development and technology-based learning, it is apparent that a cognitive apprentice, mentor or coach is a basic requirement in an effective model. What type of staff development can be provided for mentors to facilitate a shift from instruction to construction or discovery learning with emerging technologies? The framework that will be discussed includes three key conditions for a school or school division in providing staff development: planning for staff development, implementing effective staff development for educators and providing ongoing support.

Planning for Staff Development

Administrators must encourage educators to continue building technology skills, and an excellent method is to involve teachers in technology planning (Meltzer & Sherman, 1997). Apple (1991) notices that "rather than the machine fitting the educational needs and visions of the teacher, students, and community, all too often these needs and visions are made to fit the technology itself" (p.77). Schools may assist teachers in planning for technology use by determining educational goals and then organizing the technology to meet the goals (Vojtek & O'Brien Vojtek, 1998). The staff will take ownership and make sure the goals are realistic, attainable and measurable if they are equally involved in the planning process. Once schools identify the educational goals, it becomes much easier to

determine what is required to make those goals possible and later assess the actions taken.

Schools in Alberta are trying to achieve an average 5:1 student to (modern) computer ratio as recommended in the "Framework for Technology Integration in Education: A Report of the MLA Implementation Team on Business Involvement and Technology Integration" (1996). However, Banks and Renwick (1997) reported, "educators are finding that even the best technology cannot make students smarter or teachers more capable" (p. A-1). Often, planning for technology in schools only refers to the tangible items purchased instead of planning for staff development as well. There are various tools available to help staff development such as organizing groups to determine the needs of the staff and how to structure staff development accordingly.

The Fort Worth Independent School District in Texas used a survey to plan for staff development and found that classroom teachers identified four critical areas in staff development: time, training relevance, technology availability and teacher-type or hands-on tasks (Shelton & Jones, 1996). However, ongoing input from the stakeholders and consideration of current literature allowed for modifications to these four critical areas and, ultimately, changes to the staff development plans in the Texas school district. Three different levels of staff development were developed and implemented to meet the needs of all the stakeholders as discussed earlier: the Teacher Technologist Training Institute for Campus Trainers, The Technology Bootcamp for Novice Computer Users and TECHS Seminar for Experienced Computer Users.

Many studies identify diverse levels of competency in technology skills. The ACOT study (Sandholtz et al., 1997) identified five stages of instructional evolution: entry, adoption, adaptation, appropriation and invention. Similarly, Fletcher's Creek Senior Public School in Brampton, Ontario, identified three levels of technological competency to support their community of learners (MacInnes, 1997). The three levels included the aware level, the confident level and the enabled level. The aware level introduces learners to the basics of technology. The confident level provides learners with an opportunity to use a

variety of software programs and technologies to support their learning. The enabled level describes those that have mastered using hardware and software to manage information and can help direct other learners to appropriate resources.

It is helpful to begin by identifying levels of competency and sharing levels of technology competency or instructional evolution with educators to help build growth plans and develop personal goals. A deeper understanding of the competency levels may result in an acceptance that each person needs to individually advance at a personal rate. How can we implement staff development to support all levels of readiness and competency?

Implementing Staff Development for Educators

MacInnes (1997) suggests, "the successful implementation of professional development for technological competency requires that you assess and allow for:

- The individual technological needs of all learners,
- Learners' attitudes towards technology,
- Learners' technological aptitudes,
- The technological understandings of learners in your community,
- Individual learning styles, and
- Fostering collaborative skills" (p.25).

Dwyer (1994) recommends teacher development includes building "a teacher force aware of, and eager for, change – a teacher force that is fleet in mind and steady in heart and rededicated to helping all children find success in their world" (p.10). Similarly, in a Los Angeles Times article, "Technology Remains Promise, not Panacea," authors Banks and Renwick (1997) report that only 15% of teachers nationwide have received at least nine hours of staff development in educational technology. Apple (1991) recognizes the importance of staff development in education. Furthermore, he indicates one of the major effects of computers in the classroom

> may be the deskilling and depowering of a considerable number of teachers. Given the already heavy work load of planning, teaching,

> [attending] meetings, and paperwork for most teachers, and given the expense, it is probably wise to assume that the largest portion of teachers will not be given more than a very small amount of training in computers, their social effects, programming and so on (p.67).

Staff development may consist of "teaching" teachers sharing ideas and strategies of effective technology use in the classroom with colleagues. This model is supported by Apple Classroom of Tomorrow research and is also one of the eight key elements and benefits of exemplary technology staff development (Dwyer, 1994; Siegel, 1995). Lee (1996) also describes a teacher-training-teachers model that has potential to impact 30,000 teachers. Nine days of release time are provided to the technology trainers and, in return, they provide a minimum of 10 hours of technology staff development in the school or district during the year. "If teachers are to guide ... learners, they too need the time, skills and resources to ask questions and seek the best answers" (Lee, 1996, p.21). The teacher-training-teachers model is supplemented with ongoing mentoring and coaching by consultants.

Likewise, MacArthur et al. (1996) describe the teacher-training-teacher model as a cascade model of staff development. A study of technology mentors that worked with five protégés in coaching, advising, and providing emotional support found the "key features of the mentoring approach are that assistance is provided within the context of a personal relationship and is focused on the individual needs of the protégé" (MacArthur et al., 1996, p.119). It was helpful that each mentor was in the same school as the protégé to allow for collaborative planning and meetings on a weekly basis. Once protégés are comfortable in using technology in the classroom, they may become mentors and work with their own group of five protégés, creating what can be termed a cascade model.

Providing Ongoing Support

There are many avenues in providing staff development support. As discussed earlier, both time and financial commitments are key requirements for staff development and are necessary for providing ongoing support. In addition, school administrators are crucial to staff development support.

School administrators can support a constructivist model by developing flexibility in operating the school. Examples of support may include the following: banking extra time to provide staff development opportunities for staff; allocating funds for staff development; and providing mentorship and leadership in technology integration. It is important to recognize and celebrate successes with other schools, allowing teachers to shine in their achievements. Staff may have ideas on changing or restructuring the business operations of the school to provide better access to the technology. "Some changed the structure of the school day to create longer periods and more interdisciplinary programs. Others dissolved classrooms and formed multi-age teams, where children worked on self-paced research projects" (Banks & Renwick, 1997). Many schools are operating open libraries where students have access to the library all day for research opportunities. Some schools are developing partnerships with other schools and sharing expensive projectors, technicians and ideas for organizing and learning with technology.

One of the most significant challenges in providing ongoing support is dealing with technical problems that arise. In Wiburg's (1997) research of on-site mentorship, she found there were many "technical problems - computers that didn't work, network problems and computers at one school that really weren't set up to do multimedia" (p.178). Researchers realize there is inadequate technical support in schools to support staff development (Mehlinger, 1996; Moursund, 1992-3). Kittler (1994) advocates providing technical training for educators as a solution to dealing with the challenge of ensuring equipment is functional. Few teachers have certified technical training, which is becoming necessary to support emerging technologies, and many administrators are recognizing the need for on-

going technical support and taking action to employ services of highly trained technicians to help maintain the equipment purchased.

In addition to an on-site technician, school administrators can assign a teacher as a "facilitator working in daily partnership with every classroom teacher to bring technology into the basic fabric of the classroom curriculum (Pearson, 1994, p.71). Researchers advocate the empowerment of individuals who are experienced in technology and curriculum as educational leaders and mentors in the schools (Brand, 1998; Browne & Ritchie, 1991; Wiburg, 1997). Staff development models are dependent on the educational leadership provided by administrators as well as technology mentors in the school.

Administrators can also demonstrate support for school technology leaders by affording learning opportunities that will inspire and motivate educators. Van Horn (1990), director of instructional technology and professor in Florida, developed an inservice program for teacher experts and encourages administrators to send educators to professional technology conferences. Ultimately, it is most effective to send two educators to a conference together rather than a single representative from a school (Solomon & Solomon, 1995, p.39). Attending conferences is an excellent method of providing educators with opportunities to learn about technology, to network with colleagues and experts outside the district and to feel like a professional. Technology leaders will return from professional conferences refreshed and ready to share their enthusiasm to facilitate new projects with teachers in the school.

Parents are becoming more interested in technology integration and want their children to have access to technology in schools (Mehlinger, 1996). Communication with parents is essential to support staff development. Parents need to understand what the technology will be used for in the school to support ongoing expenditures and curriculum projects. Wiburg (1997) describes parents demanding additional keyboarding classes at one of the schools participating in a mentoring action research project. The parents were unaware of the purpose for computer pods in the classroom as opposed to a keyboarding lab. Administrators can provide support by helping teachers share objectives and intended outcomes

with parents to ensure everyone understands the extent of technology integration in the school.

Research demonstrates planning for staff development, implementing staff development and providing ongoing support are all necessary components in purposefully using technologies. Schools interested in improving technology integration are seeking suggestions and policies from physical infrastructure and training programs to ongoing support. Consequently, school divisions will be required to define standards and provide examples of exemplary efforts to implement and manage technology in schools. Based on the research shown for many successful staff development programs, it is interesting to observe the current initiatives in Alberta.

Current Alberta Initiatives

Teachers in Alberta are beginning to understand the expectations of technology integration in the curriculum. According to the Alberta School Act (1997), teachers are expected to be able to:

> ... use teaching/learning resources such as the chalkboard, texts, computers and other auditory, print and visual media, and maintain an awareness of emerging technological resources. They keep abreast of advances in teaching/learning technologies and how they can be incorporated into instruction and learning. As new technologies prove useful and become available in schools, teachers develop their own and their students' proficiencies in using the technologies purposefully, which may include content presentation, delivery and research applications, as well as word processing, information management and record keeping.
>
> ... use electronic networks and other telecommunication media to enhance their own knowledge and abilities, and to communicate more effectively with others (Ministerial Order #016/97).

One initiative involves Alberta Learning, formerly known as Alberta Education. Alberta was divided into six regional consortia in 1995 for the purposes of staff development. Each individual consortium can undertake the development of staff development programs to meet emerging educational needs. The six regional professional development consortia support the 1998 "Information and Communication Technology Interim Program of Studies," expected technology outcomes for students in grades K-12, and they endeavor to provide necessary staff development for teachers to use technology confidently and for a purpose.

The rationale behind the "Teaching and Learning with Technology: Professional Development for Alberta Teachers" (1998), a document produced by the consortia, recognizes the phase of professional growth in adoption of technology in the classroom. Similar to Fletcher's Creek School (McInnes, 1997), the six consortia in Alberta identified four stages of professional growth:

- Entry level – the teacher begins to learn how to use basic computer tools.
- Early adoption – the teacher is tentatively trying new things, but technology has not become a regular and comfortable part of the teaching repertoire.
- Mature adoption – technology is used regularly and confidently and provides students with opportunities to initiate the use of the technology.
- Innovation – teachers create new and meaningful ways of using technology to support teaching and learning.

The consortia in Alberta decided to provide staff development to advance teachers through all four stages of professional growth. It takes educators personal time and effort to make technology a relevant part of the learning environment. This type of staff development provides educators with examples of technology integration based on current realities in schools, such as access to "one-computer classrooms" or "pods" of computers instead of continually focusing staff development on modeling strategies in computer labs. In addition, teachers are given opportunities to thoroughly evaluate the educational value of

technologies available. The consortia provides a valuable staff development model meeting the needs of learners at diverse levels of readiness.

Similarly, the Telus Learning Connection Alliance, supported by Alberta Learning, is another initiative in Alberta that has been structured to assist teachers in the implementation of the 1998 "Information and Communication Technology Interim Program of Studies". The goal of this project is to provide Internet training and initiate Internet curricular projects in Alberta schools. The project has three deliverables:

1. Teacher inservice – representatives from all school divisions in Alberta participate in workshops providing leadership and training.
2. The 2learn web site – a valuable resource for Alberta teachers. The web site is organized into five strands: Curriculum Resources, Telecollaborative Project Centre, Teacher Tools, Research Skills and Strategies, and Professional Growth and Mentorship.
3. Internet Projects – each school division in Alberta as well as the project team will design Internet projects from grades K-12 that will be shared on the web site.

Conclusion

As technology-based learning becomes more prevalent in classroom practice, it is expected that additional provincial initiatives to support educators with staff development will evolve. Similarly, individual school divisions are also beginning to recognize the value of investing efforts into staff development to support technology leadership and to improve technology use in the curriculum. Critical aspects of directing revolutionary changes in schools today and preparing students for life-long learning include involving educators in technology planning, implementing effective staff development strategies, and providing technology support to empower educators with choices and abilities to make sound technology-related educational decisions. The aspects that emerged through the literature review are discussed further in chapter five of this case study research

on the Technology Mentorship Program, a staff development initiative in an Alberta school division.

Chapter III: Research Methodology

Research Method

Due to the characteristics of this type of research, the case study approach was selected as the research methodology for this study. Stake (1995) distinguishes the four major characteristics of qualitative studies as (1) holistic, (2) empirical, (3) interpretive and (4) emphatic (p.47). First, a case study is generally holistic and demands the researcher seek to gain a deeper understanding of the case or phenomenon. The Technology Mentorship Program was established to provide ongoing staff development and support, which requires investigation and understanding. The purpose of this study is to examine the experiences of teachers participating in the Technology Mentorship Program. Second, the study is empirical, and the case can be described using natural language based on field observations. I was immersed in the program from the time it began and collected substantial observations. Third, the research is interpretive and based on research-subject interactions and my own personal observations as researcher and participant. Fourth, the experiences of the technology mentors were shared by the subjects and reported with emergent data, making the research "emphatic" as described by Stake (1995).

In addition, evidence by researchers Gall, Borg & Gall (1996) suggested the use of the case study approach for the qualitative inquiry of the Technology Mentorship Program. The case study approach can be analyzed in relation to four characteristics of case study research: (1) the study of a phenomenon by focusing on specific instances, that is, cases; (2) an in-depth study of each case; (3) the study of a phenomenon in its natural context; and (4) the study of the emic perspective of case study participants (Gall et al., 1996, p.545). The following discussion describes how each of the four characteristics of case study research is related to the investigation of the Technology Mentorship Program.

(1) Is this a study of a phenomenon?

Yin (1989) also defines a case study as an empirical inquiry that investigates a phenomenon, in this case the Technology Mentorship Program. This is a case study describing the individuality of three schools participating in the Technology Mentorship Program. The study was designed to explore the experiences of technology mentors specifically in an urban school division. The study particularly focuses on the role of technology mentor specifically in the areas of planning, implementing and supporting staff development.

(2) Is this an in-depth study?

In this in-depth study, data was collected in various forms. The data includes questionnaire responses, interviews and a personal journal with documentation such as meeting notes, handouts, attendance records, evaluation forms, observations of staff development sessions and other artifacts provided by the participants. The questionnaire collected quantitative and qualitative data and is discussed in chapter four. Respondents were provided with results from the questionnaire and were invited to make amendments to ensure the responses were representative of the group. The interviews collected data and descriptions from three educators at each school to present multiple points of view and validate data. The interviewees were also provided with draft copies of interpretations and encouraged to make any corrections and amendments.

(3) Is this a study of a phenomenon in its natural context?

The interviews and observation of staff development sessions took place on site to allow data collection in its natural context. Also, as researcher, I have been part of the Technology Mentorship Program since its inception and have worked closely with many of the mentors in their schools. I was able to interact with the participants in the program and learn about their perspectives through "direct and personal contact with people in the program and in their own environments" as described by Patton (1987, p.16).

(4) Is this a study of the emic (thick description) perspective of the case study participants?

The three schools described in this case study revealed the similarities and differences in their experiences and in the role of the technology mentor. The interviewees were provided with an opportunity to share their perspectives by describing their roles as technology mentors and their challenges in being part of the Technology Mentorship Program through informal conversations and during a face-to-face interview. I was also able to directly observe many of the mentors naturally in the field. Common challenges and issues emerged from the subjects as the data was collected.

Rationale

The Technology Mentorship Program was designed to meet the objectives outlined in the technology plan and three-year education plan of the school division under study. It was assumed this type of professional development strategy was worthwhile during a time when the province was implementing student outcomes in technology, and staff development in technology was in high demand. The research describes the experiences of those involved in the program and highlights challenges faced by the technology mentors.

More specifically, the purpose of this case study is to examine the experiences of teachers participating in the Technology Mentorship Program to help define the role of the technology mentor specifically in the areas of planning, implementing and supporting staff development. The case study may be used as a learning tool in sharing best practices of staff development in schools. In addition, the research may be valuable for others interested in commencing a Technology Mentorship Program or a similar program.

Sample

The subjects were educators assigned the role of school technology mentor. All technology mentors were informed about the study and were asked to

voluntarily complete a questionnaire, *Technology Mentorship Program Questionnaire* (Appendix A), about their experiences as lead teachers in their respective schools. The data collected from the questionnaires was used to summarize experiences of the technology mentors and to provide data about time spent as technology mentor, tasks, planning and staff development provided as well as any challenges and issues.

There was no pressure to participate in the interviews since more mentors volunteered than were required. I selected three typical sites for participation, two elementary schools and one junior high school that would be representative of the schools participating in the Technology Mentorship Program. The interview participants included the principal and one other staff member in addition to the technology mentor from the same school. Subjects had the option of participating in an interview and having the interview audiotaped. Some subjects even provided artifacts to substantiate content in their interviews.

Role of the Researcher

Yin (1989) describes the *participant-observation* method where the researcher actually participates in the events being studied. I was a participant of the Technology Mentorship Program as facilitator of the program responsible for organizing all the meetings. As researcher, I collected documentation and kept a journal with observations and, through participating in the program, developed a strong rapport with many of the subjects. I developed a working relationship with most of the technology mentors since they attended the technology mentorship meetings and also invited me to assist in staff development sessions at their schools. The technology mentors corresponded regularly using an online mailing list and web site. I made every attempt to ensure participants did not feel obligated to participate in completing the questionnaire, being interviewed or providing any artifacts for purposes of this study.

I did not attempt to evaluate the effectiveness of the Technology Mentorship Program or any individual technology mentor. Instead, I subscribed

to a constructivist epistemology and gathered examples of experiences provided by the technology mentors and others interviewed and shared descriptions of any observations. It will be up to the reader to construct knowledge based on the data and make personal interpretations. Stake (1995) recognizes this as *relativity* where "each researcher contributes uniquely to the study of a case; each reader derives unique meanings" (p.103).

Data Collection

The three primary techniques employed for data collection included the following: (1) distributing a questionnaire to technology mentors participating in the program, (2) conducting semi-structured interviews with volunteers at three different schools, and (3) collecting my own thoughts and documentation in a journal format throughout the program as an organizer and participant. The *Technology Mentorship Program Questionnaire* (Appendix A) was developed to provide the school division under study with data about the program and to collect data for this study. The questionnaire was administered to a sample of three educators to pilot the instrument prior to administering the questionnaire to the subjects in the study. At the beginning of the March 1, 1999, meeting, technology mentors were given directions for completing the questionnaire and the purpose of collecting the data, and they were provided with adequate time to complete the questionnaire at the meeting. The questionnaire did not require participants to include their name and school location in order to provide anonymity and, as the researcher, I did not pressure respondents to respond in any particular way. A few technology mentors chose to complete the questionnaire at an alternate time and return the questionnaire later.

The *Interview Consent Form* (Appendix B), was given to participants on a separate sheet of paper where the technology mentor could agree to be involved in an interview and provide further information about his/her role as a technology mentor. Several technology mentors agreed to participate in the interview, but only three were selected due to time constraints and resources available to

conduct the research. I attempted to select three sites that were interested in participating and locations that would provide a representative sample of the schools in the Technology Mentorship Program. The two elementary schools and one junior high school selected were used as part of the case study without any connection to the questionnaire responses. Once the locations were selected, the school principal and one other teacher on staff were contacted personally and asked to participate in the interview in addition to the technology mentor at the school.

Interviews were used to "obtain the descriptions and interpretations of others" (Stake, 1995, p.64). The interview participants consented to participate in an audiotaped interview, and many shared work samples and artifacts. The subjects were interviewed for approximately one hour using a semi-structured interview style in which some of the questions were open-ended and allowed the respondents to provide opinions and personal insights, a technique Yin (1989) describes as common in case study interviews. A sheet entitled, *Preparation for Interview Questions* (Appendix C) was sent to the participants in advance. However, new questions emerged based on the responses of the interviewees. In some cases, observations of staff development sessions took place, field notes were collected and audiotapes were used to capture the sessions with permission of all participants. The data was used to describe the role of the technology mentor and the challenges in planning, implementing and supporting staff development.

All attempts were made to maintain confidentiality and anonymity in describing information from the interviews and observations in the thesis through descriptions of the three sites. Names and locations were kept confidential and anonymous. Descriptions based on field notes and use of any artifacts in the thesis do not include any identifying factors that would divulge the individuals described or the school locations. All subjects signed a written *Research Consent Form* (Appendix B) which declares confidentiality and anonymity.

Data Analysis

The nature and purpose of the research was explained to the participants verbally at the time of the interview and when completing the questionnaire as indicated below:

> **The purpose of this study is to examine the experiences of teachers participating in the Technology Mentorship Program, a program designed to empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum. Through examination of the experiences of the technology mentors, the school division will be able to define the role of the technology mentor specifically in the areas of planning, implementing and supporting staff development.**

The purpose statement is summarized and also included in the cover letter (Appendix B) which accompanied the *Research Consent Form* (Appendix B) required to obtain permission from all interview participants for the semi-structured interview and collection of any artifacts.

It was imperative that participants felt comfortable in honestly describing their experiences as technology mentors to provide accurate and comprehensive descriptions. The data was validated and clarified through triangulation by conducting interviews with the technology mentor, the school administrator and one other teacher on staff. I agree with Stake (1995) regarding validation and felt ethically obligated to "minimize representation and misunderstanding" by identifying the need for triangulation (p.109).

Participants were asked to examine draft copies of written work once all data was collected from the questionnaire and personal interviews. Field notes and any written descriptions were shared with the participants to invite feedback and consent on the interpretations and use of information provided. The questionnaire results were presented to all technology mentors at one of the meetings, and the results for each item were discussed. Mentors were given the opportunity to make any amendments to ensure the results were representative of the technology mentorship group. As researcher, I also sent the results by

electronic mail to all school administrators and technology mentors for review. Having participants review statements made in any reports to check for accuracy and validate observations is what Stake (1995) terms "member checking" (p.115). This process identified any discrepancies or errors that lead to making some modifications to the reports.

An organizational matrix (Appendices D, E and F) was created for each site in order to organize the information collected from the interviews and compare and contrast responses from the different sites and the different perspectives of those interviewed. The matrices were used to analyze recurrent themes that emerged during the personal interviews and questionnaire results, which generated significant findings. In chapter four, the research findings are presented for the original research questions. Chapter five includes a discussion of the findings. The issues focus on the examination of the experiences of teachers participating in the Technology Mentorship Program specifically in planning for staff development, implementing staff development and ongoing support required in providing technology-based learning.

Delimitations

The following delimitations were intentionally implemented due to the nature of the study and resources available to conduct the research:

- The data from the questionnaire and interviews were collected during a four-month period, and my personal journal and documentation was collected over a two-year period.

- Three school sites out of 84 possible sites, including two elementary schools and one junior high school, were selected from a list of volunteers to participate in the semi-structured interviews.

- The entire school staff was not interviewed. Three individuals were interviewed at each site. The semi-structured interviews provided the perspective of the technology mentor, the school principal and one other teacher on staff.

- The interview participants were provided with the interview questions in advance to avoid discussion of other topics during the interviews.

- There are many elements necessary for a successful program. This study only focuses on the role of the technology mentor, specifically in planning, implementing and supporting staff development.

Limitations

The following research limitations inherit to the study were identified as follows:

- School administrators selected a staff member(s) at the beginning of the school year with the responsibility of being a technology mentor without pre-determined selection criteria. Therefore, many of the participants were not necessarily the most suitable candidate for the Technology Mentorship Program.

- Schools chose to provide release time for the technology mentors to meet on the scheduled dates from 1:00 P.M.- 4:00 P.M. with a group of other lead teachers, for a total of 12 times throughout the year, without financial assistance from the school division. Due to budgetary constraints, many schools did not participate regularly in the program.

- The technology mentors were not obligated to attend all the staff development sessions provided by the Technology Mentorship Program throughout the

year. The data collected from the questionnaire is limited to those attending the March 1, 1999, meeting.

- Administrators were encouraged to provide technology mentors with time to facilitate technology integration and cascade learning to colleagues at the school, but this did not necessarily occur.

- Technology mentors had varied amounts of time dedicated to their roles.

- Many technology mentors had various roles/responsibilities and positions in the school.

- The technology mentorship group was not homogenous, and each technology mentor returned to a school with diverse circumstances.

- The subjects voluntarily completed the questionnaire and were provided time during one of the technology mentorship meetings. Some of the participants did not complete the questionnaire and may have responded differently since they were allowed to discuss the questions with others and submit the questionnaire at a later time.

- The subjects interviewed were not randomly selected. The sites were selected to provide a representative sample of the schools participating in the Technology Mentorship Program. The technology mentor and the administrator volunteered for participation and the teacher was selected within the school. The interviewees at the sites volunteered to participate in the semi-structured interview and provide artifacts for the study.

- As researcher, I built a relationship with many of the technology mentors. In addition, I had a position at the school division level, which may have impacted the involvement and responses of the respondents.

Assumptions

The following assumptions provided a basis for the research:

- The Alberta Learning "Information and Communication Technology Interim Program of Studies" provides the basis for staff development activities for teachers (1998). It is assumed that educators will require staff development to support integration of the technology outcomes, and the responsibility is up to each teacher, school and/or school division. There is a need to work with teachers and assure teachers they can handle their roles effectively.

- The Technology Program of Studies outlines the expectations for students, which influences the teacher competencies required to employ programs using technology effectively. Hence, teachers will require staff development and time to improve competencies.

- Researchers believe that technology-based learning with a constructivist approach to teaching and learning can be used to reach higher level thinking skills (Newman, 1994; Jonassen, 1996).

- Coley (1997) stresses the importance of "social contexts." He claims, "Educational technologies cannot be effective by themselves.... Attention has focused on the effect of educational technology on students and the way they learn, but more attention should be paid to the effects technology has on teachers and the way they teach." This study demonstrates how schools and jurisdictions can plan to encourage staff to integrate technology and support teachers in learning how to engage children in authentic technology-based learning tasks. A constructivist perspective is assumed to be more viable and effective in technology integration.

Chapter IV: Research Findings

There's someone continually moving it [technology] along, shepherding it, promoting it, praising people and encouraging people.... You need the facilitator, the igniter, that catalyst on site to keep it alive and to keep the change going.

Site One Administrator

Overview

This chapter provides data collected about the role of the technology mentor specifically in the areas of planning staff development, implementing staff development and providing on-going support. The three primary methods of data collection included the following: (1) distributing a questionnaire to technology mentors participating in the program, (2) conducting semi-structured interviews with volunteers at three different schools, and (3) collecting my own thoughts and documentation in a journal format throughout the program as an organizer and participant. This chapter describes the research findings relative to the original research questions presented in chapter one.

Population

There were 75 out of 84 schools in the school division under study which were formally enrolled in the program and, as shown in Table 2, there were a greater number of technology mentors at the elementary level than the secondary level. Even though many of the schools were enrolled in the program, an average of 48 technology mentors attended the 12 meetings provided throughout the school year, based on the attendance records. In addition, non-school based personnel occasionally attended the meetings, including staff from continuing education, the school division consultant group and one consultant from a rural school division.

Table 2

Technology Mentorship Population

	Schools Participating	Schools not Participating	Schools Participating (%)
Elementary	47	4	92
Elementary - Junior High	14	0	100
Elementary - Senior High	1	0	100
Junior High	9	1	90
Junior - Senior High	2	0	100
Senior High	2	4	50
Total	75	9	89

Questionnaire

The questionnaire was distributed to 46 technology mentors at the March 1, 1999, meeting. Technology mentors were provided time to complete the questionnaire at the start of the meeting. However, many participants chose to complete the questionnaire at a later time and mail it to the researcher. There were a total of 28 questionnaires completed, with a 61% return rate. As many as 71% of the respondents were technology mentors for two years, and 29% of the respondents were part of the program for one year or less. Out of all the respondents, 86% of the schools had assigned time to one technology mentor, and 14% of the schools had more than one technology mentor.

Interviews

The schools selected for participation in the personal interviews included two elementary schools and one junior high school, which will be referred to as sites one, two and three respectively.

Site one was an average elementary school located in a middle income neighborhood with approximately 270 students and 14 teachers on staff. The parents in the community were supportive of technology integration but mainly left the decision-making regarding technology planning up to the administration and teachers at the school. The school had one technology mentor with approximately three hours of release time per week. In addition, the school hired an on-site technician for eight hours per week. The technology mentor, school principal and a teacher on staff participated in the interviews.

The teacher interviewed at site one proudly described the history of the school and the teachers' comfort level by expressing that "three years ago only three staff members owned their own computers. Most may have even been hesitant to work with the electronic report card. Our main computer lab was filled with Apple IIe's. Today, 95% of our staff own their own computers, and all teachers have Pentium computers on their desks with Internet connections and an increased use of email as a correspondence tool." In addition, the teacher added, "The library is equipped with 15 Pentiums also connected to the Internet, a mobile computer with a VCR and projection unit and scanner."

The second elementary school selected was a larger school located in a middle to upper class neighborhood. The enrollment was approximately 340 students with 17 teachers on staff. The parents in this school expected their children to receive technology-based learning experiences and were extremely supportive and influential in technology planning in collaboration with the school administration and teachers. This school had two technology mentors, a teacher and the assistant principal. The teacher had approximately two hours of release time per week; the assistant principal did not have official time dedicated but used some of her administrative time for mentoring. This school also hired a technician for 20 hours per week to assist with their school network and any

technical problems. At this school, the mentor, principal and assistant principal participated in a semi-structured interview.

The teachers and students at site two used technologies on a regular basis. The school principal described the environment as a place where "you can't hide from the technology. The technology here is in your face all the time, whether it's for the announcements in the morning or through the report card or communicating with one another. So if you are not accepting of the technology here at this school, then you might be like a fish out of water." The assistant principal on staff remarked, "In this school, there are expectations. This [use of technology] is a standard here, not an option."

The third school selected was a junior high school in a low-income area with approximately 240 students and 15 teachers. This school provided the technology mentor with release time to attend the 12 meetings and with approximately one hour of release time each week. The parents were not involved in technology planning but were pleased with the direction taken by the staff to utilize technology in the curriculum. Both the school principal and technology mentor were new teachers on staff and inexperienced in their roles as principal and lead teacher respectively. At this site, the technology mentor, school principal and a teacher on staff were interviewed.

"Every teacher has one computer in the classroom," outlined the technology mentor at site three as she described the school, and the school is equipped with a lab of networked computers and a projection system. Unlike many other secondary schools and the two elementary schools described earlier, this school did not allocate a budget to hire a technician on staff to assist with technology maintenance. There was a diverse level of expertise on staff with as many as "half the staff being brand new teachers and half being older teachers that are not as comfortable with using computers," explained the technology mentor.

Journal

Comments from my journal were included in the research findings to help clarify the ideas discussed in the interviews or marked in the questionnaire. The journal was maintained for two years, from the commencement of the Technology Mentorship Program. However, since the program was in a prototype stage during the first year of implementation, the documentation was minimal. The journal contains documentation including meeting agendas, handouts provided to the participants, attendance records and evaluation forms. In addition, as a technology facilitator in the school division, I collected records of working with the technology mentors and teachers on site. The journal also contains observations and anecdotal records collected from the program.

Description of Results

Role of the technology mentor

What is the role of the technology mentor? Based on the review of mentorship programs in the literature and personal experiences with mentorship, the Technology Mentorship Program was initiated with a basic understanding of the role of the technology mentor. In two previous teaching experiences at the elementary and secondary level, I was provided with some release time or flexible scheduling, which allowed me to facilitate technology integration with teachers individually or in small groups. The focus was to help or counsel teachers with using technology as a tool in teaching and learning. Once I accepted a school division position with essentially the same goal, to help facilitate technology in the curriculum, I felt the model used at the school level could be extended to the school division level. Thus, it was emphasized throughout the Technology Mentorship Program that the role of the technology mentor was to gather information from a school division level and return to the school to share the information at a school level.

One of the first staff development sessions provided this year was a "Workshop on Workshops" on how to present to adult learners from the Alberta

Teachers' Association. This particular session was helpful for mentors in gaining a better understanding or realization of their role. Furthermore, the interviews with the technology mentors indicated that their role included attending meetings, planning and providing staff development sessions and helping teachers on staff. The administrators also believed the role of the technology mentor was to attend the meetings and share or report back to the staff. The administrator at site one summarized, "I think the role of the technology mentor is instructional. His/her job is to show teachers how to integrate technology into the Program of Studies, and it is simply a vehicle." Similarly, the teachers on staff felt the role of the technology mentor involved contact with school division staff and networking, bringing back information to the school and providing professional development for staff.

The technology mentor at site three added that, as part of her role, she was expected to set up computers and handle some of the maintenance and troubleshooting. In my observations and personal contact with technology mentors in the program, I recognized their role was dependent on the functioning and availability of equipment at the school. In many cases, in order to provide staff development, substantial time was required in advance to prepare hardware, software or training procedures, which can become a challenge for technology mentors considering the limited amount of time available. For example, staff development sessions in the Technology Mentorship Program, such as configuration of electronic mail accounts, helped mentors learn how to set up an email account for each staff member. This type of staff development was necessary prior to introducing curricular connections and the use of email as a teaching tool in the classroom.

In item two on the questionnaire, respondents were asked to provide the number of hours spent as a technology mentor during the last month, referring to February, 1999. On average, participants spent six hours per week as a technology mentor, with a standard deviation of 7.38. However, in item five, respondents indicated their time allocation with an average amount of assigned time per week for each technology mentor as approximately three hours with a

standard deviation of 3.73. The highest amount of allocated time to a technology mentor was 14 hours per week. Table 3 shows the relation of allocated time versus time spent. In most of the cases, more time was spent on tasks than officially allocated to the technology mentor. Out of the 28 questionnaires, 26 were used to provide the data regarding time allocated versus time spent since two questionnaires did not provide numerical responses to the questions.

Table 3

Time Spent as Technology Mentor

Technology Mentor	*Allocated Time (hrs/wk)*	*Actual Time Spent (hrs/wk)*	*Difference*
1	0.00	2.50	-2.50
2	1.17	10.00	-8.83
3	14.00	17.50	-3.50
4	8.00	2.00	6.00
5	2.33	1.25	1.08
6	9.33	15.00	-5.67
7	0.00	3.00	-3.00
8	4.67	5.00	-0.33
9	1.17	6.25	-5.08
10	11.67	36.25	-24.58
11	1.17	3.75	-2.58
12	1.17	1.50	-0.33
13	2.33	5.00	-2.67
14	0.00	3.00	-3.00
15	2.33	2.00	0.33
16	0.78	7.50	-6.72
17	1.00	3.00	-2.00
18	2.33	5.50	-3.17
19	0.00	2.50	-2.50
20	4.67	2.50	2.17
21	2.33	3.00	-0.67
22	2.33	5.00	-2.67
23	0.00	5.00	-5.00
24	2.33	3.00	-0.67
25	4.20	12.50	-8.30
26	0.00	2.50	-2.50
M	3.05	6.38	
SD	3.73	7.38	

In item three on the questionnaire, respondents were asked to indicate the percentage of time spent on each task during the last month. As shown in Figure 1, technology mentors spent time on various tasks in their roles. The greatest amount of time was spent on fixing computer problems, with an average of 29% of the monthly time dedicated to that task.

Second, an average of 24% of the time assigned to the technology mentor was spent attending the three hour Technology Mentorship meetings, which generally took place 12 times throughout the school year. During some months, there were two meetings; however, during the month of February, which is the month technology mentors used as the basis for their responses on the questionnaire, only one meeting was held. Also, for part of their time, technology mentors provided staff development sessions for staff and helped staff plan lessons or units integrating technology. A similar amount of time was devoted to both technology planning and other tasks such as web development, purchasing equipment, software reviews, upgrading software, generating report cards, and coordinating tasks for technicians and repair people (See Figure 1).

Figure 1. Average amount of time respondents spent on tasks during the last month.

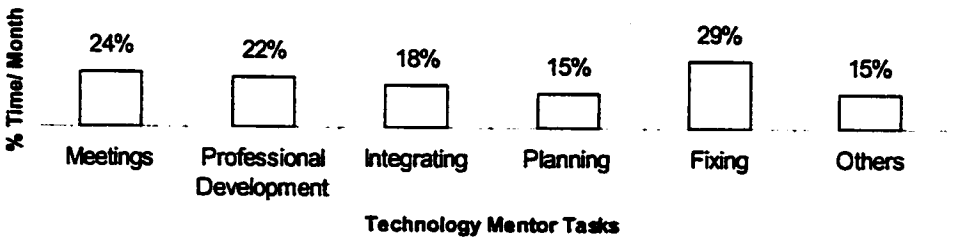
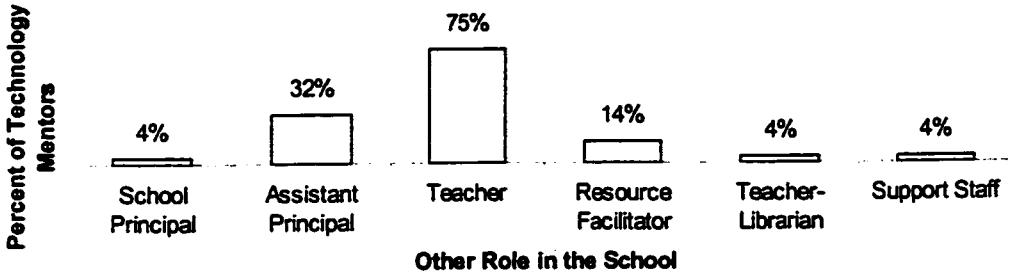


Figure 2 illustrates the percentage of technology mentors that have other roles in the schools. Item six on the questionnaire found the majority of technology mentors were classroom teachers, and as many as 32% were also assistant principals. The administrator from site two stated, "I seem to have read

somewhere where they [school division] would like to see the assistant principal as the key person to implementing any technology changes in the school."

Figure 2. Other roles technology mentors had in the schools.



Planning Staff Development

How do technology mentors plan for staff development in their schools? In item eight on the questionnaire, respondents were asked in an open-form question to list any new technology projects and plans in schools. Technology mentors listed the following items (these are not listed in any particular order): wiring, networking, using Windows NT, integrating technology in the curriculum, email use, strategies for using the Internet as a research tool, using PowerPoint for presentations, using MS Office, planning, web page construction, MS Publisher, Integrade grade book program, increased number of computers, spreadsheets, databases, word processing, projects and digital cameras. Technology and curriculum connections were rarely stated.

The teachers interviewed discussed the idea of organizing committees for planning staff development. Site one established a Technology Support Team responsible for coordinating staff development based on school identified goals in cooperation with the technology mentor and on-site experts. One of the major goals in the technology plan was to implement a plan that integrated technology into the Alberta Program of Studies and incorporated staff input, school division

goals, Alberta Learning goals and the Information and Communication Technology outcomes.

Site two used a questionnaire and a planning sheet to determine the specific needs of staff. This questionnaire helped the technology committee determine the type of professional development required by the staff. The committee tailored a one-day staff development session to help teachers learn how to create web pages for classroom activities and online projects. This school seemed to facilitate staff development sessions appropriate for a continuum of ability levels with a focus on learning how to use technology as a tool for learning.

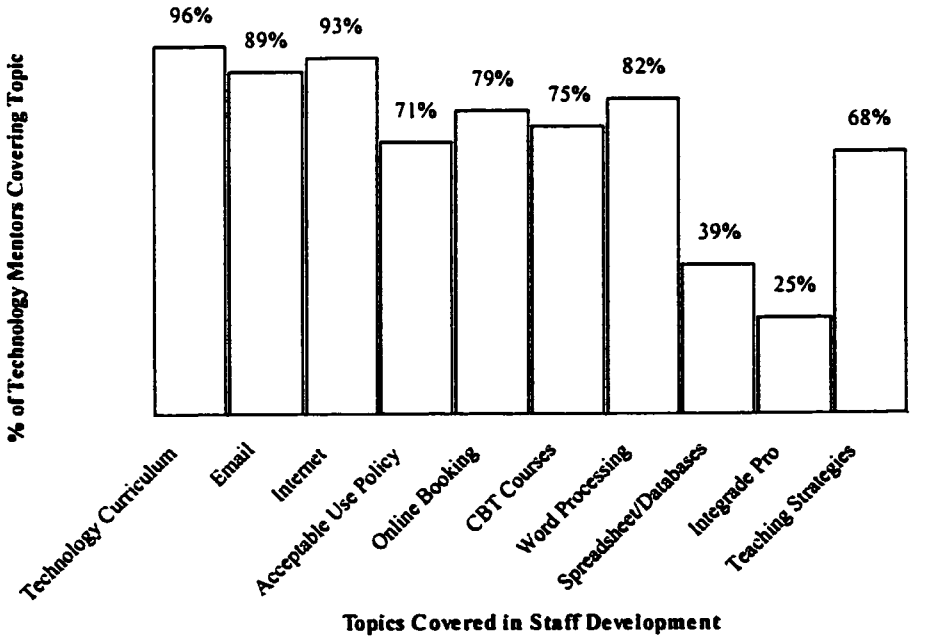
Site three found it very difficult to provide sessions for the whole group since the technology skill levels on staff were so diverse. The administrator at site three referred to the staff as a "mixed bag" when it came to using technology. The technology mentor at this school was successful in offering optional staff development sessions after school and provided sessions for beginners and alternate sessions for more advanced users. The staff development provided was mainly related to the report card and generating marks at the junior high school level.

Implementing Staff Development

What type of staff development topics are technology mentors covering? Technology mentors provided staff development in many areas as shown in Figure 3. Respondents were asked to indicate their involvement in providing staff development in 10 categories that were emphasized in the Technology Mentorship Program throughout the year. On item seven, 96% of the respondents agreed they provided staff development of the awareness of the Technology Program of Studies to their staff at some point during the year. As many as 93% of the mentors trained staff on the use of the Internet, which also includes web page construction. Only 29% of technology mentors provided staff development on Integrade Pro, the program used to generate student grades.

Many technology mentors trained staff on using the school division online booking system that allows teachers to reserve print and audiovisual resources for classroom use. Computer Based Training (CBT) Courses were available for staff development in basic productivity skills, and many technology mentors used the courses as a method of individualized training. Staff development on employing various teaching strategies included the use of one-computer classrooms, pods of computers, labs and methods of organizing learning through technology. On the questionnaire, technology mentors were provided with an open-ended category to list other staff development provided. The areas listed included the following: software training for typing, training for basic skills and presentations, troubleshooting techniques, how to use CD ROM's, networks, operating systems and projectors.

Figure 3. Staff development provided by technology mentors.



A similarity in the interviews was that all three sites used whole staff and individual staff development methods. Site one focussed on the use of the Internet and integration in other curricular areas. Site two developed a one day

conference for the creation of web pages to support classroom instruction and online projects. Site three discussed the use of the program generating report card marks and importing the marks in the student record system. All three technology mentors provided staff development based on the needs of the school and staff goals.

Site one had a unique approach to staff development that involved school division technology facilitators as well. This approach was used to train teachers on the integration of technology in the Program of Studies. The administrator referred to the model by describing the four stages in the following way:

1. **Initial Conference Stage** - where the instructional technology facilitators from the school division came out to the school to work with teachers and the technology mentor on a pre-planned theme or concept within the curriculum and helped plan a lesson.
2. **Demonstration Stage** - included a partnership lesson where the facilitator, technology mentor and teacher together brought in the students, and launched the project or taught the lesson in collaboration.
3. **Empowerment Stage** - the teacher was required to continue the lesson or carry on following the partnership lesson.
4. **Follow-up Stage** - a meeting between the facilitator, mentor and teacher took place to build accountability and provide support.

In addition, site one created on-site experts. The administrator declared, "We found with all the technology, there are so many things going on, that it was not practical to try and know something about everything." Thus, they developed on-site experts or specialists with an area of expertise. They had a teacher who was familiar with the report card program and another with multimedia presentations and a third with electronic communications recognized as on-site experts. "Spreading the wealth is what we are doing here. We are not overloading one person," described the teacher at the school. These specialists also prepared staff development sessions and helped mentor other staff members.

Support for Staff Development

What support is available to the technology mentor at the school level and at the school division level? In items nine to fifteen on the questionnaire, using a five point Likert scale, respondents were asked to indicate a level of agreement with the statements as shown in Table 4. The following attitude scale was used to determine a mean score for each response: Disagree (D) = 1; Somewhat Disagree (SD) = 2; Neither Disagree Nor Agree (ND NA) = 3; Somewhat Agree (SA) = 4 and Agree (A) = 5. Most technology mentors felt they received adequate support from their school administration and other technology mentors in the program.

Table 4

Level of Adequate Support

I have adequate support from the:	***M***	***SD***
Staff at the school	3.93	1.15
School Administration	4.54	0.92
Consultants from School Operations Services	4.04	0.88
School Division Help Desk	3.18	1.31
Technology Trainers from Technology Services	3.75	1.11
Technicians from Technology Services	2.93	1.56
Technology Mentors in the Program	4.50	0.69

In item sixteen, respondents were provided with an open-form question to list other persons/agencies providing support to the technology mentors. Responses included the following (these are not listed in any particular order): computer vendors, staff from other schools, family, friends, outside contractors, support staff, purchasing department, high school work experience students and the Telus Learning Connection team.

The technology mentors and teachers on staff at all three locations highlighted school administrators as the number one area of support. The administration provided release time to attend the Technology Mentorship

meetings and additional time to work with other staff members. Technology mentors at both sites two and three indicated the administrator was crucial in providing budgetary funds to assist with technological purchases. Site one spent a substantial budget last year on equipment and the focus this year was more on staff development. Providing encouragement and opportunity for teachers to share their growth was also very important. The administrator at site one stated that the school "encourages teachers to attend workshops on technology and give a presentation to staff. This helps their own professional development and nurtures empowerment and ownership."

The interviewees also agreed on the positive influence of the Technology Mentorship Program and, specifically, the support provided by other teachers attending the meetings. The networking provided by the program and the cohort groups established allowed mentors to interact with colleagues around the city and support each other. The mentor from the junior high school stated, "Everyone is always offering everyone ideas ...there's a kind of network that has been developed." The mentor from site one felt that networking was an opportunity afforded to all; however, some of the technology mentors did not take advantage of this. She stated, "You have to be willing to connect with other people or email people if you have a problem." From my observations, the technology mentors who made an effort to network and share ideas with each other gained more support than others who attended irregularly and were not willing to connect with others did. Also, during sessions where the cohort groups met and discussed issues, some technology mentors were more involved in discussions than others.

The Technology Mentorship Program also established communication techniques to assist mentors in their roles. One support was the web site, which included information about upcoming meetings, handouts and information from previous meetings. The technology mentor from site two expressed her satisfaction by stating, "The work done on the web page is outstanding. You can go to the web page, and there are FAQ's [frequently asked questions], professional development material and literature to read prior to the meetings." In addition, CBT online courses were available for basic computer competencies in using a

word processor, spreadsheet, navigating the Internet and using electronic mail. These courses were available to staff members for individual use and self-directed pacing.

Another means of communication was the mailing list, also known as the listserv, designed to facilitate electronic mail delivery to all the technology mentors. One of the first staff development sessions provided through the program demonstrated how to configure an email account, and technology mentors received a handout with directions on how to subscribe to the listserv. This process automatically added the sender's email address to the mailing list. Once messages were sent to the listserv address, all email addresses that were part of the mailing list received the same message. Technology mentors used this method of communication to quickly receive responses to questions or to share information with others. This was a successful means of communication for the group. The technology mentor at site three described the listserv as a place "where we can chat through email about our concerns" and, on the questionnaire, a respondent wrote, "It is a very useful way to solve problems."

There was a consensus that the program and means of communication provided for the technology mentors would not have been possible without the support of a technology facilitator or a person in place to coordinate the Technology Mentorship Program. "The facilitator position is absolutely necessary," commented the mentor at site three. The administrator at site two even supported the idea of having more technology facilitators hired to focus on technology integration and instruction. The interviewees agreed that it was helpful to have a facilitator that was easy to access and willing to help others and provide support.

Other staff members working at the schools also provided tremendous support at all three locations. The technology mentors and administrators were pleased to see teachers helping and mentoring each other. Site one formalized this mentoring process by distinguishing lead teachers as on-site experts. The administrators seemed to involve staff in the decision-making processes that encouraged teamwork and collaborative efforts in learning new skills. The

administrator at site three noticed other staff members complementing the technology mentor and "telling her what a good job she was doing." One can really make a difference by "promoting a collegial model of helping each other," highlighted the administrator at site one.

Site one and two shared a similarity of having a technician on staff, and both schools admitted this support was necessary. The mentor at site two described this as a "luxury" but was pleased with the reduced number of calls and questions he received regarding technical issues. The teacher at site one felt fortunate over the last few years to have people on staff as so called "techies" that could handle the technical maintenance. The administrators also recognized the importance of having technical support on-site. "You don't want to be down with a problem, and then Technology Services can't come out for two weeks," emphasized the administrator at site one because "momentum is important."

Site two and three both commented on the support provided by the help desk. "Knowing that there is somebody there to answer questions has been beneficial," shared the teacher at site two. However, she also indicated that, due to having an on-site technician, the school did not tap into the help desk service very much. On the other hand, site three relied on the services and support provided by the help desk for all technical problems. The staff members were all aware that any calls to the help desk needed to be directed through the mentor who assisted in dealing with support personnel. Even though the service was valuable and necessary, especially for a school without on-site technical support, there were some concerns about the slow response time and negative attitudes of the technicians from technology services. "They come in and try to hide and get out quick instead of coming in with a plan," observed the administrator at site three.

Challenges

What challenges do technology mentors face as they facilitate curricular technology integration in their schools? In item eighteen on the questionnaire, an

open-form question, respondents were asked to identify their most important need as technology mentors. Most felt more time was necessary to accomplish more in their role. The following is a summary of the key items listed as high needs or challenges:

- **Time** to inservice, implement programs, attend meetings, attend workshops for personal training, collaborate with colleagues and meet school needs.
- **Support** for various computer formats and programs, troubleshooting technical problems, priority access to help desk and support with technology planning.
- **Money** for human and material resources.
- **Recognition** or incentives such as a flexible timetable, release time and staff development opportunities.

Similarly, all interviewees discussed the need for more time to accomplish tasks. As previously outlined in Table 3, technology mentors spend considerably more time than what schools allocated for their roles. It was evident the technology mentor, school administrator and staff member acknowledged the reality of inadequate time and indicated this as the greatest challenge in participating in the Technology Mentorship Program.

In addition, there was the issue of the diverse level of knowledge with regards to technology integration at both elementary schools and the junior high school. Similar to teaching a classroom of students and differentiating instruction to meet the needs of learners, the mentors shared frustration in trying to support staff with different levels of expertise. "You have to look at the fact that not everybody is going to be ready on staff at the same time," expressed the mentor at site one. The mentor at site two indicated a challenge is to "encourage the new users that are reluctant to come on board," and the mentor at site three described many of the teachers on staff as "not comfortable with using computers."

Another similarity in responses was the need for additional resources or funding. Generally, the administrators felt more resources and/or funding was the most important need or challenge. Funding directly impacts the ability to allocate

more time to the technology mentor role and other positions in the school. For example, the administrator at site one felt strongly about teamwork and suggested that "to complement the team, you need a media resource person that is very literate in technology and can assist the technology integration process when the class comes into the media resource centre." In addition, he felt a technician was also an important member on staff and crucial in supporting technology integration.

Both sites two and three discussed the need for more curriculum connections with technology. The technology mentor at site two wanted more direction and "understanding of how the technology can be used in the classroom," and the technology mentor at site three felt she spent the year getting the hardware and software in place and was only ready to start investigating curricular integration. However, site one spent time on understanding the technology outcomes and even outlining the expectations for each grade level. Each teacher on staff was expected to integrate technology in at least one unit of study and was expected to share his/her idea with staff at one of the staff meetings.

The administrator at site two described an incentive as "a carrot dangled in front of teachers or administrators to be able to put programs or strategies in place and to be able to move the technology forward." The technology mentor at site one described her release time as "flexible time," which could be considered as an incentive by some teachers. She was released from classes every Monday afternoon, which allowed her to attend the meetings without preparing lessons for her class. In addition, on non-meeting days, she had an opportunity to work with other staff members and provide her choice of in-class or individual assistance. If she helped teachers after school or at alternate times during the day, then she could utilize the Monday afternoon release time for her own classroom preparations. The administrator at site two supported his technology mentor by providing release time to attend the meetings and give support in attending other conferences or professional development opportunities, which may also be considered as an incentive by some teachers. Even though support or what some

may consider as incentives were provided for technology mentors through release time and opportunities for attending conferences, respondents felt there was a need for additional incentives.

Some of the unique challenges faced at the junior high level included the following:

- scheduling release time for the technology mentor,
- students lacking basic skills,
- limited time and access to the computer lab, and
- technical issues.

Unlike the two elementary schools interviewed, in the junior high, it was impossible to provide the technology mentor with consistent release time to attend the Technology Mentorship meetings and work with teachers at the school due to a six-day rotational schedule. Second, many of the teachers at site three were not comfortable with integrating technology into curricular subjects, and computer class was an optional course for students, which made it possible for students to graduate from junior high and not have any experience using technology. The technology mentor discussed the need for a mandatory computer class in grade seven to ensure students have some basic technology skills in junior high. Third, the teacher at site three was concerned about the limited lab time and the inability to utilize the technology during her classes due to scheduling. However, an additional grade seven computer class would have made scheduling even more restrictive and limit access to the computer lab even further.

Site three also had the challenge of dealing with technical problems. Both sites one and two allocated budgets to hire an on-site technician. However, site three relied on the technology mentor and the help desk, which provided technical support to the schools, for fixing technical problems. The administrator at site three indicated the school division is slow in responding to requests, and the teacher felt there was too great of an expectation for the technology mentor to fix every problem. Sites one and two did not focus on technical problems during the interviews.

Positive Aspects

What are the positive aspects of participating in the technology mentorship Program? All three mentors indicated that one of the positive aspects of being a technology mentor was the opportunity to learn new things and share them with others. The administrator at site two was pleased to have a teacher on staff who was knowledgeable in the area of technology integration and kept abreast of new developments. The teachers on staff also indicated the importance of having a knowledgeable individual who provided focus and encouragement and who was proactive. "It is great to have someone to ask questions ... and applies knowledge to integrate technology in the curriculum," commented the teacher at site three.

The technology mentor at site two was pleased to be part of the decision-making process and liked the ability to share ideas with others. Similarly, the teacher from site one spoke highly of the technology mentor at his school and was delighted to have a representative from the school "having direct input in determining the direction of an emerging field." From the interview responses, it was evident the technology mentor held a respected role in the schools and provided opportunities for teachers to share their talents.

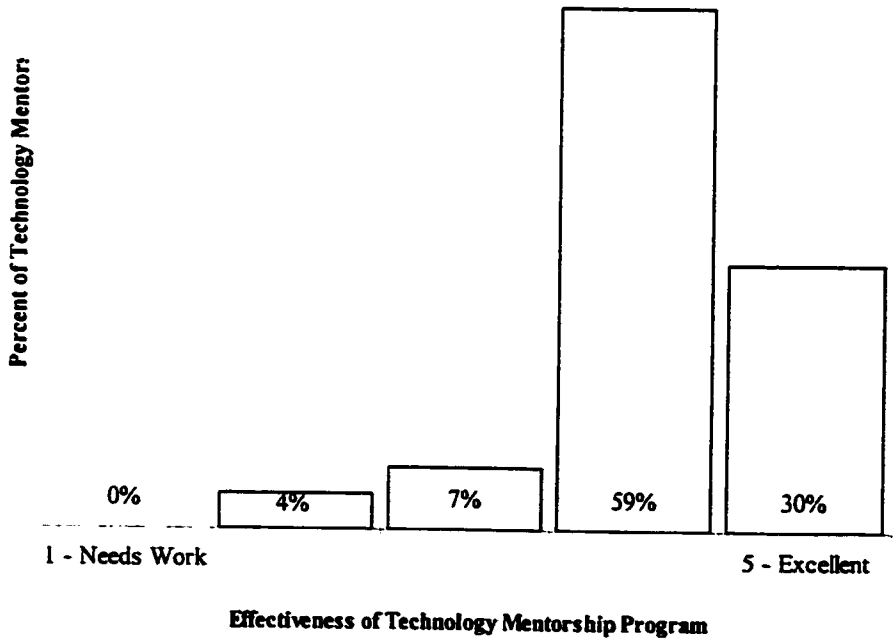
The final item on the questionnaire provided respondents with an opportunity to include any additional comments. Most of the comments included positive statements about the program, such as, "I feel the Mentorship Program is very helpful in that it makes us aware of the problems and successes other schools are having. This helps us prepare a plan for our school. It is also a great network for sharing information." Overall, the comments indicated support of the program, the sessions provided and the speakers who presented sessions in the program. Many comments demonstrated support of communication methods used in the program. "Technology Mentorship is a necessary program. It facilitates inter-school division communication and staff development. It allows opportunities to network, support and question each other." The main focus of the program was to share information with the schools and support technology integration, and one mentor commented, "I think the mentor group is an excellent avenue to bring information back to the schools. It is also a wonderful way to

keep communication between schools." Another respondent commented positively by writing, "Since the Technology Mentorship Program, I have been able to help out my school immensely."

Effectiveness

What is the effectiveness of the Technology Mentorship Program? Based on the current realities in the school division, particularly limited budgets, technology mentors rated the effectiveness of the Technology Mentorship Program in item seventeen of the questionnaire. Figure 4 illustrates the use of a five-point scale from a rating of one, which indicates the program needs work, to five as an excellent rating. The majority, 59% of technology mentors, rated the program favorably. The mean response was 4.15 on the five-point scale.

Figure 4. Effectiveness of the Technology Mentorship Program.



Similarly, the interviewees seemed to respond favorably to the program and the content of the sessions. The administrator at site one expressed, "The Technology Mentorship Program has been a tremendous benefit to the school, and the mentor has provided valuable leadership in the program. It was designed as a program where she would be the facilitator, the mentor and the lighthouse in the school as far as technology is concerned." The teacher at the same school described the program by saying, "The technology mentors are the first ones to get exposed to any new technologies and advances. What makes it exciting is that it is passed on to us." There is always a concern of not meeting the needs of teachers working with different grade levels. However, the mentor from the junior high school stated her satisfaction with the sessions by remarking, "There is always something for everyone."

Summary

The data collected through the questionnaire, semi-structured interviews with three schools and a journal with observations and artifacts provided information to address the research questions presented in chapter one. The role of the technology mentor, specifically in the areas of planning, implementing and supporting staff development based on the experiences of the teachers participating in the Technology Mentorship Program, will be discussed in chapter five.

Chapter V: Discussion

Overview

The intent of this chapter is to discuss the detailed results presented in chapter four. The discussion in this chapter is based on the purpose of the thesis: to examine the experiences of teachers participating in the Technology Mentorship Program. Through examination of the experiences of the technology mentors, the school division will be able to define the role of the technology mentor specifically in the areas of planning, implementing and supporting staff development.

The review of the literature showed that various staff development opportunities are available to educators to support technology-based learning. The studies reviewed in chapter two identified three key components of staff development: planning for staff development, implementing effective staff development for educators and providing ongoing support. The data collected in the questionnaire and interviews focussed on the role of the technology mentor and the above three key components. Observations and field notes from the journal are used throughout the discussion to help clarify ideas or support findings in the questionnaire and interviews. There are other aspects that could be considered in researching a staff development program and will be identified as suggestions for future research later in this chapter.

The following discussion begins by describing the characteristics of a technology mentor, the role of the technology mentor and the issues that emerged from the data collected. This is followed by an explanation of how planning for staff development, implementing staff development and providing support through a Technology Mentorship Program can empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum. Throughout the interpretation of results, limitations of the Technology Mentorship Program will be identified, and suggestions for changes in the program will be noted.

Categories for Discussion

Characteristics of the Technology Mentor

During the semi-structured interviews, many interviewees discussed essential characteristics of technology mentors. Perhaps the technology mentor selection process could be identified and communicated with the administrators and staff at the start of the school year. The following ten characteristics for effective technology mentors emerged in the interviews with the three schools in the case study. The technology mentors interviewed exhibited many of the characteristics listed, which I believe contributed to the success of the program in their schools. This list is not meant to be exhaustive but could be used as a guideline for selecting or nominating a technology mentor at a school. The technology mentors according to my research, should fit the following criteria:

1. Interested in the program - it is important to involve staff that show interest and are willing to participate in a Technology Mentorship Program.
2. A person with exceptional interpersonal and organizational skills.
3. Computer confidence - somewhat knowledgeable in the area of technology-based learning and willingness to learn and keep abreast of new technologies and curricula.
4. Able to work as part of the leadership team at the school.
5. An excellent communicator both orally and in written form - the technology mentor will need to share learning with others, and communication ability is crucial.
6. Willing to network and help others - networking may involve connecting with teachers from other schools and school division personnel.
7. Sensitive to different levels of ability and readiness when mentoring others.
8. Flexible - willingness to provide assistance during unscheduled times.
9. Patient when helping others.
10. A risk-taker - a person who is willing to try new teaching methods or facilitate innovative projects.

At first, a new technology mentor may feel pressured to solve all the technology problems or know something about all the computer applications being used in the school. The technology mentor at site one provided this particular advice and said it is essential that a technology mentor realizes that he/she "doesn't have to know all the answers to everything." The teacher from site one added, "Don't be afraid to ask for help and assistance." Through clear communication in the selection process of technology mentors, it may be possible in the future to identify the characteristics required for a successful experience in the Technology Mentorship Program.

Role of the Technology Mentor

In interviewing the technology mentor, school principal and a teacher on staff, it was clear the general role of the technology mentor was to support technology-based learning. However, the specific tasks carried out by the three mentors identified in this study were somewhat inconsistent with the questionnaire responses as shown in Figure 1, chapter four. There were also significant differences in responsibilities based on the understandings of the role of the technology mentors at the three sites in this study. The following discussion addresses issues that occurred relative to defining the role of the technology mentor such as technical differences, role ambiguity, role accountability, role sharing, role overload and release time tension.

Technical Differences

Fixing computer problems was a task to which technology mentors devoted almost 30% of their time. Yet, in the interviews, only one of the technology mentors indicated some time was spent on repairs or maintenance of equipment. As expected, most technology mentors spent more time on technology-related tasks than was assigned by the school administrator. Some of the responses in the questionnaire demonstrated that mentors spent as much as double the time they had allocated to their role. As mentioned earlier, a third of

this time was dedicated to technical issues, with only 18% devoted to integrating technology in the curriculum. Brand (1998) advocates that it is effective to invest in someone with experience in both technology and curriculum whereas Meltzer and Sherman (1997) found that "principals who accept the role of keeping things in working order are more successful than those who leave the fixing to teachers" (p.30). The administrators from site one and two allocated funds for an on-site technician whereas site three relied on the technology mentor and off-site technicians for repairs.

Is a technology mentor a teacher or technician? It is possible that site one and site two did not require the technology mentor to fix computer problems since both schools had technicians on staff for 8 hours and 20 hours per week respectively. The technology mentor at site three spent time setting up computers, troubleshooting and communicating with off-site technicians to seek assistance with problems in addition to providing staff development for teachers at the school. The teacher on staff indicated the technology mentor, "is not a technician; she is a teacher trying to integrate technology in the curriculum." The administrator agreed that "we can't expect the teacher to be a total technician."

However, many teachers spend numerous hours dealing with technical difficulties before and after school in order to use technology for curricular purposes (Sandholtz et al., 1997, p. 38). The administrator at site three argued, "The reality is that we don't have the money for a technician." In my observations visiting technology mentors at their sites and communicating on a regular basis with many of the technology mentors and administrators, this situation is common at many schools. An additional question on the questionnaire could have asked if the school had a technician on staff. There may have been a correlation between schools with technicians and the amount of time spent on fixing computer problems compared to schools without on-site technicians. Do schools with on-site technical support focus more on technology-based learning? This issue will be discussed later in this chapter as a suggestion for future research.

Role Ambiguity

Is the technology mentor a combination of both an educational expert or technical expert? Solomon and Solomon (1995) urge schools to provide on-site support people to ensure technology is functioning properly in order for teachers to continue using the technology (p.38). Are technology mentors feeling overworked by setting unrealistic goals and spending far more time than allocated as shown in Figure 1, chapter four? Is the ambiguity in role between teacher and technician influencing some technology mentors to spend excessive amounts of time in their roles? History shows us that, with any new innovation, there are advantages accompanied by unexpected occurrences. Is technology mentor burnout one of those unexpected occurrences?

We need to be sensitive to the possibility of teacher burnout and the reluctance to continue as technology mentors if mentors continue to spend the amount of time indicated in the questionnaires on their tasks. Role ambiguity can contribute to employee dissatisfaction and increased stress (Jaques, 1985). Perhaps the Technology Mentorship Program could address this issue to help protect mentors from burnout and dissatisfaction.

Role Accountability

There are other issues that were apparent during the interviews with the three sites that might result in teacher burnout. In site three, the teacher on staff suggested that, in the future, it would be helpful to define the role of the technology mentor for all staff. It is necessary to know what the mentor can and cannot do and how much time this person has been allotted for the role. Conversely, site one made it very clear to staff that the technology mentor would be released from teaching duties every Monday afternoon. The expectation was that she would attend the technology mentorship meetings when scheduled and help teachers on staff with technology integration on alternate Monday afternoons.

If the technology mentor is afforded a flexible schedule, it is necessary to share any changes in scheduling regularly with staff to provide accountability and to ensure staff members are supportive of the technology mentor. The mentor at site one communicated with staff members at staff meetings to inform them of any changes to her schedule so staff members would not get annoyed if they saw her working on something else during her allocated time. If staff required extra support after school during report card week, then the technology mentor would utilize the Monday afternoon for her own classroom preparations since she knew that all her after school time would be dedicated to her role as technology mentor. The Technology Mentorship Program could encourage administrators to regularly provide time at staff meetings for reports from the technology mentors.

In the questionnaire, mentors identified providing staff development as one of the most significant parts of their role. Through interviewing the Mentors at two elementary schools and one junior high, there was a variance in the amount of time spent providing staff development. If this is an essential part of the role of the technology mentor, then the administrator should clearly indicate the amount of staff development that should be provided in return for the release time allocated. Site one provided staff development including one-on-one training for staff, mini-sessions for small groups and whole staff sessions. Site two focussed on a one-day staff development session. Site three offered optional sessions for staff throughout the school year in a more unstructured format. In the future, examples could be shared with administrators to provide a clearer understanding of the role of the technology mentor and types of staff development technology mentors could provide.

Role Sharing

Is technology mentorship a role that can be shared by more than one person at the school to avoid burnout? Site two was a good example of a school that shared the mentorship role. The assistant principal and a teacher on staff both attended the technology mentorship meetings and shared the responsibilities of

disseminating information and providing staff development. In fact, both indicated that other teachers on staff also had expertise and helped in providing staff development and support to other staff members. Alternatively, site one identified on-site experts to support the technology mentor and attend some of the technology mentorship meetings. As demonstrated by both of these schools, it was possible to share the role and collaborate with one another to plan staff development opportunities. Other studies have also demonstrated the benefits of teamwork (MacArthur et. al, 1996; Sandholtz et al., 1997).

Sharing the role of technology mentor may not work as effectively as it did at both sites one and two in this study. Through my observations, I also recognized that some schools chose to send a different staff member to each technology mentorship meeting, perhaps to share responsibility in reporting information back to staff. There are definitely advantages to the consistency provided by assigning one or two persons the task of attending meetings and providing staff development. As the program organizer, I noticed that individuals who attended on a regular basis were able to easily network with others in the program and felt comfortable in asking questions and sharing experiences at the meetings.

The technology mentor and teacher at site one recommended that, in the future, it would be helpful to have a technology mentor for primary and another one for upper elementary to provide guidance to teachers at the different grade levels within the school. Schools need to spend time carefully deliberating the decision to assign the role of technology mentor to multiple individuals. The Technology Mentorship Program could address the issue of job sharing and provide suggestions for collegial sharing models.

Role Overload

How many other roles does the technology mentor have in the school in addition to teaching a regular class? In the questionnaire, mentors were asked to indicate their other roles or responsibilities in the school. Most technology

mentors were teachers, but about one-third were also assistant principals. As in the case of site two, there were two technology mentors, and one was the assistant principal. The principal felt it was important to have someone in a leadership position that could impact change as part of the team attending meetings. Conversely, the principal at site three objected to the idea of the assistant principal taking on the additional tasks associated with being technology mentor in the school.

Harris (1997) describes "opinion leaders" as opposed to "change agents" as persons who can help non-users become more receptive when introducing an innovation rather than one who brings news of change or catalyzes change. The opinion leaders are teachers rarely in a position of authority like that of the change agents and "are sought out by others most frequently and consistently" (p.55).

Are most technology mentors opinion leaders or change agents? Many technology mentors, as shown in Figure 2, chapter four, are assistant principals and in a position of authority. On the questionnaire, some technology mentors responded that time spent on tasks was part of their administrative time and that specific time was not allocated for curricular technology support and staff development. Evidently, some schools are expecting the assistant principal to utilize administrative time for technology purposes, which could be another reason that so many technology mentors are spending more time than officially allocated to their roles as shown in Table 3, chapter four.

The Technology Mentorship Program could identify the differences between opinion leaders and change agents and encourage schools to nominate opinion leaders as technology mentors to prevent role overload.

Release Time Tension

Release time becomes an issue for various reasons. Through my observations, I recognized what I will refer to as "release time tension." There are various problems associated with tension that release time can cause for the individual technology mentor, administration, other staff members, students and

parents. First, the individual technology mentor experiences stress when asked to provide lesson plans for an afternoon in addition to attending a meeting that requires a report back to staff after returning to the school. This is an extra task beyond the regular teaching duties. For many technology mentors, after school time is required to practice or implement the topics discussed at the meetings. For example, when technology mentors were provided with instructions on setting up staff email accounts, many mentors returned to their schools and spent numerous hours configuring computer stations and troubleshooting problems. Once email was set up properly and working, the technology mentor was able to spend time planning staff development for using email as a tool for teaching and learning.

Second, release time tension is a problem for many administrators as well. In trying to support their schools and staff members and save funds, many administrators provided coverage for teachers to attend the technology mentorship meetings. This was an additional task added on to the role of an administrator who was already overwhelmed with the number of responsibilities in operating a school. The technology mentor at site three was concerned about the needs of the school and the administrator. She checked in with the administrator prior to each meeting, "If it's inconvenient to have me out of the school, it's your call. I won't go if you don't want me to go." The administrator felt the Technology Mentorship Program was important and always supported her attendance.

Creative scheduling may be required to assist the technology mentor in attending the meetings without feeling guilty that the school principal or other staff member is covering his/her class. The technology mentor requires dedicated release time each week to not only attend the meetings but also to spend time planning for staff development and working with protégés. It is important the release time provided does not require the teacher to prepare lesson plans for the replacement teacher; otherwise the mentor is actually dual planning - for his/her class and for working with a protégé or other staff member.

Other staff members also dealt with release time tension. In all three schools, the teachers interviewed were very supportive of the program and pleased with the support provided by the technology mentors in their respective

schools. However, in my observations, there were a few occasions where staff members questioned the amount of time a teacher spent on technology-related tasks, and they did not support the technology mentors in their schools. We can learn from the three schools interviewed and ensure there is a clear administrative message to staff indicating the importance of the program and the role in the school. The literature also supports the value of administrators communicating a vision and direction early in the school year to support programs such as the Technology Mentorship Program (Brand, 1998; Meltzer and Sherman, 1997).

The administrator at site three felt, "the biggest negative is the kids" regarding the time the technology mentor spent away from the school. Evidently, the students were not pleased with their teacher being away and having someone else cover the class. Due to a six-day rotational schedule at the junior high level, it was difficult to provide consistent release time like site one, being an elementary school on a regular daily schedule. The parents also exhibited frustrations with the regular teacher being absent from the class. One technology mentor at an elementary school attended the meetings regularly during the first year of the program but only attended a few meetings during the second year. In discussion with this mentor, he indicated the parents of students in his class were concerned about frequently having a substitute teacher teaching the class. Apparently, the parents felt it was more important to have the same teacher consistently and were not supportive of regular attendance and participation in the Technology Mentorship Program.

Since release time tension was a problem, I would recommend that, in future, administrators are provided with examples of time allocation for technology mentors and discuss potential issues that might arise based on the release time. Suggestions could be provided on handling release time in a school with staff, students and parents. It is essential that administrators clearly communicate the purpose and advantages of participating in a staff development program to all stakeholders.

Planning

In any staff development program, it is essential to spend time carefully planning prior to beginning the staff development process. Schools can begin by recognizing there are stages of instructional evolution when learning how to integrate technology. Then, schools can develop approaches for planning staff development programs based on the instructional evolution stage of each staff member.

Stages of Instructional Evolution

The ACOT project "set out to investigate how routine technology by teachers and students would affect teaching and learning" (Sandholtz et al., 1997, p.3). Five stages of instructional evolution were identified: entry, adoption, adaptation, appropriation and invention. The three schools interviewed in this case study provided examples of teachers at the entry, adaptation and appropriation stages.

Generally, many of the teachers at site three were at the entry level stage, where much of the time during the year was spent on setting up the technology and making sure everything was working as described by the administrator on site. The teachers were starting to feel more comfortable with the basics, and the staff development focussed more on the tools of technology and less on the integration of technology in the curriculum. Many teachers at site three were gradually moving into the adoption stage with more of a focus on instruction.

The administrator at site two described the technology-rich classrooms at his school and the increasing motivation for teachers to utilize the tools to support instruction. Many of the teachers at site two were at the adaptation stage, where technology was integrated in classroom practice. The teachers at this site focussed staff development on productivity skills such as learning how to create classroom web pages or using presentation software. The technology mentor worked with the staff mainly in whole group sessions rather than in a protégé

relationship as discussed in chapter two. Consequently, the staff development focus was on productivity.

The on-site experts and some of the teachers at site one exemplified the appropriation stage. I had the opportunity to work with many of the teachers on staff for a two-year period in supporting technology-based learning. The most significant determinant of success was the change in personal attitudes of many staff members. Teachers on staff moved from using technology because it was an expectation to using technology because they were excited and felt more confident in planning technology-based lessons that inspired and motivated students. The teacher at site three, who was also the protégé, described, "... my fear continues to diminish as my confidence grows. Watching others take on a project and begin to succeed is a powerful motivating factor. It's an amazing transformation to think about where we were." Perhaps the Technology Mentorship Program could share examples and conditions that were in place to nourish the mentor-protégé relationship that occurred at site one. Technology mentors could be encouraged to formally work with one or two protégés at each school, and the mentor and protégé could submit a plan outlining intended objectives and outcomes for the year.

Invention is the next stage of evolution where teachers will "experiment with new instructional patterns and ways of relating to students and to other teachers.... Interdisciplinary project-based instruction, team teaching and individually paced instruction" will be common (Sandholtz et al., 1997, p.44).

Approaches to Planning Staff Development

The stage of instructional evolution at each school was relative to the approach used to plan staff development. Each school had teachers anywhere on the continuum in the five stages described in the ACOT study, and therefore, staff development for staff with diverse comfort levels required strategic planning. Schools needed to take into account the broad needs of teachers in planning staff development (Brand, 1998; MacArthur et. al, 1996).

The three sites in this study used various approaches to planning. Both site one and site two established committees to plan staff development whereas site three planned for staff development in a more unstructured form as required throughout the school year. The diverse approaches to planning staff development may be influenced by the different stages of the instructional evolution. Site three was at an entry-level stage so it would be difficult to create a survey and ask for staff input in staff development needs when the teachers were not quite sure of what was even possible or what they needed. Conversely, site two, at the adaptation stage, was able to successfully use planning sheets and a survey to support a full-day staff development session.

Site one, being at the appropriation level, organized small groups to plan for professional development in different areas and used more of a collaborative approach with ongoing staff development throughout the year. In addition, each staff member was responsible for planning a presentation at a staff meeting to share a successful method of classroom practice using technology. On-site experts were also involved as part of the Technology Support Team and planned small group or whole group staff development sessions. Becker and Riel (1999) support this type of collaborative relationship among teachers and contend that the more teachers engage in collaborative work within and beyond their schools, such as mentoring other teachers and teaching peers at workshops, the more constructivist their teaching practice.

Site three recognized the need for assistance with planning for staff development. Means and Olsen (1994) believe "schools must first rethink their missions and structure, starting with the needs of students and a set of instructional principles, before they can understand the ways in which technology can help them" (p.221). The Technology Mentorship Program could provide sessions to help technology mentors plan for staff development at elementary and secondary schools. It may be helpful to have separate sessions in order to deal with the unique challenges at each level.

The Technology Mentorship Program could support schools in developing needs' assessments. It may be valuable for schools to determine the stage of

instructional evolution for each teacher at the school and, accordingly, develop planning strategies. As discussed in chapter two, research shows that it is important for learners to use technology as a productivity tool first before moving to a stage of curricular technology integration (MacInnes, 1997; Sandholtz et al., 1997; Shelton & Jones, 1996). This can account for the fact that site three spent most of the year helping teachers become familiar with using programs such as the mark generating program for junior high. Planning must start with exposure to the tools, then considering the curriculum objectives and determining how technology can support teaching and learning. Learning how to use the tools is an ongoing task that varies for each learner. The process for planning in any school should provide enough variety to meet the needs of teachers with a broad range of ability levels. MacInnes (1997) states that "every school's and, in fact, every person's plan for growth will be different." During the interview, site one shared a correlation of their school growth plan and their technology growth plan with a chart outlining specifically how each outcome was implemented, the date, who was responsible and the result. This type of exercise helped the teachers in planning staff development activities and could be shared with other schools through the Technology Mentorship Program.

Teachers at site three indicated the desire for a mandatory computer class in grade seven to provide students with basic skills, but Wiburg (1997) advocates, "Technology tools must be integrated with the subjects they study during the rest of the day and not isolated or separated" (p.180). Perhaps the Technology Mentorship Program could provide suggestions on ensuring students have basic skills. For example, an elementary-junior high school in the school division had a teacher-librarian who was also a technology mentor, and she met with each class at the start of the school year to review basic skills, discuss the acceptable use policy and instruct Internet search skills for research projects.

Teachers want more time in the computer lab with their classes. Perhaps the Technology Mentorship Program could provide specific sessions for secondary teachers and administrators to discuss limited access to the computer lab and the need for more pods of computers or a one-computer presentation

system in the classroom. In addition, I would recommend the Technology Mentorship Program support the idea of teachers working in partnership at the junior high level to deal with limited access to technology labs and to foster collaboration and curriculum integration. It may be necessary to begin offering specialized technology mentorship meetings specifically for secondary teachers and administrators.

Alberta Learning could also support schools in planning for staff development by detailing grade level objectives to make the curriculum more of a reality for each teacher. Currently, the Program of Studies that will be implemented in September, 2000, for technology focuses on specific outcomes in each learning division rather than each grade level. Site one spent one year focussing on the technology outcomes and creating a document outlining specific outcomes for each grade level. How many other schools are also spending time on devising grade-specific outcomes? This time could be spent planning for staff development instead.

Implementing Staff Development

The five stages of instructional evolution were also relative to the different types of staff development that technology mentors provided for schools. Overwhelmingly, 96% of technology mentors provided staff development related to the technology program of studies according to the questionnaire. However, during the interviews with the three sites, it was not evident that all three schools focussed on the curricular outcomes. The staff development provided at site one was curriculum-based but the staff development at sites two and three was tool-based. Perhaps this is due to the stage of instructional evolution as described earlier when discussing the planning differences at each site. I would recommend that teachers beyond the entry level of instructional evolution begin planning for integration of the technology outcomes whereas staff working at the entry level should focus on acquiring basic skills first to improve their own productivity.

Perhaps recognizing the stage of instructional evolution and stage of readiness could help technology mentors in implementing effective staff development. It is important to realize that one type of staff development method will not meet the needs of all learners, and a variety is recommended. Administrators and technology mentors need to be aware of the different types of staff development that can be provided to accommodate learners at the different stages from entry to appropriation and invention. Some technology mentors found it valuable to use the CBT online courses as a means of providing staff development or supplementing workshops for teachers at the entry-level. Two technology mentors that were job sharing supported staff in using the CBT courses by dedicating one afternoon per month specifically on using the CBT online courses. The teachers worked individually on their choice of online course at their own pace, and the mentors were available to help or answer any questions.

Schools with teachers beyond the entry level may focus on sharing knowledge and skills with colleagues at the school through a mentor-protégé strategy. MacArthur et. al (1996) described a study of technology mentors that worked with protégés. Based on the definition of mentor, a technique can be employed called "scaffolding," which is described as assisting with "tasks that teachers cannot do on their own or offer hints and suggestions on how a task may be solved" (Browne & Ritchie 1991, p.30). Eventually, it is intended that protégés become mentors at some point in time. Site one used a model of staff development implementation that encouraged the mentor-protégé relationship to evolve. The model was discussed in chapter four and included four stages: initial conference, demonstration, empowerment and follow-up. These four stages, along with the scaffolding technique, allowed the technology mentor to work closely with one of the on-site experts or protégés at the school as a role model, coach and advisor. As a result of the successful mentor-protégé relationship at site one, the on-site expert will take over the role of technology mentor in the following school year.

Technology mentors found it challenging to offer staff development that would accommodate the diverse comfort and ability levels at the schools.

Similarly, as the program facilitator, I found it challenging to meet the needs of the technology mentors at the meetings due to the broad range of their ability levels. One technique used was to provide repeat sessions throughout the year. The principal at site one was pleased with this innovation, which helped meet the diverse needs of the participants. "The cyclical process allows people to climb aboard at their own state of readiness, rather than using a linear approach" to staff development, commented the principal. He further described the cyclical approach with an analogy of "providing people an opportunity to come on the train at their own time of readiness, but knowing that they have to catch it." The cyclical approach could also be used in providing staff development or guidance to staff members who are at different stages of instructional evolution. A high school technology mentor repeatedly offered a session on Internet searching to provide teachers with a choice of when to attend the session based on their level of readiness.

Pedagogy is another area that requires consideration when implementing staff development. In studying Internet usage and the value of using the Internet in the classroom, Becker (1999) found the results directly related to a teacher's pedagogical approaches. Becker found that "the more constructivist the teacher, the greater their average use and the more positively they viewed the Internet." Clearly, a teacher's pedagogical beliefs and practices are strongly related to how relevant they see the Internet for their teaching and whether they use it. A teacher's pedagogical beliefs may impact the likelihood of acceptance in staff development regarding technology and, ultimately, their usage of technology in the classroom. It is necessary for the technology mentors to recognize differences in pedagogy and help teachers with ideas and suggestions on how to move towards a more constructivist approach to teaching; otherwise, many educators may disregard the opportunity to use a new tool in teaching and learning.

Support

Staff development plans need to have a component of ongoing support. In reviewing the questionnaire responses as to the levels of adequate support provided by many of the stakeholders and comparing the interview statements regarding support, several issues emerged. The following discussion involves issues related to support provided by administrators, support at different levels of schooling, time and financial support, technical support, consultant support and support from parents.

Administrative Support

Meltzer and Sherman (1997) advocate the importance of administrative support in implementing successful staff development. In the questionnaires, mentors overwhelmingly indicated they had adequate support from the school administration. It was not surprising that technology mentors also requested more money and time to support their roles. This may be an indication of the state of schools today. Technology mentors recognized that administrators provided as much support as possible given the current realities of reduced funding and, subsequently, the inability to provide additional time for technology support. Alberta Learning needs to recognize the increased need for funding to adequately support the implementation of a technology program of studies.

"When principals support change, participate in learning with teachers, provide incentives for change, reinforce change, and include change in school policies there is far more improvement," contends Licklider (1997, p. 11). Are administrators providing basic support or incentives? In reviewing the literature, it seems support and incentives are terms often used interchangeably to provide motivation to educators in using technology (Brand, 1998; DeBettencourt & Matson, 1994; Licklider, 1997). The administrator at site one referred to incentives as released time from the classroom and opportunities to participate in leadership positions whereas the administrator at site two provided incentives to technology mentors by sending them to professional conferences. In both cases,

are these administrators truly providing incentives for teachers to participate in the Technology Mentorship Program, or are the administrators providing basic support that is necessary for professionals to do their jobs?

In some cases, research leads one to believe there is a need for incentives such as monetary stipends as described by Wiburg (1997) in a school collaborative research project designed to help teachers learn to use multimedia and telecommunications in the classroom. However, the technology mentors did not mention a need for stipends; instead mentors recognized the need for more time and a budgetary allotment towards equipment and infrastructure. Some mentors requested incentives in the form of recognition as opposed to stipends. Release time that does not require preparation for a substitute teacher could be provided to support technology mentors in their roles and could be considered a form of recognition. Financial support for functional equipment and necessary infrastructure, which includes networking and electrical installations, is no longer considered luxury and could also be thought of as recognition.

As shown in Table 2, chapter four, more than 90% of the elementary and junior high schools participated in the Technology Mentorship Program. The lowest participation was with the high schools, where only 50% participated. The participation continually increased over a two-year period from 35 schools to 75 schools enrolled. Incentives could be provided to encourage schools and educators to continue participating in the program. For example, at the school division level, mentors could be presented with certificates confirming their participation in the program, and a copy could be placed in personnel files. Universities may consider a partnership where credit could be offered to technology mentors toward a graduate level course. Perhaps incentives would increase the low participation from the high schools in the school division.

Support for Different Levels of Schooling

In conducting this study, I have changed my view on the needs of elementary schools and secondary schools participating in the Technology Mentorship Program. Without a budget for the program, it was impossible to

provide separate programs for different schooling levels and may be impossible in the future as well. However, I recognized a significant difference in the needs voiced by the technology mentors, administrators and teachers at the different levels. There are basic operational differences at the two levels that require different methods of staff development. Elementary schools are well on their way towards teaching an integrated curriculum. In discussing technology integration, elementary teachers are more apt to participate in staff development and implement new practices in their classroom teaching whereas secondary schools, in particular the one detailed in this study, continue to teach individual subjects with very little content integration. How can we possibly provide the same type of workshops for two very different types of settings? I believe the Technology Mentorship Program needs to be sensitive to the organizational differences in secondary schools and accommodate these differences in the program.

Time and Financial Support

When will there be enough time and money? As educators, we will continually be proponents of the necessity for more time and money to provide an excellent education for students. There was a strong consensus among the questionnaire respondents and the interviewees that time and money are the greatest needs in the program. The Technology Mentorship Program is an example of a staff development program without an operating budget that was developed due to a need and high demand for support in technology integration. Perhaps, if the program and its participants actually had a budget, the program would appear very different. Educators recognize the need for staff development in technology integration and are willing to participate even though there are insufficient resources both at the school level and the school division level. In order for the program to successfully continue in future, it is recommended that a budget for the program is provided, and a detailed work plan with a clear vision and direction with input from all the stakeholders would be expected. The budget

needs to consider the demands of school division level staff who organize the program as well as onsite technology mentors who participate in the program.

Technical Support

In the questionnaire responses, technology mentors indicated dissatisfaction with support provided by the help desk and technicians from Technology Services in comparison to the other areas of support. This might be directly related to the number of schools with on-site technicians. In interviewing two schools with on-site technical support and one without a technical support person on staff, one may speculate this might be the case. Further research would help determine the reasons for dissatisfaction. Some of the technology mentors responding to the questionnaire found the technical support provided from the help desk and technicians was adequate, but these schools had their own on-site technicians, which may be the reason they did not rely on support from technicians that work centrally. Conversely, the dissatisfied schools may be the ones without on-site support that heavily relied on the services provided centrally.

In my observations, many schools hired on-site technical support and recognized a need to maintain equipment for optimal use. "Although teachers can troubleshoot and help their peers, those who are teaching full-time should not be expected to be technicians," (Sandholtz et al., 1997, p. 166). There was an increased demand on the services provided by technicians in the school division this year. In working closely with many technicians and having the opportunity to share in responding to help desk calls, I noticed the unmanageable number of requests on one department that is comprised of less than 30 staff members. Many technicians were overworked and responsible for hundreds of help desk queries every week. It was impossible to satisfy the needs of 84 schools with the structure of services provided.

Training courses were made available for technicians to increase productivity and knowledge, which is essential for optimal service and definitely needs to continue. However, most importantly, the service structure needs

modification. Each school requires a technician that is assigned to the school for continuity and reliability. Perhaps one technician could be assigned to several schools in one area of the city to reduce the amount of time spent travelling between sites and time spent trying to diagnose work done by other technicians. Protocols should be implemented describing what is required when entering and leaving a site. Communication with the on-site personnel is essential and needs improvement as described by the administrator at site three. Communication with the technology mentors could also be improved by keeping regular communications with the program facilitator and participating in the technology mentorship listserv and web site.

"Inspiring a group to work toward a shared vision necessitates building trust," recommends Dede (1993), a director of educational technology (p.10). Since the trust seems to have diminished among the stakeholders, I recommend the school division consider developing a new structure of technology services with objectives that are realistic and attainable.

Consultant Support

In the questionnaire, technology mentors indicated the school division consultants provided adequate support. The teacher at site one mentioned the increased accessibility to consultants due to the school division email system. He noted that it was much more convenient to send an email with an inquiry rather than spending time trying to access a telephone and possibly delaying contact with the person for several days. During the second year of the Technology Mentorship Program, the consultants in mathematics, language arts and social studies attended many of the sessions and presented workshops demonstrating the integration of technology in curricular areas at different grade levels. These workshops were well attended and received positive reviews from the technology mentors on the session evaluation forms. I would recommend the curricular consultants from the school division and from the University and Department of

Learning continue to participate in the Mentorship Program and become involved in setting objectives and plans for the program.

Parental Support

Parental support is essential in schools due to the influence of parent groups regarding budgetary issues. Interestingly enough, the technology mentors did not mention any support provided by parents in the questionnaires or the interviews. In visiting schools, I know that some sites relied on parental expertise in making purchasing decisions for technology, and some parents even worked with students one-on-one in the classroom to assist the teacher when using technology in the curriculum. When parents are not included in the understanding of the educational shift toward technology use, they are unlikely to support schools and teachers and provide needed support. In the case of the technology mentor who did not attend technology mentorship meetings due to the increased complaints from parents of students in his class, it is evident that as educators we need to include parents in the decision-making process. Mehlinger (1996) insists that "parents want their children to have access to technology in school" (p.407). Through sharing clear visions and direction for technological integration with parents, there is a better chance of receiving necessary support.

Summary

In this chapter, many recommendations were discussed based on the research and the relevant literature to improve the Technology Mentorship Program as a model of staff development in the school division under study. The examination of the experiences of the technology mentors in this study may help define the role of the technology mentor specifically in the areas of planning, implementing and supporting staff development.

First, the characteristics of a technology mentor should be identified and communicated to schools at the beginning of the school year. The technology mentor selection process could be established to assist schools in selecting the

most appropriate candidates for the Technology Mentorship Program. Second, the role of the technology mentor needs to be clearly communicated with school administrators, staff and parents to avoid problems. The purpose, potential limitations and advantages of participating in the Technology Mentorship Program needs to be communicated with all the stakeholders. Third, it is recommended that time be spent on planning staff development at the school level based on the instructional evolution of each staff member. The approach to staff development and implementation of staff development may vary with schools and is also dependent on the stage of instructional evolution. Fourth, staff development plans should include components of ongoing technological support to avoid issues related to insufficient support in integrating technology in teaching and learning.

Implications for Future Studies

A future study could focus specifically on evaluating the Technology Mentorship Program. Once a budget is provided for the program and a work plan with clear objectives is in place, it would be reasonable to expect a study on evaluating the effectiveness of the program and perhaps a comparison of effectiveness at the elementary and secondary levels.

As schools invest significant budgets towards the purchase of equipment and infrastructure to support technology-based learning, it may be wise to assess the total cost of technology ownership. Ongoing technical support is part of the cost of ownership, and a serious investment needs to be made in maintaining the equipment if we intend staff and students to effectively use technology. In many cases, budgets also neglect to include support for staff development required to support educators in using technology confidently. These "hidden costs" all contribute to the total cost of ownership, which begs for further investigation. What is the difference in cost of ownership between schools with on-site technical support in comparison to schools without on-site technical support? Do schools with on-site technical support focus more on technology-based learning?

Further research could also address other important questions such as the following: How does participation in a Technology Mentorship Program impact student learning? What are the attitudes of a successful technology mentor? What are the characteristics of a successful technology mentor?

Conclusion

In comparing the experiences and perceptions of participants at three different school sites, one is able to gain a deeper understanding of the technology mentorship role. Planning, implementing and supporting staff development are important components for educators providing staff development for diverse levels of readiness in technology adoption. Providing staff development opportunities for staff is a shared responsibility of the school division and each individual school. The Technology Mentorship Program is an example of a program designed to support technology leaders in schools in building a learning community to share knowledge and expertise with colleagues and to positively impact teaching and learning.

References

Apple, M. (1991). The new technology: Is it part of the solution or part of the problem in education? *Computers in the Schools*, *8*(1/2/3), 59-81.

Alberta Association for Supervision and Curriculum Development (ASCD, 1999). Celebrating Educational Successes in Northern Alberta. *Scanner*, *11*(3), p.3.

Banks, S., & Renwick, L. (1997, June 8). Technology remains promise, not panacea. *Los Angeles Times*, p. A-1.

Barron, L., & Goldman, E. (1994). Integrating technology with teacher preparation. In B. Means (Ed.), *Technology and education reform: The reality behind the promise* (p.81-110). San Francisco, CA: Jossey-Bass Inc.

Becker, J. (1999). Internet use by teachers. [On-Line]. Available: http://www.crito.uci.edu/TLC/findings/Internet-Use/startpage.htm

Becker, J. & Riel, M. (1999). Teacher professionalism, school work culture and the emergence of constructivist-compatible pedagogies. [On-Line]. Available: http://www.crito.uci.edu/tlc/findings/special_report2

Brand, G. (1998). What research says: Training teachers for using technology. *Journal of Staff Development*. [On-Line]. Available: http://www.nsdc.org/library/jsd/jsdw98brand.html

Browne, D., & Ritchie, D. (1991). Cognitive apprenticeship: a model of staff development for implementing technology in schools. *Contemporary Education*, *63*(1), 28-34.

Coley, R. (1997, September). Technology's impact. *Electronic School*, A30-A33.

Collins, A. (1991, September). The role of computer technology in restructuring schools. *Phi Delta Kappan. 73*, 28-36.

DeBettencourt, L., & Matson, C. (1994, November). Technology training takes time and teamwork. *Educational Technology*, 49-51.

Dede, C. (1993). Leadership without followers. *The Computing Teacher*, *20*(6), 9-11.

Dwyer, D. (1994). Apple classrooms of tomorrow: What we've learned. *Educational Leadership, 51*(7),4-10.

Framework for technology integration in education: A report of the MLA implementation team on business involvement and technology integration. (1996). Alberta Education.

Fullan, M., (with Stiegelbaur, S.). (1991). *The new meaning of educational change.* New York: Teachers College Press.

Gall, M., Borg, W., & Gall, J. (1996). Educational research: An introduction, Sixth edition. White Plains, NY: Longman Publishers.

Goodson, I. (1991). *Curriculum and context in the use of computers for classroom learning.* Toronto, ON: Ontario Department of Education.

Harris, J. (1997, April). Who to hook and how - advice for teacher trainers. *Educational Technology*, 54-57.

Hawkins, R. (1994). Teaching teachers how to teach with technology: Do's and don'ts. *The Computer Teacher, 21*(8), 16-17.

Information and communication technology interim Program of Studies. (1998). Alberta Education: Curriculum Standards Branch. [On-Line]. Available: http://ednet.edc.gov.ab.ca/technology

Jaques, N. (1985). *Occupational stress: Sources, effects and coping strategies for Edmonton Public Teachers.* Unpublished master's thesis, University of Alberta.

Jonassen, D. (1996). *Computers in the classroom: Mindtools for critical thinking.* New Jersey: Prentice-Hall, Inc.

Kephart, D., & Kinnaman, D. (1998). Professional development: What we know and what we need. *Curriculum Administrator, 34*(2), 42-43.

Kerr, S. (1996). *Technology and the future of schooling. Ninety-fifth yearbook of the national society for the study of education.* Part II. Chicago, IL: National Study of Education.

King, J., Morris, L., & Fitz-Gibbon, C. (1987). *How to assess program implementation.* Thousand Oaks, CA: Sage Publications.

Kittler, P. (1994). Technological dark ages. *Thrust for Educational Leadership. 24*(1), 6-10.

Lee, C. (1996, April). Teacher training for technology. *Thrust for Educational Leadership*, 12-13, 21.

Levine, T. & Donitsa-Schmidt, S. (1997). Commitment to learning: Effects of computer experience, confidence and attitudes. *J. Educational Computing Research*, *16*(1), 83-105.

Licklider, B. (1997). Breaking ranks: changing the inservice institution. *Professional Development Bulletin*, 9-21.

MacArthur, C., Pilato, V., Kercher, M., Peterson, D., Malouf, D., & Jamison, P. (1996). A mentoring model for technology education for teachers. In Ely, P. & Minor, B. (Eds.). *Educational Media and Technology Yearbook* (pp.119-125). Englewood, CO: Libraries Unlimited, Inc.

MacInnes, J. (1997, January/February). Technology and learning: Supporting learners through professional development. *FWTAO/FAEO Newsletter*, 22-27.

Means, B. (Ed.). (1994). *Technology and education reform: The reality behind the promise.* San Francisco, CA: Jossey-Bass Inc.

Means, B., & Olson, K. (1994). Tomorrow's schools: Technology and reform in partnership. In B. Means(Ed.), *Technology and education reform: The reality behind the promise* (pp.191-222). San Francisco, CA: Jossey-Bass Inc.

Mehlinger, H. (1996). School reform in the information age. *Phi Delta Kappan*, *77*(6), 400-407.

Meltzer, J., & Sherman, T. (1997, January). Ten commandments for successful technology implementation and staff development. *Professional Development Bulletin*, 23-32.

Moursund, D. Empowering teachers. (1992-3). *The Computing Teacher*, *20*(4), p.6.

Newman, Denis. (1994). Computer networks: Opportunities or obstacles? In B. Means (Ed.), Technology and education reform: The reality behind the promise (pp.57-80). San Francisco, CA: Jossey-Bass Inc.

Oppenheimer, T. (1997). The computer delusion. *The Atlantic Monthly, 280*(1), 45-62. [On-line]. Available: http://www.theatlantic.com/issues/97jul/computer.htm

Owsten, R., Murphy, S., & Wideman, H. (1992). The effects of word processing on student's writing quality and revision strategies. *Research in the Teaching of English, 26*(3), 249-276.

Papert, S. (1980). *Mindstorms*. New York: Basic Books, Inc.

Patton, M. (1987). *How to use qualitative methods in evaluation.* Newbury Park, CA: Sage Publications.

Pearson, K. (1994). Empowering teachers for technology. *The Computing Teacher, 22*(1), 70-71.

Raff, T. (1995, November). Tackling technology inequity within the school. *Principal*, 48-50.

Riel, M. (1990). Computer-mediated communication: A tool for reconnecting kids with society. *Interactive Learning Environment, 1*(4), 255-263.

Sandholtz, J.H., Ringstaff, C., & Dwyer, D. (1997). *Teaching with technology: creating student-centered classrooms.* New York, NY: Teachers College Press.

School Act, Ministerial Order (# 016/97).

Shelton, M., & Jones, M. (1996, October). Staff development that works! A tale of four t's. *Bulletin, 80*(582), 99-105.

Siegel, J. (1995, May/June). The state of teacher training. *Electronic Learning.*

Solomon, G., & Solomon, S. (1995, November). Technology and professional development – 10 Tips to make it better. *Learning and Leading with Technology*, 38-39, 71.

Stake, R. (1995). *The art of case study research.* Thousand Oaks, CA: Sage Publications, Inc.

Tapscott, D. (1998). *Growing up digital: The rise of the net generation.* New York: McGraw-Hill Companies, Inc.

Teaching and learning with technology: Professional development for Alberta teachers. (1998, March). [On-Line]. Available: http:// www.quasar.ualberta.ca/erc/techpd.html

Telus Learning Connection Alliance. (1998). [On-Line]. Available: http://www.2learn.ca

Tinson, L. (1996, April). Teachers' vital role in bringing technology into the classroom. *Thrust for Educational Leadership*, 10-11.

Van Horn, R. (1990, November). Creating high-tech teacher experts. *Principal*, 52-53.

Vojtek, B., & O'Brien Vojtek, R. (1998, Summer). Action plan goes to the heart. *JSD National Staff Development Council*, 61-63.

Webb, R. & Sherman, R. (1989). *Schooling and society 2nd edition.* New York, NY: Macmillan Publishing Company.

Wenglinsky, H. (1998). Does it compute? The relationship between educational technology and student achievement in mathematics. Educational Testing Service. [On-line]. Available: http://www.ets.org/research/pic/technolog.html

Wiburg, K. (1997). The dance of change: integrating technology in classrooms. *Computers in the Schools, 13*(1/2), 171-184.

Wolfe, E., Bolton, S., Feltovich, B., & Bangert, A. (1996). A study of word processing experience and its effects on student essay writing. *J. Educational Computing Research, 14*(3), 269-283.

Yin, R. (1989). *Case study research: design and methods.* Newbury Park, CA: Sage Publications.

Zeitz, L. (1995, April). Developing a technology workshop series for your faculty and staff. *The Computing Teacher*, 62-64.

Appendix A: Technology Mentorship Program Questionnaire

Technology Mentorship Program Questionnaire

1. How long have you been a technology mentor in the school division?

_____ Less than 1 year

_____ 1 to 2 years

2. How many **hours** did you spend as a technology mentor during the **last month**? _____

3. **Indicate the % of time** spent on each of your tasks as a technology mentor during the **last month.** (The total should add to 100%)

_____ Attending technology mentorship meetings

_____ Providing inservices and training for staff

_____ Helping staff plan lessons or units integrating technology

_____ Technology Planning

_____ Fixing computer problems

_____ Others (please list):

_____

_____

4. How many technology mentors have been assigned time at your school? _____

5. How much assigned time do you have as technology mentor **(from 0.1 -1 for full time)**? _____

6. Indicate the amount of time you are assigned to other roles **(from 0.1-1 for full time).**

_____ School Principal

_____ Assistant Principal

_____ Teacher

_____ Resource Facilitator

_____ Teacher-Librarian

_____ Support Staff

_____ School-based technicians

_____ Others: _____

7. Check the technology training you have provided to staff as the technology mentor. **Please check all that apply.**

_____ Awareness of Technology Program of Studies

_____ Email

_____ Internet

_____ Acceptable Use Policy

_____ IMC Online booking

_____ CBT online training courses (Computer Based Training)

_____ Word-processing

_____ Spreadsheets and/or Databases

_____ Integrade Pro Mark Program

_____ Teaching strategies with technology (Ex. One-computer classroom)

_____ Others: _____

8. What technology project/plans, if any, is your school implementing currently or next year?

_____

_____

_____

_____

Please indicate your level of agreement with each of the following statements.
D- Disagree **SD** - Somewhat Disagree **ND NA** - Neither Disagree Nor Agree
SA - Somewhat Agree **A** - Agree

I have adequate support from the:	**D**	**SD**	**ND NA**	**SA**	**A**
9. Staff at my school.					
10. School administration.					
11. Consultants in School Operations Services.					
12. School Division Help Desk.					
13. Technology Trainers from Technology Services.					
14. Technicians from Technology Services.					
15. Technology Mentors in the program.					

16. List other persons/agencies providing **support** to you as a technology mentor?

_____

_____

_____

17. In my opinion, based on the current realities in the **School Division**, I would rate the **effectiveness** of the **Technology Mentorship Program** as:
(1 - needs work ... 5 - excellent)

1 2 3 4 5

18. What is your most important **need** as a technology mentor at your school?

_____

_____

_____

19. Additional Comments:

_____

_____

_____

_____

_____

_____

Thank you for completing the questionnaire!

Appendix B: Consent Forms and Participant Letter

University of Alberta
Interview Consent Form

_____ Yes, I would be willing to participate in an interview to further discuss the Technology Mentorship Program and my role as a technology mentor (**optional**).

Name _____

School _____

Email _____

Phone _____

Dear Colleague:

This letter is a request for participation in a research project, entitled "Technology Mentorship: A Staff Development Opportunity for Educators." The researcher in this project is Barbara Brown and the subjects are school technology mentors and/or administrators and teachers in the school division.

Staff development is a crucial part of implementing any innovation or change. Teachers in Alberta are facing the challenge of implementing the *Information and Communication Technology Program of Studies* by year 2000 and seek staff development in the area of technology-based learning. The school division initiated a Technology Mentorship Program in September, 1997, to support educators in curricular technology integration. The mission of the Technology Mentorship Program was to empower lead teachers to share their knowledge and expertise in integrating technology in the curriculum to enhance students' learning needs and to inspire and prepare students for a society with emerging technologies.

The purpose of the research is to describe the Technology Mentorship Program based on the experiences of teachers participating in the program and to make future recommendations regarding this model of staff development. Through careful analysis of many studies in the area of staff development and technology-based training, three key categories for research emerged: planning for staff development, implementing staff development for educators and providing ongoing support. The study will focus on identifying strategies used by schools and technology mentors to cascade learning from a school division level to a school level. The thesis will attempt to illustrate the type of training or education that can be provided for educators to facilitate a shift from instruction to construction or discovery learning with emerging technologies.

I am interested in understanding your role as a technology mentor and strategies used in your school to facilitate technology integration. To do this, I would like to interview you and others from your school. With your permission, I would like to audio tape the interview to help me describe your accounts accurately and, perhaps, include some quotations. Your name and school will not be disclosed in the thesis. All attempts will be made to provide confidentiality and anonymity for the information you provide. The data gathered will be used for research and teacher education purposes only.

I hope you will agree to participate in this research about staff development in technology-based learning. **Please sign and complete the attached Research Consent Form if you agree to participate in this research.** I would like to stress that you do not need to participate, and you may change your mind at a later date if you decide you do not want me to use your responses to the interview questions or observations.

Sincerely,
Barbara Brown
Secondary Education Graduate Student
University of Alberta

University of Alberta
Research Consent Form

I, _____, hereby consent to be
(print full name)

- ☐ interviewed;
- ☐ tape recorded;
- ☐ photographed or have artifacts photographed;
- ☐ videotaped and/or
- ☐ observed

by Barbara Brown.

I understand that:

- I may withdraw from the research at any time without penalty;
- All information gathered will be treated confidentially and discussed only with Barbara Brown's thesis supervisor;
- Any information that identifies myself will be destroyed upon completion of this research and
- I will not be identifiable in any documents resulting from this research.

I also understand the results of this research will be used only in the following:

- Research thesis;
- Presentations and written articles for other educators and
- To provide information to the school division.

_____
Signature of Teacher

Date signed: _____

For further information concerning the completion of the form, please contact Barbara Brown by sending email to barbrown@oanet.com

Appendix C: Preparation for Interview Questions

Preparation for Interview Questions

Experience as a Technology Mentor

Reflect on your story as technology mentor. Be prepared to provide examples demonstrating your experiences as a technology mentor in the school division.

Role of Technology Mentor

Consider your role as a technology mentor.

- What are the positive aspects of being a technology mentor in the school division?
- What challenges do you face as a facilitator of technology integration in your school?

Planning and Staff Development

Consider the staff development opportunities you have made available to your staff to support technology-based learning. Be prepared to provide examples of the training provided to your staff and your experiences in providing staff development as a technology mentor.

- How do you plan for staff development at your school?
- Do you feel staff are responding favorably to the technology-based staff development available at the school level? Why or why not?

Support

Consider the human and material resources available to you as technology mentor. Be prepared to describe how these supports assist you in your role as technology mentor.

- What support is available to you as technology mentor at the school level and at the school division level?
- What would help you improve your role as a technology mentor?

Appendix D: Interview Matrix - Site One

Interview Matrix - Site One

Key Ideas	Mentor	Administrator	Teacher
Role of the Mentor	- Attend mentorship meetings. - Delegate (help develop on site experts). - Technical role (ex. setting up email). - Working with teachers one-on-one. - Anything of benefit to teachers and students. - Provide mini lessons. - Provide handouts.	- On-site expert. - Put together booklets. - Show teachers how to integrate technology into the Program of Studies. - Attend workshops and report back to staff.	- Interact with other colleagues at meetings. - Provide regular updates (ex. email). - Provide assistance.
Type of SD or Mentoring Provided	- Email inservice. - Internet inservice. - Referencing Internet sites. - Searching. - Creating projects. - Integrade Pro Program. - Scanning. - Incorporate facilitator model to work with teachers.	- Integrade Pro Program. - PowerPoint. - Electronic report card. - Email. - Internet. - Incorporate facilitator model to work with teachers.	- PowerPoint. - Integrade Pro Program. - Internet. - Email.
Type of Technology Planning in School	- Plan for different levels of readiness. - Staff shares technology use at each grade level during May and June. - Goal: to integrate in at least one unit of study for each teacher. - Arrange mini-lessons throughout the year.	- Establish technology support team. - Different stages of inservices. - Experts for different levels of readiness. - Teams work on goals from school growth plan.	- SD days for technology. - Constant meeting updates. - Staff share technology projects. - On-site experts present mini-lessons. - Technology support team. - Different levels or readiness. - Teachers share one project at the end of the year.

Support Provided	- Administrative support for release time every Monday afternoon. - Staff dedication to furthering technology.	- Administration providing people with opportunities to attend training sessions. - Technology services facilitators. - Telus Learning Connection teacher leaders. - Media resource person. - School technician.	- Administration provides release time. - On-site experts. - Media resource person. - Staff providing encouragement and support of each other. - Technology services facilitators. - Use of email to support. - School technician.
Staff Response to TMP	- Favorable response. - Teachers excited. - Realize they are far ahead in comparison to other schools.	- See it as a professional development and leadership opportunity. - Keeps technology visible. - Helps build success. - Staff feels elated in how far they have come over the past two years.	- Spurns enthusiasm. - Leadership opportunity. - Increase in use of computers. - Diminishing fear factor. - Amazing transformation and growth.
Other Comments	- Mentor should not have to know all the answers to everything. - Mentor should not get caught in trap of doing a technician's job.	- We don't want to burden teachers with fixing computer problems.	- Mentors should not be afraid to ask for help or assistance from others.

Note. SD = staff development; TMP = Technology Mentorship Program

Appendix E: Interview Matrix - Site Two

Interview Matrix - Site Two

Key Ideas	Mentor	Administrator	Assistant Principal/ Mentor
Role of the Mentor	- Attend meetings. - Network - use and delivery. - Train new teachers on staff. - Delivering sessions. - Setting up one-day conference for staff (tailor SD for staff). - Help teachers with projects.	- Attend meetings and report information back to staff. - Position of leadership to effect change. - Provide SD for staff. - Communicate informally through email. - Provide follow-up sessions.	- Attend TMP meetings. - Contact with school division staff and networking with other mentors. - Responding to the needs of the teachers. - Being a catalyst and liaison. - Being exciting and motivating. - Keeping things current.
Type of SD or Mentoring Provided	- Networks (basic skills). - Digital camera. - PowerPoint. - Web pages. - Electronic report cards. - File management.	- Web pages (one-day conference). - Monthly staff meeting (SD meeting).	- Mini sessions. - One-on-one sessions. - Integrate technology into curriculum. - Web page development.
Type of Technology Planning in School	- Part of school growth plan. - Tailor SD to staff needs. - Created a questionnaire to facilitate planning. - SD day.	- Committee planned SD day and follow-up sessions. - Appropriate for staff at different levels (continuum of ability).	- Committee planned SD day based on questionnaire responses. - Plan for curricular connections to learn transferable skills.
Support Provided	- Technician on staff. - Teachers help each other on staff. - Administrative support. - Budgetary allocations to technology. - Cohort group support at TMP meetings. - Telus Learning Connection teacher leaders.	- Administration providing the opportunity to highlight learning. - Administration providing release time. - Administration providing opportunities to broaden horizons by attending conferences and inservices.	- Administrative support for attending TMP meetings. - Other key teachers in the school. - Technology mentors. - TMP meetings. - TMP web site and facilitators. - Technical support (help desk).

Most important needs or challenges	- Time. - Encouraging reluctant users. - Making connections to the curriculum. - Keeping abreast of new programs. - Balancing differing philosophies on staff. - Funding. - Need more direction from the school division level.	- Time. - Financial resources. - School division needs leadership, plan and vision. - Incentives.	- Time. - Technology person at school is essential. - Helping respond to the needs of teachers. - Keeping things up to date and products current. - Making decisions on purchases.
Staff Response to TMP	- Has come a long way over the past few years. - They want more. - Feedback from student work is most rewarding. - People felt good about the SD day.	- More than happy with what they brought back to school. - Teachers had class pages up and running which was motivating. - Staff is accepting of technology and sees the excitement it generates with kids and teachers.	- Teamwork is contagious. - Without the technology mentor to lead, projects would not have started.
Other Comments	- Define roles-technician versus teacher. - Would like to see more curricular integration.	- Educators should not be involved in solving technical problems.	- Mentor can't have all the answers.

Note. SD = staff development; TMP = Technology Mentorship Program

Appendix F: Interview Matrix - Site Three

Interview Matrix - Site Three

Key Ideas	Mentor	Administrator	Teacher
Role of the Mentor	- Attend meetings. - Expected to know everything there is to know about computers. - Set up computers. - Order computers. - Help and motivate teachers with their classroom computers (target - older teachers). - Set up email. - Provide some SD. - Provide handouts and information.	- Attend meetings. - Share information at staff meetings. - Order computers. - Call the help desk. - Establish rules on use of computer lab. - Help teachers by guiding slowly. - Organize. - Provide SD for staff in small groups or individually. - Flexible.	- Attend meetings regularly and bring information back to school. - Provide SD for staff. - Target those who are not familiar with the program (huge range of variation on staff). - Provide oral presentations and written information packages. - Write notes regarding technology updates on white board in staff room. - Send email. - Speak at staff meetings.
Type of SD or Mentoring Provided	- Integrade Pro Program. - Import grades into student records program. - Email. - Use of computer lab. - PowerPoint. - Optional sessions. - One-on-one assistance.	- Report cards (Integrade and import grades into student records). - Individualized Program Plan software. - Math program. - Use of computer lab (rules). - Optional sessions.	- Oral and written SD (handouts). - Integrade Pro Program. - Email. - Online projects. - Small group sessions. - Follow-up provided informally; everything is accessible.
Type of Technology Planning in School	- Use handouts from meetings and apply information from sessions to school needs. - Provide different levels of sessions (split) for beginners and more advanced users. - Hands on sessions. - Talk to staff informally.	- As part of the planning, teachers wrote budget proposals for approval. Mentor received about half of the budget for technology. - Different levels and needs with technology. - Whole staff SD sessions planned.	- SD committee. - Once per month an afternoon for SD. - Committee mainly does planning. - Mentor has provided many optional sessions for various levels of readiness. - Casual dialogue in staff room.

Most important needs or challenges	- Physical resources. - School structure (6-day rotation and non-mandatory computer class in junior high) needs changes. - More time. - More help with curriculum integration.	- Time needed. - Slowness in responding to technical problems is a problem. - To be able to access help when you need it. - The school division needs a plan and someone to do the research. - It is a challenge to leave class often for TMP meetings and for fixing things. - Scheduling - 6 day rotation problem.	- Too great of an expectation that mentor can fix every problem. - Huge variation on staff in terms of skill. - More time is needed. - Lab time is a problem (scheduling). - Mentor role is not defined with clear expectations. - Do not have a technician at the school. - Training and professional development for mentor is essential.
Positive Aspects of being or having a TM on staff	- Learning. - Networking with others. - Being respected at school. - Keeping abreast of the technology.	- Mentor has the expertise. - Having someone to whom I can go to and to whom staff can go. - Someone who will find things out if they don't know. - Keeps everything in order. - Willingness to learn.	- Staff is aware of what is going on in the school division. - Great to have someone to ask questions. - Mentor is accessible to staff. - Mentor aids teachers and is helpful. - Link to information. - Applies knowledge to integrate technology in the curriculum.
Staff Response to TMP	- No one really complains about the TMP and technology sessions provided. - People attend optional inservices provided and seem interested in attending school division inservices. - Teachers are starting to use their classroom computer for Integrade and email and approach mentor for help.	- Saw mentor's self-confidence grow through the year. - Staff see it as a valuable thing. - Staff tell her what a good job she is doing. - Excitement at school. - Teachers starting to mentor each other.	- Respect mentor. - Mentor shares knowledge. - Asset to the school. - Supportive role in answering our questions. - Interesting to watch mentor change through the year.

Other Comments	- Someone in the position should have some background in using technology.	- Expertise and willingness to learn are key factors. - We can't expect that a teacher is the total technician; we need flexibility.	- Mentor is not there to fix every computer in the school. Mentor should not be a technician.

Note. SD = staff development; TMP = Technology Mentorship Program