IDENTIFYING CONSULTANT PRACTICES WHICH MAY POSITIVELY INFLUENCE TEACHERS' INTEGRATION OF TECHNOLOGY IN THE CLASSROOM

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ABSTRACT

This study explores the experiences of five teachers as they learned to integrate technology with teaching and learning in their classrooms. The purpose of the study was to identify consultant practices which might positively influence the classroom integration of technology. The teachers participated in a project which involved inservice and classroom support as they developed an Internet project with their students. Data were collected through interviews, focus group discussions, and reflective journals.

The findings of the study indicate that the use of technology in the classroom can have a significant impact on teachers' teaching style, and might influence their pedagogical beliefs. It was also clear that the integration of technology could provide the impetus for creating a community of learners environment in the classroom. Four factors emerged as important themes in this study. Support, inservice, time and attitude played a significant role in these teachers' success in the integration of technology in the classroom. Each teacher's experience was unique and these factors played varying roles in their experiences. Addressing the needs of the teachers as they changed their classroom practice emerged as a key consultant practice. Teachers needed supported inservice to develop their skills in various technology areas. Time for inservice, discussion and practice was needed for teachers to increase their own skill level. They also needed to share ideas with colleagues. These teachers had a risk-taking attitude, welcoming change and willing to work through it. It is clear that the consultant must be a facilitator, providing what teachers need in a personal and supportive manner, to make teachers' learning experiences and change efforts successful.

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CHAPTER 1 – THE PROBLEM

1.1 Introduction

In the first chapter, I will outline the problem that led to my research and background information which justifies the need for this research. I will then outline the assumptions I made prior to my research, and the pivotal ideas and concepts that are dealt with in this thesis.

1.2 Problem

In my work as educational technology consultant for a large urban public school system, my responsibility is to support the use of computers for instruction. A large part of my role involves helping teachers learn to integrate technology into their teaching as they facilitate children's learning. I set out in my research to discover how I could do this more effectively. I proposed to identify specific teaching practices in inservice and consultation which positively influence teachers' integration of computer-related technology into teaching and learning across the curriculum.

The purpose of this study was to provide an in-depth description and interpretation of the experiences of a group of teachers involved in a six-month project that taught them how to integrate computer-related technology into their teaching. In the project, the teachers developed Internet-related activities with their students, and I provided the inservice and support necessary to help the teachers carry out their planned activities. In my research, it was my intention to describe their experiences and attempt to understand the factors which contributed to successful integration of technology.

This study is significant in as much as it provides information which will help me (and other technology consultants) to design more effective professional development for teachers in the area of educational technology. The potential benefit of effective professional development for teachers will be improved classroom instruction and student learning.

1.3 Justification

With the rapid development of technology it is very difficult for teachers to keep up with the knowledge and skills required to use and integrate technology in their teaching. There are many factors which affect this kind of professional development including teacher time, inservice, teacher attitudes, and available equipment (Szostak, 1998). Acquisition of hardware and software is the first of many steps toward the integration of technology. Equally important is helping teachers develop the requisite knowledge and skills – skills in using the computers and software, as well as knowledge of where and how to use technology within curriculum areas to improve the learning experience. I have found that even when teachers have the necessary hardware and software, and have computer skills, they often do not integrate technology in their classrooms.

In my school division, the average age of a teacher is 44.5 years, and the median age is 47 years. (Regina Public Schools, 2000) This means that half of the teachers are older than 47, so a large number of those may have been teaching for 20 years or more. Computer technology has developed during their career. The Internet has grown tremendously in the past 5 years. Many teachers have established teaching practices

which are independent of computer-related technology and have established views that technology is an "add-on." It is therefore crucial to find effective ways of challenging these views and teaching them to include technology in their teaching practices.

1.4 Assumptions

I assumed, in this study, that teachers who participated in the project would be motivated to improve the integration of technology into their classrooms. I also assumed that these teachers would have experiences related to technology during the study that may be similar to those that other teachers in the field would experience when developing the use of technology to enhance teaching and learning.

Also, for the purpose of this thesis, I have made the assumption that educational gains can be made by integrating technology in the classroom. Based on classroom observations I have made and information shared by other teachers, I'm assuming that learning to use technology is, for teachers and students, a "gain", that is, something that is good.

1.5 Pivotal Concepts and Ideas

The focus of my research was how I could help teachers learn to integrate technology into their teaching and children's learning. While technology is a broad term, when I use it in this thesis, it refers specifically to computer-related technology. A key concept is "technology integration." My current understanding is that technology is a tool that should be used to enhance curriculum areas. Technology is not an end in itself. It should be used, where appropriate to the situation, to improve teaching and learning in the classroom.

Computer technology has many applications appropriate to use in the classroom including teacher planning and preparation of materials, assessment of learning, and record keeping. In this study, I was not interested in these applications, but in the way teachers can use technology with children to enhance their learning. When I refer to technology integration in the classroom, I mean the curricular uses of technology for teaching and learning purposes.

I explored models of staff development to become aware of possibilities that I might pursue in my research. Central to this exploration was developing an understanding of change, how it has an impact on individual teachers, and how it is implemented in an educational setting.

Fullan (1991) states that:

> Change is a highly personal experience - each and every one of the teachers who will be affected by change must have the opportunity to work through this experience in a way in which the rewards at least equal the cost. (p. 127)

The most important aspect of this research for me was to find out how I could help to support the changes the teachers made in their practice. I hoped to discover some of the ways in which individual teachers would work through the change involved in integrating technology in the classroom. Would they be able to see technology as an integral part of their classroom curriculum? What rewards would they experience and what challenges would they face? Would they, in the space of this six-month project, observe enough benefits to learning that they would continue to integrate technology in their classroom?

Moersch (1995) has outlined seven levels of technology implementation for teachers (LoTI). This is a helpful framework within which teachers can identify their own level of implementation, validate their progress, and set goals for improving their integration of technology.

> In the LoTI framework, we propose seven discrete implementation levels teachers can demonstrate, ranging from Nonuse (Level 0) to Refinement (Level 6). As a teacher progresses from one level to the next, a series of changes to the instructional curriculum is observed. The instructional focus shifts from being teacher-centred to being learner-centred. Computer technology is employed as a tool that supports and extends students' understanding of the pertinent concepts, processes, and themes involved when using databases, telecommunications, multimedia, spreadsheets, and graphing applications. Traditional verbal activities are gradually replaced by authentic hands-on inquiry related to a problem, issue, or theme. Heavy reliance on textbook and sequential instructional materials is replaced by use of extensive and diversified resources determined by the problem areas under study. Traditional evaluation practices are supplanted by multiple assessment strategies that utilize portfolios, open-ended questions, self-analysis, and peer review. (p. 41)

Access to technology, by itself, will not make these changes happen. Each year, our school system adds to the number of computers in each school, so there is access to technology in all of our schools. Over the last few years, I have observed that supplying the hardware and software does not necessarily make changes occur. In some cases, teachers make good use of the computers, with their classroom practices reflecting the upper levels of the LoTI framework. In many other classrooms, I have observed Level 0 which is Nonuse. In my consultant role, I am trying to help teachers move through the levels so that technology in the schools can be used to its fullest potential. Moersch also quotes Dwyer (1992) who states that using technology does not guarantee that

fundamental changes will take place in the teaching-learning process and, as a result, in learning outcomes for children. I believe that teachers need help in order to change the teaching-learning process in their classroom - to reflect on their own actions and make conscious decisions to move from a teacher-centred classroom to a student-centred classroom. I also want to support teachers as they examine their practice. This desire to help teachers integrate technology and examine their teaching practice led to the initiation of my research.

1.6 Summary

First, I turned to current literature in the field of educational technology to discover what work was already being done in this area. As it is a relatively new field that is changing quickly, it is very challenging to find current, relevant information. As I read, I became more aware of the need for research about teacher inservice in this important field. I have outlined the literature and the need for more research in the next chapter.

I designed a research project which would provide teachers with instruction and hands-on experience with the integration of technology which they could implement in their classrooms. During the project I planned to collect data in several ways including interviews, group discussions and journals. The plan for my research is explained in the third chapter.

Following the CyberChallenge project, I worked with all of the data I had gathered and compiled the story of each teacher, trying to reveal the challenges and successes each teacher had experienced. The fourth chapter contains the participants' stories.

As I developed the story of each participant, I began to see common threads in these teachers' experiences. Finally, in the fifth chapter, I have outlined the themes which emerged from the data and the conclusions which I have drawn from my research.

In the second chapter, I will outline some of the current work in the field of educational technology, specifically in relation to integrating technology into the classroom curriculum. I will also explore literature related to change, as the integration of technology involves a change in practice for teachers.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction

For technology to be integrated in the classroom, a lot of things need to be in place. In this chapter, I will explore various aspects of technology integration through current literature. First, the computer literacy level of teachers is an important component. Plans must be developed for technology development in schools, as well as professional development of teachers. The possibility of changes in teaching practice needs to be explored, and the supporting role that social context plays for teachers involved in such changes. Integrating technology may have some influence on pedagogic beliefs and teaching style. It is helpful to examine models which facilitate innovation and change in order to understand the dynamics of the change process. Finally, in the information age in which we live, constructivist approaches to learning involve students actively. Some of the literature looks at teachers with constructivist philosophies involved in the integration of technology. I will examine the literature related to these topics in this chapter.

2.2 Computer Literacy Level of Teachers

When discussing the issue of integrating technology, the first area to look at is the computer literacy level of teachers. Maddux (1997) claims that generally poor teacher computer literacy skills are compounded by increasingly sophisticated hardware and software. Technology is changing so quickly, that it takes a concerted effort for a teacher to keep up. Since lack of experience with the Internet makes it difficult to know how to use it, teachers need inservice on basic literacy skills.

I agree that teachers need to develop their level of computer literacy. In my six years as consultant, I have offered hundreds of inservice sessions in computer skills. Teachers could sign up voluntarily to take these after-school and evening sessions. While the sessions were well-received, I noted that some teachers attended the same sessions repeatedly in order to become skilled in that area. Teachers were reluctant to use computers with their students until they reached a level of competence themselves. I questioned whether a series of one-time sessions was the best approach to use in helping teachers.

2.3 Technology Development Models

Milone (1998) outlined three development models used successfully in American schools. In Austin, Texas, intensive summer programs are held for teachers who then become mentors in their own schools. An important part of this program is the development of a vision statement outlining what teachers want students to learn, how they plan to teach it, and how technology can help. With a plan in place, these teachers have something to which they are personally committed. By becoming mentors in their own schools, they can contribute to the professional development of the rest of the staff. This study caused me to wonder if an onsite mentor would make the difference for other teachers.

In a second situation in Hood River, Oregon, a buddy system is used. Two teachers are given time each Monday morning through the use of roving substitutes. These teachers learn together and work together as a team. If a question arises, the buddy

can help. Once again, there is a helping relationship being developed within the school. These two situations point to the need for teachers to have support nearby.

In the third situation outlined by Milone (1998), in South Huntington, New York, teacher trainers take five days of sessions in the summer and three in the rest of the year, and are provided with a computer for their own use. This program uses technology as a vehicle for restructuring classroom environments around student learning. This approach tackles two of the impeding factors I identified in a previous project. (Szostak, 1998) Teachers need access to technology. They also need time to learn and to practise with technology.

Milone's three success stories suggest some characteristics of an effective staff development program. He identifies teachers' need to have other teachers who can support their work with technology, that is, discuss new ideas and help overcome challenges. Teachers must also be given access to current technology, with time for inservice and practice. As I read this article, I wondered how I could take these ideas and implement them in my system-wide program. Having on-site mentorship would be ideal, but it is also an expensive alternative, requiring the hiring of additional staff members. I wanted to develop a program where I could, as the system consultant, have an impact on the school system.

2.4 Characteristics of a Professional Development Plan

Hedney (1998) wrote an article that had a tremendous impact on my thinking about how to help teachers integrate technology. This forward-thinking article provides a basis for planning in the area of technology in the future. Hedney begins by discussing the

dramatic effect technology has had on the world over the last twenty years. He believes that after developing a vision, and a comprehensive plan for technology, an important step is to tailor a meaningful professional development programme for teachers.

> Any programme should acknowledge that teachers are independent learners and should ensure that these teachers retain personal control over their professional development. Furthermore, the school must foster an atmosphere in which teachers are prepared to take risks by trying new things, and be forgiving when these teachers make mistakes. (p. 15)

Hedney (1998) contends that the majority of teachers are interested in technology but are waiting to be convinced. "They will use computer technology when it is relatively risk-free and there is good reason to do so" (p. 15). Hedney also recommends giving teachers unlimited access to technology by providing teachers with computers. He states that professional development must focus less on teachers becoming competent users of technology and more on "learning the skills required to successfully teach with technology" (p. 16).

In research that I conducted previously in our system (Szostak, 1998), a lack of time emerged as the greatest obstacle to teachers integrating technology. Hedney's (1998) findings were similar, indicating that teachers need opportunity (time) to develop new teaching and learning strategies, and work with their colleagues in peer learning situations.

There are several ideas in Hedney's (1998) article which formed the basis for my developing vision for technology in the system in which I work. What Hedney does not directly address is how to help teachers actually develop the skills in teaching with technology. It is logical that those skills are crucial, and my research provides some insight as to how they can best be learned.

2.5 Change in Teaching Practice

In addition to learning computer skills and developing abilities related to the integration of technology with the curriculum, several authors highlight the role technology can play in changing a teacher's practice. Somekh and Davis (1997) compiled a collection of studies related to the integration of technology in the classroom. Several of these studies relate to the quality of learning and development of teachers. In Chapter 1, the authors make a case for the use of technology as an intellectual tool. As well, they provide support for the evolution of a teacher's practice through the use of technology.

> It would also allow a change in the teacher's role: student autonomy in learning means that teachers no longer need to adopt a didactic approach, but gain the freedom to function increasingly as 'enablers of quality learning experiences.'
> (p. 15)

In Chapter 8, Scrimshaw (1997) outlines the importance of technology as a tool for change in teaching and learning.

> The computer is not simply another curriculum innovation; it is also arguably the most important technical aid to teachers wishing to explore their own practice. This is because it is an immensely flexible (albeit infuriating) device for generating and modifying curriculum innovations to enable learners and teachers to try out for themselves new approaches to teaching and learning. (p. 100)

Various approaches have been developed as technology has become an integral part of our society. School systems across North America are struggling to find the best way to support the use of technology in the classroom. The challenge lies in the fact that

technology has so many possibilities. It is not a simple teaching tool, but a multi-faceted learning tool that has the potential to change the classroom environment. To look at the integration of technology in depth requires a deeper look at the phenomenon of change, and how that impacts on teachers learning to integrate technology.

Fullan (1991) helps to lay a foundation for the phenomenon, outlining the components involved in implementing change.

> The difficulty is that educational change is not a single entity even if we keep the analysis at the simplest level of an innovation in a classroom. Innovation is multidimensional. There are at least three components or dimensions at stake in implementing any new program or policy: (1) the possible use of new or revised materials (direct instructional resources such as curriculum materials or technologies), (2) the possible use of new teaching approaches (i.e. new teaching strategies or activities), and (3) the possible alteration of beliefs (e.g. pedagogical assumptions and theories underlying particular new policies or programs). All three aspects of change are necessary because together they represent the means of achieving a particular educational goal or set of goals. (p. 37)

The research reported in this thesis was designed to address all three dimensions – to introduce teachers to new technologies and help them to develop new teaching approaches, with the hope that new pedagogical beliefs would develop. Part of my intent was to discover whether a supportive relationship could help teachers effectively integrate technology, perhaps working on all three dimensions at once.

2.6 Social Nature of Educational Change

2.6.1 In-school interactions

Fullan points out that meaningful educational change does not occur in isolation, but is influenced by interaction with others. The process of change involves learning to do something new. Peer relationships in the school are very important as they can provide ideas, support and positive feelings about teachers' work.

The quality of those relationships has an impact on the level of implementation of a change. Fullan suggests open communication, trust, support, and help lead to better results, greater job satisfaction and higher morale. I tried to include these elements in my project, in the hope that the change experience of the participants would be more successful.

2.6.2 Learning group support. Fullan (1991) also points out the need for teachers to be involved with other teachers. This seems to support the kinds of activities involved in my project - inservice training with in-class support, and focus group involvement. Fullan says:

> There is no getting around the primacy of personal contact. Teachers need to participate in skill-training workshops, but they also need to have one-to-one and group opportunities to receive and give help and more simply to converse about the meaning of change. Under these conditions teachers learn how to use an innovation as well as to judge its desirability on more information-based grounds; they are in a better position to know whether they should accept, modify, or reject the change. Sometimes teachers cannot answer this question until they have had a chance to try out the new program and to discuss it. (p. 132)

Fullan argues that for teachers to embrace an innovation fully, they must have supportive relationships with other teachers, with opportunities to share ideas, help, and discuss the impact of the change. While Fullan is referring to the broad spectrum of educational change, there is a need for research that examines the role of supportive relationships related specifically to the integration of technology.

2.6.3 Consultant support. In the American report prepared by the President's Committee of Advisors on Science and Technology, Panel on Educational Technology (1997), the authors state:

> In the Panel's view, what teachers actually need is in-depth, sustained assistance as they work to integrate computer use into the curriculum and confront the tension between traditional methods of instruction and new pedagogic methods that make extensive use of technology. Such assistance should include not only purely technical support, but pedagogic support as well, ideally including observation within the classrooms of successful technology-using teachers, periodic consultation with more experienced mentors, and ongoing communication with other teachers grappling with similar challenges. (p. 15)

The approach of the teacher makes the greatest difference, and teachers can do amazing things, whatever their situation is. What I believe may be required is the support of a specialist who can share ideas, discuss plans, supply help - both technical and pedagogical, as well as emotional support and enthusiasm to encourage the teacher who is stepping out and risking. This was a major focus of my study - to try to understand the role that such a specialist plays in the experience of a teacher learning to integrate technology in the classroom.

As the President's Committee of Advisors on Science and Technology, Panel on Educational Technology (1997) indicates:

> Most teachers, however, cannot use computers effectively unless someone is available to help not only with the technical problems that are likely to arise from time to time, but also with the deeper pedagogic challenges of choosing software, organizing projects that make use of technology, and learning how to guide students in the use of computer-based resources. (p. 15)

This argument implies that effective staff development programs must include both technical skills training and support as well as pedagogical training and support in order to be effective. There is more to professional development in technology than simply helping teachers choose software and organize projects using technology. The whole area

of pedagogic beliefs needs to be addressed. As Fullan (1991) indicated, pedagogic beliefs include the assumptions, concepts and theories that underlie particular practices or programs.

2.7 Influence of Technology Use on Pedagogic Beliefs

Why is there a need to change the pedagogic beliefs of teachers, and how is technology involved in that? Hancock (1997) outlines the characteristics of an information age school - a school that equips children with the skills to be successful in the workplace and in life in the 21st century. Interactivity is important, providing students with opportunities to learn cooperatively and access electronic and community resources. Students have more control over their learning if it is self-initiated and the teacher is a facilitator rather than a direct instructor, a coach and guide rather than a dispenser of facts. Technology is important in supporting a project-focused, research-based curriculum, integrating subject areas with the use of information resources. Continuous evaluation is a key characteristic. Overall, there is a changed environment in an information age school.

> Classroom methods link information retrieval, analysis, and application with strategies such as cooperative learning, guided inquiry and thematic teaching. Technology is accessible to students, and students are involved in learning projects - curious about many issues and anxious to communicate what they discover. (p. 62)

To transform our schools into information age schools, we must risk and try new approaches, focusing on the connections between content and process. We must be willing to experiment with new ways of integrating technology, and help teachers develop skills as facilitators of learning in an information age environment. With the ultimate goal of improving teaching and learning, we must use the technology that is available to

transform the classroom into a learning environment that will prepare our students for life in the new millennium.

How can a program positively influence a teacher's beliefs about teaching and learning? Saye (1998) claims that teachers are the gatekeepers of classroom change. "Research suggests that teachers will accept only changes that they perceive will help them do their job as they have defined it" (p. 211). The challenge then is to help teachers reflect on their jobs, and in the light of new understandings about education, begin to redefine the job they do.

Dede (1998) points out the need for many teachers to be able to implement new approaches to education without a large investment of extra time and energy.

> To achieve large-scale shifts in standard educational practices, many more teachers must alter their pedagogical approaches. [They] must be convinced to make the leap to a different mode of professional activity – with the understanding that, once they have mastered these new approaches, their daily work will be sustainable without extraordinary exertion. (p. 6)

So the implementation of technology integration must be carried out in a way that doesn't significantly increase the workload of busy teachers. Harris (1998) adds a further caution:

> True change in perspective, and therefore practice, comes only as a result of a conscious, self-initiated, and willing decision by each practitioner. That kind of change cannot be mandated but certainly can be catalyzed, energized, and supported. Your role, then, is to facilitate more than deliver, encourage instead of mandate, assist rather than coerce. (p. 18)

2.8 Influence of Technology Use on Teaching Style

Teaching style plays an important role in the classroom and may be said to be grounded on pedagogic beliefs. Teachers need help to become facilitators in their classrooms, so that students can develop independent learning and thinking skills. To do this, we must help them explore their beliefs and perhaps to alter them. Moersch (1995) identified three styles of teaching - the traditional expository approach, the teacher as resource person, and the teacher as facilitator and co-learner. The traditional expository approach involves the teacher as provider of information and the students as receivers. When the teacher becomes a resource person, the students become more involved in the learning, but the teacher is still structuring the learning activity and environment. The teacher as facilitator and co-learner is involved with the students in hands-on inquiry and experiential learning. Technology is used as a process, product and tool to find solutions to authentic problems, communicate results and retrieve information. Instruction is learner-centred and students take more control of their learning. This pedagogic environment is enabled by the use of technology.

So the integration of technology goes far beyond the teaching of computer skills, or ideas for integration. Truly integrating the use of technology in a classroom can lead to profound changes in the learning environment, the teacher's practice, and perhaps even in their pedagogic beliefs. The task of helping teachers integrate technology is growing more complex! How then could I help teachers begin to implement such far-reaching changes?

2.9 Models to Facilitate Innovation and Change

Anderson (1997) outlines the assumptions of the Concerns-Based Adoption Model (CBAM), a model for change. First of all, change is a process, not an event, so it occurs over time, with developmental growth in feelings and skills taking place. Change is accomplished by individuals and is therefore a highly personal experience. Facilitation of this change involves interventions directed toward the individuals, innovations and contexts involved.

The CBAM model was presented by Hall and Hord (1987). Loucks-Horsley (1996) supports this point of view. She outlines the levels of use of an innovation in this model - Nonuse, Orientation, Preparations, Mechanical, Routine, Refinement, Integration, and Renewal. These levels are similar to the levels of technology integration used by Moersch (1995). Both authors suggest a sequential development through the levels of use of innovation. While this may be broadly applied to any innovation, my research applies specifically to innovation involving technology integration. This model provides some clues to the levels of development for teachers.

Bailey and Pownell (1998) have developed a modification of Maslow's hierarchy of needs which prioritizes the human needs involved in technology staff development and support programs. They claim that an effective staff development program must address both technical and human needs by involving participants in the planning, using a sound planning process, providing time and resources, providing continuity in time periods, making expectations clear to participants, offering flexible scheduling and options to participants, and using sound evaluation procedures. Bailey and Pownell believe that

teachers fulfill their need for belonging through peer interaction, with opportunities to discuss and compare ideas and information. "Teachers must work with others on significant technology projects over an extended period of time" (p. 50). They also claim that esteem is built through the use of innovations in technology. "Experimenting with technology is the essential ingredient in innovation" (p. 50). Self-actualization occurs as teachers become empowered by "technology, continual innovation and continuous exploration" (p. 51).

These change models provided some important guidelines for developing my research project – the importance of good planning, continuity, access to resources, and interaction with other teachers, as well as respecting the different needs of individual teachers.

2.10 Constructivist Teachers Implementing Technology

Dexter, Anderson, and Becker (1999) provide an informative snapshot of teachers who are currently integrating technology into their classrooms, and how they see that integration affecting their teaching style. Data was drawn from 47 teachers in 20 Kindergarten to Grade 12 schools in three states of the United States, through the use of a questionnaire, interviews, and classroom observations. While a number of the teachers stated that technology helped them develop different approaches in their classrooms, only 2 of the 47 teachers thought that technology caused changes to take place. Approximately two thirds of the teachers involved in this research were constructivist in their approach to teaching and learning. Dexter, Anderson and Becker compare instruction, a teacher-centered approach, with construction, a student-centred approach.

In the constructivist approach, teachers use technology to "allow students to work in active ways. The technology can support active learning: it becomes a tool with which the students may construct knowledge" (p. 222).

These results seem to indicate that technology provides different solutions for different teachers, and it is important to help teachers implement technology to the best of their ability. The researchers in this study concluded that "for teachers to implement the use of educational technology in a constructivist manner, they must have opportunities to construct pedagogical knowledge in a supportive climate" (p. 221).

In a continuation of the initiative which began with my research, I have again been involving teachers in interactive web-based projects. Through this initiative, which includes inservice sessions and classroom support, teachers have a chance to involve themselves and their students in an exciting web project. It seems clear to me that a constructivist approach, in which students and teachers get involved in learning together, provides the greatest opportunity for teachers to develop skills which will help them to re-organize the way teaching and learning happens in their classroom. Using technology as a tool can support and enhance the constructivist classroom. Dede and Sprague (1999) promote the constructivist approach as an effective way of integrating technology into teaching and learning. They refer to the "power of student-centered learning enhanced by the appropriate use of educational technologies" (p. 17). This approach suggests an environment where the technology is a tool, and use of it is taught as it becomes necessary to complete the task at hand. Student responses influence the content and instructional strategies, and the technology is an important component of the classroom environment.

2.11 Summary

I have outlined the literature which addresses various topics related to the integration of technology in the classroom. There is a need to improve the computer literacy level of teachers, and we must find ways to do that effectively. Some school systems have implemented successful strategies for developing the use of technology. These and other experiences provide clues to the characteristics of effective technology implementation plans and teacher development plans. Several authors have highlighted the role technology can play in changing a teacher's practice. This is an area that needs to be explored in more depth, as well as the role colleagues play in supporting teachers involved in changing their practice. Pedagogic beliefs and teaching style may be influenced by the use of technology, and this is an area of study with exciting potential. In the process of examining some of these changes for teachers, there are change models which assist us in understanding the dynamics of the change process. The constructivist approach to teaching and learning may hold some clues about the successful integration of technology.

Effective integration of technology involves not only the development of technical skills, but new teaching approaches and beliefs. It is simple enough to provide sessions on technical skills, but how can a school system attempt to influence teachers in all three areas? The specific question for this study is "What strategies are effective for a consultant who wants to help teachers experience these kinds of changes?" This literature has supplied clues, but the question remains. Do the change models reflect the best approach to helping teachers integrate technology? Which components of the staff

development program are most crucial to ensuring that effective integration will take place? It is my hope that my research sheds light on this discussion.

In the next chapter, I will explain the design for my research study. I developed a project that would provide teachers with practical experience trying to integrate technology in their classrooms. I will outline the research I conducted in an attempt to find answers to these questions.

CHAPTER 3 –THE METHOD

3.1 Introduction

In this chapter, I will outline the background which led to this research project. I will explain the action research method I employed, and outline the method I used for my research.

3.2 Background

When I first began to consider doing research at the graduate level, I knew what domain I wanted to explore - how do you take an entire school system and move them ahead in the use of technology in the classroom? In my position as educational technology consultant for a large urban school division, that was my driving mission. I was convinced of the importance of helping our students develop skills in the use of technology in the context of other areas of learning. It took some time and discussion to narrow the question. I knew how foolish it would be to take on a research task that huge! I wondered how I could capture the essence of that project in some meaningful way, a way that would provide some directions and applications within the school system?

I was willing to reduce the range of my research to a few schools, representative of the whole system. I was taken with the idea of measurement - of being able to show that if a measure were taken before and after the period of research, then whatever was done in between the two measurements could be shown to have had a significant effect, or no effect at all. In this way I would be able to isolate the specific practices that led to a positive improvement in the use of technology in the chosen schools. By extrapolating

that data, I would be able to predict what types of change initiatives should be implemented in the entire system.

It sounded like a neat package, but I began to discover the weaknesses in this approach. It described an experimental strategy - measuring the starting point, developing a hypothesis about treatment that may have a significant effect, carrying out the treatment and measuring again at the conclusion. However, the implication was that whatever was being studied must be measurable.

So I looked around for suitable measurement tools. What I found was exciting to me. Moersch (1995) had developed a procedure for charting the use of computers within a school over a period of time, then analyzing that charted data, labelling the activities according to the level of implementation of technology (according to a chart with 7 levels from non-use to seamless integration) and using a complex equation to determine a value which represented the school's technology integration co-efficient.

I liked the process, but recognized the difficulty of implementing it within a school. Would all of the teachers in one school be willing to track their activities in detail for a week? Would the fact that the activities were being tracked cause teachers to be more purposeful in their use of the technology during that period? Would this measurement provide me with what I was looking for? In the end, I had to admit that the integration of technology is a very complex issue, and any attempt to quantify it falls far short of providing a true picture of what is occurring.

I would need to take an inductive approach and attempt to identify the "essence of the experience" of teachers attempting to integrate technology. I would need to find

ways to study this phenomenon which would help me to understand it, to see it from the teacher's viewpoint, and to explore the many, varied experiences of technology integration. So I decided that my approach to this research would be qualitative, but which avenue of qualitative research would I then pursue?

3.3 Action Research

Today I see that my research was action research. McNiff (1988) defines action research as "an approach to improving education through change, by encouraging teachers to be aware of their own practice, to be critical of that practice, and to be prepared to change it" (p. 4). During my research, I reflected on my own practice as a consultant, in order to identify how I could best help teachers to integrate technology effectively. McNiff identifies the process of action research as "a self-reflective spiral of planning, acting, observing, reflecting and re-planning" (p. 7). I developed and carried out a plan to help teachers learn to integrate technology, all the while recording the thoughts and feelings of the teachers participating in that process. By working closely with a few teachers, trying different types of assistance, and having those teachers reflect on their experiences, I tried to identify the practices that specifically helped them.

3.4 Method/Instruments

Five teachers working in five elementary public schools in Regina were involved in the project, which ran from January to June. The schools were located in various parts of the city (three suburban middle class schools and 2 schools in working class neighbourhoods). These teachers were currently receiving inservice in computer-related technology as part of the CyberChallenge '99 project. This was a GrassRoots project

funded by Industry Canada and Saskatchewan Education, involving teachers and their classes in Internet projects. I applied for and received ethical approval from the University of Regina's Research Ethics Committee. Then I sent letters to teachers who were involved in CyberChallenge '99 requesting that they consider volunteering to be involved in this research project. So the teachers who participated in the study were teachers who had already indicated an interest in learning how to integrate technology in their teaching.

Teachers who volunteered for the study agreed to participate in inservice sessions, participate in two interviews (one at the beginning of the research and one at the end), make entries in a reflective journal throughout the project, and participate in 3 focus group sessions.

The inservice sessions were concentrated at the beginning of the project in January, with three full-day sessions a week apart during the first month. Two additional half-day sessions were held during the next three months. These sessions covered a wide range of topics from exploring the Evergreen Curriculum (Saskatchewan's online curricula located at http://www.sasked.gov.sk.ca/docs), to Internet searching and research, curriculum-based telecomputing projects, HyperStudio for multimedia presentations, using the scanner and digital camera, and web page creation. There were opportunities in each session for discussion of project ideas and requests for help.

Each teacher volunteer participated in an initial interview in February or March during which I asked them about their experience with integrating technology in the past

and what kinds of assistance they thought they would need. Based on these needs, I worked with each teacher to plan ways to provide the necessary support.

The volunteer teachers were asked to keep a reflective journal throughout the period of research. I also kept a journal during this time. While the teachers found it difficult to consistently make journal entries, the thoughts they recorded were very helpful.

Three focus group sessions were held during April, May and June, involving all of the volunteer teachers, to discuss various aspects of what was happening in the project, and key concepts and issues. Not all of the teachers attended each session, but the discussions were lively and interesting with a wide range of topics addressed. The teachers found this part of the project very useful, as they reflected on their experiences and struggled to come to terms with the integration of technology in their own classroom.

A final interview was held with each participant in June or later, to find out what they had gained over the period of the research and what was most helpful to them during that time. Some of the results of my research were identified in those final interviews as teachers reflected on their own experience and the impact of the inservice and support they had received.

In analyzing the data I read each transcript 6 times. I wrote the stories out of my reading, then checked and rechecked to ensure the validity and fidelity of the stories. With each reading I noted commonalties and major ideas, with consistent themes gradually becoming apparent to me. I created a computer file for each theme. Pieces from the

transcripts which related to each theme were copied into the appropriate file. Finally I wrote and rewrote the discussion of the emerged themes.

Because every teacher's situation was so different, it was very interesting to explore their different experiences. Similar kinds of help had different effects depending on the context of the teacher. Factors such as the neighbourhood of the school, age and experience of the students, other resources available in the school, background and experience of the teacher, made each situation unique. There were, however, commonalties which emerged through the data. These may lead to practices that will increase teachers' capability to integrate this far-reaching change in their classrooms.

3.5 Summary

By focusing on the experiences of the teacher, I think that I have gathered much more useful information than if I had tried to quantify and measure the progress of the school. It was a little scary to contemplate stepping out on such an adventure into the unknown, but this study has helped me, and hopefully will help others in my situation, to grow in understanding of a very complex subject. I would now like to share the story of each of the participants and the challenges and insights they experienced during the course of my research.

CHAPTER 4 – THE DATA

4.1 Introduction

Here are the stories of the five teachers who took part in this study - Allison, Jayne, Jenna, Sandi, and Suzanne. All five are teachers in elementary schools in a large urban public school system, the same system in which I serve as educational technology consultant. As part of a larger group involved in an Internet-related project, these women volunteered to extend their involvement as part of my study.

During the six months of my study, I had many contacts with them including interviews, email, inservice, journals, and focus groups. I had at least monthly contact with all the teachers, but in some cases or at some times, the contact was weekly. I have developed some understanding of what they experienced during these six months of learning - an adventure of stepping out and trying new ideas as they tried to integrate technology in their classrooms.

Their stories are quite different, yet they have relevant similarities. They share a common background, for all five are experienced teachers with at least fifteen years of classroom experience and all five had some experience in working with computers, although for some, their skill level was quite minimal. They shared some common outcomes as a result of this project, too, as they grew in confidence and their own capacity to integrate technology effectively.

Here are the five stories, arranged in alphabetical order, which reflect the richness of their experiences during the project. Where I have used direct quotes from the participants, the citation is noted in the format of (event:page number date). The "event"

refers to the research event, whether it was an interview, focus group discussion or journal entry. Whenever one of the teachers' names appears, it represents one of the interview sessions. For example, (Allison 1:5 March 3/99) refers to the 5th page of the transcript of the first interview I had with Allison, which was held on March 3/99. Similarly, (Focus 2:20 May 4/99) refers to the 20th page of the transcript of the second focus group discussion, held on May 4/99. I began the study in February, 1999 and conducted my last interview in January, 2000.

4.2 Allison

Allison is a teacher who has taught for over 20 years, and is currently the vice principal in a large suburban school. The area around the school is of an upper socio-economic class, including some very expensive homes. Perched on a rise, the school and its surroundings have an air of newness, accented by the lack of trees in the area. (In the prairies, trees are common only to older, more established neighbourhoods.) As you enter the school, there is a feeling of friendly welcome, and the open layout of the school encourages students and teachers to work in various environments and configurations.

A warm friendly person, Allison has a quick smile and a twinkle in her eyes. Her easygoing manner and caring interaction with students belies her British schooling. Yet, Allison has a no-nonsense approach to getting on with the task at hand.

Allison remembers having a Commodore 64 teaching station in her primary (Grade 2/3) classroom - one of the centres that students would work at. Later she was at a school with a set of Commodore Amiga computers (very early computers), when she was teaching Grade 8, then at a subsequent school Allison taught keyboarding with old

Commodore 64 keyboards. But she feels she didn't really start using technology across the curriculum until she came to her current school three years ago.

At the beginning of the study, I asked what has made the difference and Allison explained:

> It's been ... having the equipment and having the programs, having the knowledge yourself, feeling comfortable with it yourself, it's having access to the inservices, and it's having the support from the administration as well ... Basically that first year he [the principal] just gave us everything, almost everything that we raised [school fundraising]. And we went with that and then he worked like heck to get us this room here. Basically, if we can't find the money from somewhere, he'll get it for us ... And then the staff have come on board. And when you know you've got the support there too, that pushes you even further ... What's helped now is that downtown's [school board administration] on board too. I mean, you're there [the researcher, in consultant role], there's somebody we can go talk to about computers. The technicians [at the school division office] are now on board - they, you know, they know how to fix the computers. And ... the network. That's made a humongous difference. Everybody's got the same, within the school, has got the same access.
> (Allison 1:5 March 3/99)

When asked about her comfort level with integrating technology with the curriculum, Allison responded:

> I'm comfortable. I try and use it as much as I can. There's still a lot of areas where, because you don't have, you know, 28 computers in your classroom all the time, there's a lot of things that you can't do. (Allison 1:8 March 3/99)

It is interesting to note how important the computer room was to Allison - and the capability of having the whole class using the computers at the same time. While she was comfortable with her use of technology, Allison did recognize that there was more she could be doing, and it seemed that the times that she did use computers with her students were times when she made a conscious effort. She had to deliberately decide to

use technology in a particular topic. Because she has administrative release time, Allison doesn't teach all subjects to her class. If she did, she feels that she would integrate technology more.

> It's still not totally natural to turn to the technology ... for anything and everything that's going on in the classroom. So I find I'm at a semi-disadvantage because I'm not teaching all subjects in the classroom, so, you know, there's some areas I know I could be using the technology for moreso. (Allison 1:14 March 3/99)

Allison found the three days of inservice that were offered in January as part of the CyberChallenge project very useful:

> Of course, all the inservice, you know that, I mean, having the opportunity to spend time and learn these things is tremendous. I mean the rest of, most of the staff, don't get a chance to do that ... And that's what's important, trying to find the time ... and it reinforced and took you to a different level. (Allison 1:12 March 3/99)

As the project began, Allison was enthusiastic about the involvement of her students:

> The enthusiasm of the kids this last while working on this project has just been incredible. (Allison 1:9 March 3/99)

When I first interviewed Allison, she seemed comfortable doing all kinds of things with technology in her classroom. There did not seem to be any area she could identify where she felt she would need my help. In our discussion, she did shed light on her view of the consultant's role, which I reflected on in my journal:

> After the interview we went into the lab and talked about various possibilities for arrangements. She mentioned something about having trouble with the kids' disks, so I suggested the possibility of installing a MacJanet server so the kids could save directly to the server. So, I think they're going to look at that possibility. Allison commented that that's the value of having someone like me (a consultant), because they (teachers) are so focussed on what they are doing, that they need someone with a

> broader perspective to make suggestions, and tell them about other possibilities. (Personal Journal Mar 3/99)

Throughout the spring, Allison came to every inservice and focus group meeting, but did not request any individual meetings with me. I did receive email from Allison from time to time, asking for advice or a solution to a technical problem. I responded promptly to these requests and Allison was able to use the information provided to solve her problems, as she would send a brief email to let me know that she was successful.

I visited Allison's school when she asked me to come and help her class download national anthems from the Internet for their HyperStudio [multimedia presentation software] projects on other countries. We had an hour and a half in the computer room, with about 30 Grade Six students. The computers in the computer room ranged from brand new to very old, with many variations in capability, so there were many technical problems to overcome!

Some of the computers could not access the website properly so some students had to double up. The format for the sound files was not compatible with HyperStudio so we had to download a sound converter. Some machines did not have a decompression program installed so couldn't install the sound converter. Then we discovered that the sound converter would only run on a Power Mac, so there was only one computer in the room that could handle it. So we worked out a system where the students put their anthem on a disk, went to that one computer and converted it, then went back in and installed it in their stack.

It was quite amazing that we actually accomplished the task in the time we had - and the students learned how to download and install a program as well! I was very frustrated because of the obstacles we kept encountering, but Allison was very pleased with the way the time went. Not only did they get the anthems they needed, but Allison indicated that it was helpful to her to watch how I overcame the obstacles and found ways to work around the problems we encountered. She also found it encouraging to see that I encountered problems too - it wasn't just because she lacked the knowledge that she ran into problems. The variations in computers and systems present teachers with an almost overwhelming array of compatibility problems.

When I spoke to Allison in November, she reflected on the previous spring. She feels that she is much more able to integrate technology this year - her definition of "integrating technology" has changed. This change was a result of the discussions and experience with the CyberChallenge group in the spring. She used to think that she had to have a project going, but now she sees that technology can be here and there throughout the classroom learning - in effect, integrating it with the curriculum.

> Maybe I'm looking at it from a different perspective this year ... but I, I kept thinking last year that there had to be some sort of project I was doing before I was using the computer ... and now I don't because I've been teaching little kids more this year ... and have been in the lab ... I'm not really integrating it into the curriculum but I'm trying to ... because I don't want to do it in isolation of what they are doing in the classroom. (Allison 2:1 November 8/99)

Allison felt that, in part, this change occurred because she was able to increase her own skill level, which made her feel more capable of trying new things with the computers.

> We did so many things, you know, we honed our own skills in so many areas ... so that you're less worried about what you can do or can't do ... people who don't have a lot of computer experience say that here. I don't want to do that 'cause I don't know how to do it and you know ... I try to say ... you can learn along with the kids give yourself a little bit more credit you know, but I think it's in the back of your mind all the time. (Allison 2:2 November 8/99)

During the project, Allison felt that she increased both her skill level and her confidence in trying new ideas using technology. When I asked her to identify which aspects of her experience had most helped her to integrate technology, she responded:

> Having an opportunity, well, an opportunity to talk to people and also time to play around - but also the opportunity to explore things a little bit more in depth ... the inservice was excellent because that gave you an opportunity to throw things around with other people and that's what's really important ... to bounce ideas off people, to ask questions ... The focus groups were good 'cause we got to talk about things ... Just spending the time that's the biggest thing, Jo - finding time to do these things and finding time to think these things through ... the inservices last year gave us the time to concentrate. We could forget everything else. (Allison 2:4 November 8/99)

So, the main components that Allison identified were the opportunities for inservice and discussion with other teachers in a focus group atmosphere. Both provided time to learn and to think in the company of other teachers involved in the project. Allison also indicated the importance of support throughout the project.

> I don't think I would have taken on any sort of project even if somebody had said here's an idea why don't you try and do that this year and then left me on my own to do it. I wouldn't have done it ... And again we were at an advantage having (another teacher in the project) here because if I forgot something you said she might remember but no I wouldn't have done it on my own ... it was really good to have that and it was the same this year that's exactly why I wanted to carry on this year 'cause I know it'll push me into doing some things that maybe I'll put on one side because I don't have time." (Allison 2:5 November 8/99)

So a teacher with other necessary factors in place - skills and computer access - might not have become involved in this project if she'd been on her own. This quotation underlines the importance of support offered by the consultant and by other teachers, through inservice and ongoing contact.

> You need ... back up and support from, you know, you and from the group when you're working with them but back at your ... home school ... too. (Allison 2:5 November 8/99)

When Allison considers her approach to using technology in the classroom, she sees the direction in which she wants to travel:

> I've got to learn to let go a little bit more and let the kids go. I wish I could have been a bit more like Jenna in that she had to let the kids go. I couldn't do that - I didn't do that last year. Maybe I can do it now. (Allison 2:4 November 8/99)

Allison was referring to the experience of another teacher in the project, Jenna, who found it necessary to become a learner along with her students because she lacked some of the skills. In the process, her students developed as independent learners, and Allison is starting to think that she would like to enable that experience in her own classroom.

> Maybe my definition of integrating technology's changed, Jo. If we're just talking about using technology - whether it's computers, whether it's other equipment or whatever, yes ... to a lot of extent I did but it was always an add-on. Now when I look at it ... it wasn't across the curriculum. It really wasn't. I've changed my definition of integrating into the curriculum. (Allison 2:7 November 8/99)

Allison had always treated technology as a special activity added on to the regular activities in a particular unit of study. She now finds herself using the computer room for students to do a mathematics exercise, access the Internet for information, or to write and

revise a piece of writing. Her previous definition of integrating technology was limited to including the use of technology in some projects, but now integration means using technology as a teaching/learning tool in all areas of the curriculum, not just for a special project.

It was exciting to me to hear Allison saying things like this. When the project began, I recognized that Allison was a longtime computer user who felt quite comfortable using technology with her students. The notation in my journal after our first interview reflects my uncertainty about my own capacity to help her.

> Allison is so self-assured, and seems comfortable doing all kinds of things with technology in her classroom. She couldn't think of anything she would like help with at this point! I'm not sure how much help I may be to her! (Personal Journal March 3/99)

Allison was quite satisfied with what she was able to do, and looked at this project as an interesting opportunity to make use of technology. In the short span of six months, though, Allison grew in her thinking about using technology, and was open to considering different approaches. The changes in her thinking resulted in changes in her practice in this new school year - and these changes were not necessarily consciously made. It was as she reflected on the differences that Allison recognized and identified the reasons for the change herself. Allison recognized in herself an important change in attitude. Although she was previously a competent computer user, perhaps as she explored many avenues of technology through this project, she began to realize how much there was yet to learn, and how important it was to provide those opportunities to students.

4.3 Jayne

During this study, Jayne taught Grade 8 in a small school in a working class neighbourhood. It is a discouraging area to drive through, filled with small, timeworn homes. The school itself reflects the hope and promise of a bygone era, dulled over time by the daily struggle to cope with life. Jayne's students were a lively group, some keen and anxious to learn, others lacking the interest and initiative.

Jayne has a bright smile and a gentle manner, dealing with her students with respect and expectation, ready to draw the line when needed. Very artistic and creative, Jayne has great dreams for her students, then develops those dreams with purpose and care.

Jayne hasn't always been a teacher. She started out working for a bank and remembers being excited about the new technologies being introduced there. Having been trained in secretarial school to use electric typewriters, etc., she disliked the old manual equipment and welcomed the first computers. She has welcomed technology from the time it appeared, so the use of technology has always been something she felt was important. She has used it a lot herself and she has tried to use it with her students; however, I think she has mostly used the computer for her own purposes and I sense that it is peripheral in her classroom. This project has allowed some focus on the technology but only for a few interested students. Most of her students use computers for word processing, while some have become involved in other uses, such as web page creation.

During the course of this project, Jayne indicated that she has become better able to integrate technology in her classroom.

> Oh yeah ... definitely ... definitely ... I think just having access to Hyperstudio, Internet access and certainly this web page stuff ... I couldn't do before. (Jayne 2:1 June 21/99)

When asked what specific things were most helpful, Jayne spoke first of the inservice sessions which were offered:

> Jayne Well, definitely the inservice sessions. I mean, they sort of overlapped one another ... I remember being really nervous at first and thinking oh no, I'm gonna have to do all this ... and I'm not sure ... I'm ready to move on to the next stage yet. So that I felt that there was an overlap, almost, each time and it kind of built on sort of what we had learned ... and you checked with us on that to see where we were and where we were going and how it was working. I think that's really good ...
>
> Jo ... but it was too much ... too fast
>
> Jayne No, no, I felt ... I was afraid of that at first and then it seemed ... like we took baby steps I thought ... and then if you were ready to take the big leaps ... then you had the other part of the afternoon where other people could go off and do ... and see that going on all at the same time ... let's all work here together and ... it was really good. (Jayne 2:1 June 21/99)

Jayne appreciated the continuity from one session to the next, teaching new skills one day, then going back during the next session to review any problems that may have been encountered. It was also important that the structure in the sessions moved from step-by-step direct instruction to unstructured working time where the participants could work on areas they needed to practice.

Jayne also felt that her teaching style has changed over this period of time. One of the major changes that had taken place was in terms of data collecting, which then served as an assessment tool:

> Oh yeah ... when we were in the project I found myself being a real data collector, more a collector of, what would it be ... authentic assessment, so it's more authentic assessment ... I left it for a sub and I left my notebook out and I said you know ... do the checklist ... you know the ... coilbound little book, and would you do a little check list for me ... I talked to them and they left some notes so from the notes I interpreted who had done what and who had actually been working on the web page stuff ... but that's how I do it. (Jayne 2:7 June 21/99)

While a change in style might not be apparent to an outside observer, Jayne felt that she had made changes in her own attitude and approach, especially in the area of assessment. Jayne did experience a new sense of freedom in the activities in which the students were involved. Some of her students began to work more independently because of the interest they had in the project:

> Jayne I've been allowed to really ... a certain sense of freedom. It showed me ... it helped me actually choose ... seating arrangements for this project ... there were kids who were finished their project, wanting to work on CyberChallenge things - they worked here. The other kids worked were over here working together so ...
>
> Jo ... sort of working independently ...
>
> Jayne Mmhmm ... so that was very different ... so and I found myself focusing ... for the very first time ... on the kids who were, and I always complain about that, we spend too much time with the "also rans." We don't spend enough time with the kids who ... have great ideas and want to get out there, even if they're the ones who don't always hand their assignments in, these guys have great ideas ... For whatever reason ...it was a real mish mash ... a couple of the top kids were here and a couple of the other top kids were over there ... so it's very interesting.
>
> Jo ... so it wasn't necessarily the top kids ...
>
> Jayne ... it wasn't ... but it was the kids who had great ideas ... the kids who wanted to finish whatever it is and found this to be really interesting and got into it and did ... so then ... I was focusing on those kids ... you know, you talk about enrichment, well they got

> enrichment experience ... whereas these guys ended up doing ... reading a chapter ... doing the questions and handing them in to me ... I marked it separately ... we had a little bit of discussion but some of them didn't have it done - same story, same story ... so, guess what ... that's what you get, this is what these guys get. (Jayne 2:8 June 21/99)

From Jayne's point of view, the project provided an opportunity to enrich the learning experience for those students willing to show an interest and to take the initiative. Her reference to the "also rans", those students who aren't ordinarily high achievers, reflects the fact that the students who showed initiative in the area of technology were at various levels of ability. Some were students with a natural affinity for the computer, while others had a wonderful idea they wanted to develop using the technology. The arrangement in her classroom, with a small grouping of computers, enabled Jayne to have some students finishing their regular work, while others were working independently on technology projects.

In my involvement in Jayne's classroom, I worked with pairs or small groups of students to help them with their web page project. Jayne appreciated this work with the students who needed some extra assistance:

> That was excellent ... I think you were working with the students who were ready to go ... you know, I think that works well, you know working with two of them or four of them, whatever, it works so much better. (Jayne 2:3 June 21/99)

I observed that this project helped Jayne to pursue some new directions with her class. In her own practice, she made some changes based on the inservice, discussions and classroom support she experienced. These changes will lay a foundation for more work integrating technology in the future.

4.4 Jenna

Jenna has been teaching for over 20 years, and during my research was teaching in a small school in a working class neighbourhood. Located in an aging part of the city, the school is surrounded by low-income housing and small postwar houses. As I walked into the school, I felt the warmth and comfort of a small school, where students are well-known by their teachers, and parents play an integral part in the life of the school. In an area where few families have computers at home, both students and parents are appreciative of the technology that is available in the school.

Jenna is a warm, fun-loving teacher. Her quick smile and gentle words reflect the deep caring she has for her students. She moves through her classroom in a calm and capable manner, with high expectations for both her students and herself. A strong teacher, Jenna has earned the respect of her students through her compassion, concern, and willingness to help. Jenna is involved in a number of extra-curricular activities to benefit students.

Jenna has had a computer in her classroom for about half of her teaching career. However, Jenna admits that the one computer in her classroom was not fully utilized - often it was only used by students at recess or in spare time:

> Then we finally had one computer but honestly there was lots of weeks that it ... wasn't even turned on if there were too many things going on - because I couldn't figure out - how do you have one computer with these kids? It was used as recess or if there was an indoor recess in the winter time the kids would play on it but it was like ... how can I do this? (Jenna 1:3 March 24/99)

Use of the computer room at Jenna's previous school was also not very successful.

> I took the whole class in - they each had their own computer - and we did little word processing things such as their spelling lists or, nothing creative, ... it was frustrating though in the way that ... you never got to spend any time with the kids at the program - it was making sure that something was booted up or ... all the machines were working ... and something was always freezing ... but ... personally I've really gotten into doing a lot of my own school work on them - probably for the last four or five years. (Jenna 1:3 March 24/99)

Jenna's involvement with technology was minimal until this past year, and at the beginning of the project she had only basic word processing skills. In fact, Jenna got involved with this project largely because of its Social Studies focus, and was intrigued about trying to make use of the technology. Jenna currently teaches Grade Six at a small school in a working class area.

When the inservice portion of the project began, Jenna enjoyed the first day and found it very exciting to begin using HyperStudio. The next two inservice days overwhelmed her, though, as the group explored more software, and technology such as the digital camera and scanner. Jenna felt that she had not had time to absorb what she had learned the first day, and could barely cope with the overload.

> After the first time I came back I was ... so high and (my principal) said ... are we gonna have to put up with you all the time ... if you're gonna want this and this and this ... and then after the second time it was like ... .mm ... wasn't too sure ... 'cause there was getting to be more things thrown, and more things thrown ... and then the third time ... with the Zebu [collaborative Internet project software] and everything I thought ... pfftttt ... I'm lost ... I ... I don't think I can ... I don't think I'm gonna be able to do this. (Jenna 1:14 March 24/99)

Jenna was intent on using HyperStudio with her class and went back to her school excited about the possibilities. In order to be successful with the project, Jenna knew that she needed more computer access for her students. They needed to be able to access the

Internet as well as work on HyperStudio. It seemed that the obstacles were great. It was possible to group half a dozen computers in her classroom, but some of them would need more memory, more copies of HyperStudio would need to be purchased, a hub was needed to provide Internet access, and all of these items would cost money. After a discussion with her principal, arrangements were made to purchase the needed items. But that was only part of the solution - the computers still needed to be networked and have the software installed, and that produced more technical problems.

It was in the middle of solving these technical problems that Jenna attended a meeting of the project participants. The purpose of the meeting was to touch base, find out how the projects were progressing and where the participants might need some assistance. Members of the group took turns sharing their projects, describing their successes and indicating the problems they were encountering - i.e. with the digital camera, or accessing computers. Jenna's turn came last and she laid her head down on the table, saying "I don't belong here!" Making light of her frustration, she explained that her students had not even started the project because she was still dealing with the setup of the computers. She felt that everyone else was well on the way with their projects and hers was never going to get off the ground.

Knowing that Jenna needed a hub to connect the computers to the Internet, I asked, "Would a hub help?" Jenna looked at me, puzzled, and said, "A hug?" The group laughed and the tension was broken. Jenna shared her problems, the group offered advice, and I made arrangements to go out and visit Jenna in her classroom. The notation I made in my notebook read, "Totally frustrated." What I did not learn until much later was that

Jenna was prepared to walk out of that room and quit the project that day. She had reached the end and was prepared to give up, feeling totally incapable of meeting the requirements of the project:

> When I first started, I thought ... why am I here because we have people that are at these big schools with the big bucks with the big labs. We have people here ... that are here with their librarian ... that have the support and I'm sitting here simply because I thought this would be a really neat project to get into ... because I enjoy technology and I want to find out about it. I thought - this is bizarre ... I don't belong here. And I still felt like that two months later ... I don't belong here. I keep trying but this is not ... like why am I ... why am I here? (Jenna 2:44 June 18/99)

At that point, the support she received was crucial to her continued participation. During several visits to Jenna's classroom, I helped to make the computer centre operational, with computers attached to the Internet and loaded with HyperStudio. I also worked with an "expert group" of six students, guiding them through an Internet search, and teaching them the basics of HyperStudio. Each of these students belonged to a group within the classroom. In turn, they took their classroom groups to the computers in the corner and shared what they had learned.

When I asked Jenna how it worked having six computers in the corner of the classroom, she was enthusiastic:

> Oh it's awesome ... it's wonderful ... especially if they do a week stint ... because then they really can get into it ... it's not ... they're not just dabbling for 15 minutes and then they forget about it when their turn comes up three weeks later. (Jenna 1:4 March 24/99)

When students ran into a problem or wanted to try something new, they asked each other for help. Sometimes Jenna would point them in the general direction, even though she didn't know exactly how to solve their problems either. Together the

students, with Jenna, helped each other grow in their mastery of the various features of the software, and the use of the Internet.

> In that situation when there was six of them they chatted back and forth ... so that they could show each other. Or someone would say ... oh ... you know ... how did you do that and they just LOVE to show them how they did that. So I would frantically be over there trying to watch them so that I knew how too ... but they soon learned that, you know, that I wasn't the expert. The only thing that I could do was when I went back there ... first of all I'd say, did you save your work, in case I lose it. They learned that. And then they just, they observed me going through trying things ... and most of the time we figured it out. (Jenna 2:17 June 18/99)

Jenna related a humorous incident that demonstrated how the students and Jenna were learning from each other:

> Well, I am learning from them, that's for sure. They're showing me things. And yesterday ... like even after school ... umm ... this little Curtis came to me ... and he's shining in this above everything else ... and he came to me and he said, "Do you think that you could work just with those two over there, because like I don't have ... I don't have time to work with them ... and I said "Sure ... you know I'll ... I'll work with them" ... but then I was always saying "Well, Curtis - how did you do this? (laughing) "Oh well you just go into such and such and such and such ..." They seem to remember ... they can do it once and they remember. I can ... I have to do it like six times before it's ingrained ... (Jenna 1:4 March 24/99)

When students figured out certain procedures, they then became the class expert on those procedures and were often called upon to share their knowledge. I worked with one girl, helping her learn how to copy and paste a picture from the Internet into her HyperStudio stack. She became the "copy and paste expert" and as she taught the other students, her self esteem soared:

> She has a very low IQ ... and has probably been taught that way all along that she has a very low IQ. Where with this, she was able to work with kids ... she was with some grade 6's ... she's grade 5. They had the patience ... I just kind of guided them along, and made sure that ... made sure that she

> was helped but not too much. And you could just see her all of a sudden ... wow ... I was able to not only read ... but I have some jot notes ... I've put it into a sentence ... I can type it in here ... and then she taped her voice so she could hear it back ... and it was ... you could just see her blossoming ... like the feeling of accomplishment that she could do this. And then in turn she helped (another student) ... so to see her ... who no one would probably think that she would ever be able to do an Internet search on anything ... and lots of times the books in the library she would just say were too hard for her ... I can't do this ... I don't wanna do this ... that's basically what she was saying ... but I never heard that in this. (Jenna 2:4 June 18/99)

The computers right in the classroom became an available resource for more than just the social studies project. A visit to the classroom might find students exploring volcanoes on the Internet, creating word puzzles, solving mathematics problems or exploring science sites. Jenna indicated that it became natural for the students to include the use of the technology in their daily tasks, to turn to the Internet as a resource, and to use the computer as a tool in their work.

In the final interview, Jenna talked about the changes that evolved in her classroom over the time of the project. With a group of students working in the computer corner, her problem was what to do with the rest of the class. There were always students "missing" what was being taught to the other students. Jenna began developing activities and group projects that students could work on independently. Gradually, the amount of directed instruction decreased, as students worked in collaborative groups using mathematics manipulatives, literature circles, science experiments, as well as working on their social studies research projects. Jenna moved from group to group, student to student, guiding, encouraging, and helping:

> CyberChallenge was what ... forced me in the direction of ... to see the possibilities of ... like when I could actually see what the kids were able to

> learn without me teaching it ... without me giving them notes to copy from the board ... without them studying in pairs ... without them doing fill in the blanks ... like when I could actually see how much curriculum content area they were able to absorb ... (Jenna 2:24 June 18/99)

Jenna described the evolution of her classroom as an incredible learning experience. She noticed that her students became more involved in what they were doing, learned to work with each other, were more willing to risk and try new things, and enjoyed the success of their achievements. Bringing a group of computers into her classroom provided the catalyst for Jenna to pull together a variety of strategies, transforming the teaching/learning environment into a community of independent learners:

> They could have learned the content without the computer but they may not have learned it as well ... or had as much discussion ... or as much group work ... or learned from each other ... they learned things and taught everybody else ... and they were so excited by their knowledge." (Jenna 2:2 June 18/99)

In a few short months, Jenna's teaching style evolved from an "instructor" to a facilitator and co-learner. Little had she realized when she became involved in this project that it would have such a far-reaching effect. Not that the technology itself was entirely responsible, but use of the computer corner made it necessary for Jenna to rethink her teaching approach throughout the curriculum. As a tool, the computers were an integral component of the learning environment that developed.

> The computer is in the centre and now I've had experience with each and every class ... or each and every ... curriculum. I have had some expertise in them - I've had some pilot projects or developed curriculum, or ... I've always been a believer in all of it ... but I've been trying to pull it together. When resource based learning came out I was so excited ... cause it was like ... yes ... and the theming ... because I was a primary teacher and always themed ... it was like ... YES ... this is ... this is how you're supposed to ... this is how you can learn ... and now with computers just being one more

> tool ... you can ... I can see that yes, this is one way where you can have ... kids learning ... all the different aspects of the curriculum by using that better ... by using that tool ... not that it's the only thing. (Jenna 2:1 June 18/99)

Jenna's teaching style changed significantly during this project. Using the computers and accessing the Internet as a resource opened up a new world, in which her traditional project approach was no longer suitable. Students worked within their collaborative groups to choose and research topics of interest about Atlantic Rim countries:

Jo How did they pick the topics?

Jenna We discussed what might be the possibilities ... probably about 20. So what interests you ... so one person would choose ... entertainment. Some did entertainment for both countries to compare them ... some did entertainment for one, sports for the other ... the kids that were really into music did the music and dance. They all ended up with a flag and a map and they did location. We had focused on what are the five themes of geography. When you're looking at a country ... what do you need to know about it? So, they all had a base.

Jo So then ... the project wasn't focused on ... content ... because they could branch off and go into whatever content they wanted ... about that particular country.

Jenna It was focused on content but the content was ... what do you want to know about ... our neighbour, Jamaica? What's important to you? If it's important to them they will learn it. If I had said each group had to do ... history ... they would have fought over who had to do history. Well, one group chose to do history ... the other ones kind of, it happened incidentally when they were doing some of their work on ... land or environment or ... I guess I kind of guided them as they went along. When they found a flag and they were all really excited and so then all the groups wanted a flag ... they found the national anthem and everybody found it ... found maps ... everybody wanted it ... it's not that I told them they had

to ... so basically it was here's the introduction and there's the conclusion and there's the credits ... so ...

Jo Was that a conscious decision you made to use that kind of style?

Jenna No. I should show you what I gave them last year ... to show you how far I have come in a year ... this same assignment was given on goldenrod paper ... EXACTLY what they had to include in their whole presentation ... the marks ... everything ...

Jo And so what made the difference?

Jenna Technology ... I had to learn how to incorporate that ... how to integrate that ... and because I didn't really know what they would find on the Internet ... I didn't know ... I mean I knew my books ... and I knew what I had built up but I wasn't sure what areas this whole thing would take them so I didn't feel that I could confine them ... and we did ... we just started kinda dabbling in it and then it was like ... oh yeah ... they found this ... they found that ... so it just really developed ... it's not that I consciously decided sitting here one night ... I'm not going to give them any direction except for ...

Jo ... but it was because you weren't sure yourself ...

Jenna I just knew that I didn't want to do it as regimented as last year as far as what they had to include ... because a) I wasn't sure that they would find it ... b) they might find other stuff. So I felt more confined last year and more unsure this year as to what will we find ... and let's just go with it. So the learning that they did ... and how, like ... when they would learn something they were so excited that they would share with the other groups ... and I said to the kids today too ... do you feel that you learned anything about any other country except yours? Oh yeah ... there was so and so thing, and I went over here and I had to help them link it together and they were having trouble scrolling and so I helped them with that. So they learned while they were there, so there is no way that they want to go back. I said, even though it was a long time and took a lot of work? It's just like us ... now that they're finished and now that they've presented it ... they talk about all the things that they would like to improve on. I mean ... here's kids grade 5 and 6 saying ... 'and if we had more time, we would do this, and this, and this ... and now that we have a scanner ... we found this and this

> picture'. Well, all those pictures tell a story too ... they have to know what they're talking about. And with even being able to scan a picture ... we had people in the audience saying ... 'So exactly how is that picture related to ... ?' The kids' questions - they're questions that teachers would ask at a higher level ... not what kids would ask ... so somehow the kids have gone to a much more ... analytical way of thinking. (Jenna 2:6-7 June 18/99)

What factors were important in this growing experience for Jenna? Certainly, she was willing to risk and try new things, and the integration of technology was a vehicle for putting into practice some of the approaches to learning that she believed in. But the computer project provided the impetus to reshape the classroom environment. What a loss it would have been if Jenna had walked out of that early meeting in frustration, and given up on the project! What made the difference for Jenna? The inservice was helpful, but Jenna was not providing direct instruction in computer skills to her students - her skills grew with her students as they actively explored the software together. The key for Jenna was ongoing support - getting the help she needed to make the students' experiences with technology successful. This support took many forms - classroom visits to work with groups of students, providing advice on technical problems, answering the "How do you ... " questions that would help students grow beyond their basic skill level. Whether in person or by email, ongoing contact with a support person was a key ingredient.

> First of all the setup ... the technical end of it ... I mean you have to get that set up ... and even just showing me how do you check on the computers as to which one has capabilities to do what ... and building up one major computer that can do more things ...
> The support, as far as if I phoned or for emails - you would answer a question. Because, quite often, the kids are sitting right there and it was ... like instant gratification, instant help. It was like ... oh I'll just ask Jo - so

> you know, I'd have a question and quite often you were really fast at getting back if you were in the office.
> And then coming out to the school ... that was a big help ... working with the kids. I wouldn't need that support as much next year because I would be able to handle all that beginning stuff ... technical end stuff. I know how to get the kids started ... umm ... I really needed someone to come out and answer the kids' questions. There were certain questions that we didn't email you or couldn't email you or knew that you were coming out in a day or two ... so that would kind of help us if we knew. Well, Jo's coming out on Thursday, so we'll save our questions - that kind of support."
> Training the expert group ... you helped with them ... helped me to train them ... so that, as I say, they became my little mini support group.
> Then just the continued support and encouragement ... you can do this ... and you're doin' a great job ... and look what the kids are learning. And, I mean ... teachers don't get that ... so why do we keep doing these things all the time when we're just pulling our own hair out? (Jenna 2:30-31 June 18/99)

Jenna's experience underscores the need for support to help teachers with basic skills develop the confidence to begin to truly integrate the use of technology in the classroom:

> How far I have come and how far my kids have come ... from just having ... you know ... the support and the nudge all the way along ... because ... if I had've given up it was all done. So you just made sure that I didn't give up ... and I was able to maintain my enthusiasm ... my excitement because I didn't get shut down. And I wasn't totally frustrated ... I mean ... every day there was something else I had to overcome ... or deal with ... or ... but once we got to the point of ... oh well, Jo's coming - as long as I knew you were coming, it was like - okay, I can handle these little things ... (Jenna 2:47 June 18/99)

Support comes in various forms - from the administration, from other teachers, and from outside consultants. Without ongoing available support, the transformation of Jenna's classroom and teaching style would likely not have happened.

4.5 Sandi

Sandi teaches a split Grade 5/6 class in a small school in a middle class area. The area is very pleasant, having been developed thirty or forty years ago. Tall trees line the street in front of the school, and the cheerful songs of birds surround you as you climb the front steps. There is a feeling of serenity in the neighbourhood, the homes representative of a community which at one time was the desired place to live. Aging gracefully, the neighbourhood seems comfortable and supportive, easily able to provide its occupants with the necessities of life.

Sandi, who has been teaching for about twenty years, with experience in four different schools, is a lively, fun-loving teacher. Short in stature, Sandi has an outgoing personality that can fill any room she enters. Warmth is conveyed through her ready friendly smile, and her sense of humour is contagious. Sandi is a dedicated teacher within her classroom, and she also provides system inservice in mathematics techniques and assessment.

Sandi volunteered to be involved in a system project to integrate Internet technology in the classroom because she wanted to include more technology use in her classroom. She agreed to participate in this research because she recognized the potential that technology holds for her students.

Sandi started using a computer in her classroom about eight or nine years ago. At that time, she had just one computer, a situation that in her words:

> ... was really frustrating! The thing is that, if the kid gets into any kind of trouble, and you ... you're not familiar enough with the program, or you can't go over and do a quick fix on it, then you know like, you need to

have somebody in your room almost to be troubleshooting for the kid that's on the computer because you can't be interrupted all the time. (Sandi 1:3 February 25/99)

Dave, another teacher in the school, was very knowledgeable about computers and offered assistance to other staff members. Sandi found his help quite valuable at a time in her experience when she knew nothing about computers:

Sandi: He was into computers and so he really helped the staff so he gave us some inservices, and then we got them into our rooms and, uh ...

Jo: So we're talking maybe six, eight years ago?

Sandi: Yeah, eight, maybe nine now. Yeah.

Jo: So what kinds of help did he offer that were useful to you?

Sandi: Umm ... Well like this was way back when, like turn it on basically and uh, you know like, here's how you type and here's how you save, and uh, ... I mean I had very simple programs - like I wasn't into ClarisWorks or anything, it was before that.

Jo: MacWrite probably.

Sandi: Yeah, yeah. And um, and so then, then you get a comfort zone, and so like then when we went to ClarisWorks, like that, that always throws you back, you know like it, you're not comfortable with it and I lost some things. (Sandi 1:6 February 25/99)

Dave offered Sandi some basic instruction, as well as being available to troubleshoot when it was necessary. This support was very much appreciated by Sandi, as this was an area where she had little experience. "I guess if I ever had a problem with it, I knew he would come down and fix it." (Sandi 1:18 February 25/99)

Sandi had reached a comfort level with her own use of the computer, but this comfort was tenuous and could be disrupted by changes in the technology. Several times

in the interview Sandi referred to the importance of using her own computer for inservice sessions. When Sandi learned skills on a computer in another setting, then went back to the computer in her classroom, it was very difficult to make the transfer because things on the computer did not look exactly the same.

> Sandi: Now you came out and did a couple of really ... I always remember that really neat one where you did show us the clipboard and you know how we set all the computers up in the library, and you came out.
>
> Jo: Right.
>
> Sandi: Like, like that was, that was really good, and we kind of got our own and we worked on our own. That was really good. Because I find sometimes, like even going to the board office, like, I know it's so silly ...
>
> Jo: Everything's a little different.
>
> Sandi: Everything's a little bit different, and so you're looking for your icons, and like, I mean even the library, like, that's what I say ... you get used to your own computer.
>
> Jo: Things are all in the same place ...
>
> Sandi: I go in the library and I, and I'm reading, and I'm going okay, now where is that little picture? Where is the one that I'm looking for, (laughing) and of course it's not there. And so there's Marlene walking me through like the mailing thing. (Sandi 1:18 February 25/99)

I think Sandi has a very strong fear that if she does the wrong thing, she will cause some harm to the computer. If she could learn how to do something exactly on her own computer, then she would have a series of foolproof steps to follow the next time, without any scary surprises. For teachers in general and Sandi in particular, it may take a

long time to internalize the subtle clues that guide the computer user in making correct choices.

Sandi's discomfort with different machines extends to different platforms as well. As we discussed a software product that is accessed through a web browser (making it platform independent), Sandi commented on her interest in being able to use such a product:

> Sandi: And I can see that, I mean to me the potential there is um, because of the frustration with having an IBM at home and Macs at the school ...
>
> Jo: Mmhmm
>
> Sandi: I mean I just find that SO frustrating, so when you can get beyond that ...
>
> Jo: Right.
>
> Sandi: and be linking through the net, then, you know then we've, then we've overcome that ...
>
> Jo: That's a real problem
>
> Sandi: and uh, so that'll just be great, and then I can be at home and I can be marking the kids' work and I can be setting up pages and things like that. (Sandi 1:21 February 25/99)

Having to make the switch back and forth from one computer environment to another presents Sandi with numerous challenges. In the same way that she likes to learn on her own computer so that the screen will look the same, Sandi would also like to have a computer at home that "looks the same." Moving from a familiar environment to an unfamiliar one causes Sandi enough distress that she would avoid making the move. When presented with software that would appear the same regardless of the computer, Sandi

could immediately see that she could cope easily with the software and utilize its potential with her students.

The initial involvement of Sandi's students with the computer was basically for word processing, or actually just typing in the good copy of their stories. Keyboarding practice was another aspect of computer use that Sandi worked on with her students. However, she is not satisfied with the level of integration she has achieved.

> You know I keep feeling guilty. Like I have had computers for a while, but on the report card I keep going NA on the computer section because I don't really have anything. (Sandi 1:13 February 25/99)

Guilt emerged as a factor which motivates Sandi to pursue avenues of instruction which incorporate technology. Beginning with the basics of keyboarding, she feels that the job she is doing is inadequate.

> And I also feel kind of guilty, in that I send them down to the library to type but I really don't know if they're ... like when I'm down there, I'm saying oh, you know, your posture isn't right and you're not, you know I don't want them to come out of my class just pecking, but I'm not sure that that's not what's happening. (Sandi 1:11 February 25/99)

The feeling which Sandi identifies as guilt seems to be a very powerful motivator. Sandi is motivated as much by things she feels she "should" be doing as by those which she really "wants" to do. In terms of the whole range of computer skills that students should be developing, Sandi confessed her lack of familiarity with the skills guidelines that exist in the school system.

> I think there's probably a curriculum around, but to be perfectly honest with you, I've never even looked at it. (Sandi 1:13 February 25/99)

The guidelines Sandi referred to cover a range of skills from fundamentals and information processing to multimedia and Internet activities. In the nine years of using computers in her classroom, Sandi has focused on keyboarding and word processing.

Gradually, Sandi acquired three computers for her room, which were used by students during writers' workshop. Two of these computers are now being used in the resource centre, an area where Sandi's students are currently learning to create HyperStudio projects with the teacher-librarian, Mrs. Buck. Due to scheduling difficulties, Sandi has found it works best to send a group of students to work with Mrs. Buck in the resource centre, while she teaches the rest of the class in the classroom. This provides an opportunity for the students to develop skills in using the software, but Sandi would like to be more involved with her students on the computers.

Sandi has struggled with one or two computers in her classroom, and wonders whether it would be an improvement to have a grouping of computers for instruction.

> In the back of my mind I kind of wonder what it would be like to have actually a lab where, where you would go and do computer classes. (Sandi 1:4 February 25/99)

Yet, at the same time that Sandi recognizes the potential a computer room would have for whole class instruction in terms of computer skills, the thought of a room full of computers raises some fears in her mind. Sandi finds it difficult to cope with the problems encountered when using one or two computers in her classroom. The thought of a room full of computers terrifies her.

> Sandi: Like, I can probably go through it, but if any computer has a problem with it or isn't doing what it's supposed to or, like I can't even imagine what that would be like. You know, you'd - if

> everything worked perfectly, which you know with computers it doesn't (laugh) then it would be fine. I think classroom teachers, you know, at least could go through the preliminaries.
>
> Jo: So how do you handle that now then if kids are on the computer and a problem happens?
>
> Sandi: Wait til Mrs. Buck gets here (laugh)." (Sandi 1:4 February 25/99)

Sandi's ongoing frustrations with computers are reflected in her reluctance to try new approaches for fear that something will go wrong. When I asked Sandi to think of times when something really great happened in terms of using computers in the classroom, her first response was in terms of fixing problems:

> Umm ... well yeah, if I can fix minor problems and the kids look at you like, you know, wow, that's wonderful. That's always good, that's a good feeling. But I'm not talking anything major here. (Sandi 1:5 February 25/99)

There seems to be a constant tug-of-war for Sandi between the problems and frustrations of computers and the exciting potential they have for her students. She described the excitement of students involved in creating multimedia, explaining that seeing any students making achievements and feeling proud of their computer use was exciting for her.

> I think when kids do, like, you know, especially with this HyperStudio stuff, they are just so excited, just so excited, and I think that's wonderful, I think that's great. Um ... before, I think, kids who don't have computers at home and when they get on them and they type their own story for the first time, um, that's exciting. (Sandi 1:5 February 25/99)

Sandi has an appreciation for what the computer technology can offer her students, which produces feelings of guilt when she's not able to involve them in the kinds of computer activities she would like to. I think Sandi would like to see all of her

students becoming competent computer users, able to use not only word processing, but multimedia and internet technologies to enrich their learning experiences, yet she is very uncertain how to go about making that dream a reality. Sandi's sense of excitement grows when a technology activity helps her students develop new skills. Recently, as part of the system project, Sandi's class received a digital camera to use.

> I can see the potential, and I, when I look at the kids I, I can see how excited they are about it and um, and now that we're getting the stuff actually in the schools. Like getting the camera, I mean that was just awesome ... because you know, I mean, to learn something and then not be able to use it, um, but then to get one, and then so the kids can actually use it. (Sandi 1:8 February 25/99)

When I asked about her own skill level, Sandi's answer was quite revealing:

> You'll be like totally embarrassed. Like, I'll be like, right back there. Like, I can, I can process, like, I can type. I took typing in school. But I honestly don't really feel comfortable with even clipping and pasting and all that stuff, eh, do you know what I mean? Like I just ... I should have gone in every day and said, okay I'm going to cut and paste this, you know. Now I'm pretty sure I could follow those instructions, but you know I would really love to be able to do that without having to go back and read it every time. (Sandi 1:16 February 25/99)

Sandi's own perceived lack of skills holds her back in terms of what she can do with her students. While her skill level is fairly basic, I think that Sandi lacks self-confidence, and this lack results in a lower sense of her own adequacy than may be the case. During the system project, Sandi was involved in three days of intensive inservice, on topics ranging from use of the Internet and searching, to multimedia and web page creation. Clearly, those days overwhelmed Sandi, and left her feeling insecure. Her response was not to give up and turn away (which other teachers may do in the same

circumstances!) but to become more determined than ever to develop her skills in technology.

> Jo: How do you feel about your own, in terms of your own computer skills?
>
> Sandi: I wish, I wish I would have the time to be doing better than I am. I think I've had a lot of help, and, and as you know - you know, we got those days and whatnot but I found them overwhelming, um ... this is my feedback to you now (laughing), um, in that I, I didn't make the best use of it because I should have really gone home and then done more of it, so that I would be comfortable with it.
>
> Jo: Right.
>
> Sandi: But I didn't. So then it was, leave it, and then we went on to something else. Well, meanwhile, I haven't reinforced, you know that time ...
>
> Jo: So you've had 3 days of stuff that's ... that was just too much.
>
> Sandi: Yuh, yuh. But I mean that's where I was, right, and then I didn't do stuff with it and then I keep thinking, okay, well I'm going to do that and ... so that's really why I signed up, because I thought this would force me to, um, to take some time to do that. (Sandi 1:8 February 25/99)

Sandi seems to have a desire to become competent in her own personal computer use. During the project, Sandi gained a sense of comfort and confidence in working with the computer:

> Well I would say that the biggest change that's happened is that I feel a lot more comfortable trying things. I am willing to experiment around with things. I use it more than I've used it before ... I find it still very overwhelming, with the things that we've done, simply because I don't come back then and work through it and practice it which I know I should, and again it's a timing thing. (Sandi 2:2 January/00)

Perhaps Sandi feels as much a sense of guilt as a desire to learn. With all of the equipment available, Sandi feels she should be making better use of it:

> Sandi: And I mean I would like to get to the point, like I mean we ... we bought a computer through the, through the Board program and, um, you know, I mean so we've got the scanner now and everything. I mean it's just ...
>
> Jo: Yeah.
>
> Sandi: ... it's wonderful, you know. I haven't even sat down at it. You know ... it's just ... I think in the back of my mind I'm thinking, gee, this is way too high tech for me, I'm going to go upstairs and play solitaire on the other one. (Laughing) (Sandi 1:16 February 25/99)

It struck me that Sandi wants to improve her skills, has the technology available, yet the improvement just doesn't happen. I asked her why that was.

> Sandi: Well, you know what, I don't even think I've sat down ... I'm too busy, I am just way too busy. And when I get home at the end of the day, that's not how I want to relax. I don't want to try to learn something else.
>
> Jo: Mmhmm.
>
> Sandi: And you know, by the time I get out of here at 5 o'clock, and have my supper and then go home and mark for a couple of hours, I'm not ready to sit down at the computer at that point.
>
> Jo: Because it's work?
>
> Sandi: It is. It is work for me. I mean unless I was going to go back and just type a letter. But I now have my own executive assistant, so I just get him to type that. So I'm actually less on the computer now than I, I have been in the past.
>
> Jo: Because it's not something you think, gee, I wish I had time ... I'd sit down and work on that. It's sort of ...
>
> Sandi: Well ...

Jo: I have time, but that's not really what I feel like doing?

Sandi: Well, time and energy, I guess would be the ... you know, more the energy than anything. Because I probably do have the time. I mean if I was ... if push came to shove, I could sit down, like you know, if Kelly's away for four months, I'm going to be typing. But ... I don't have to now, so ... (Laughing)

Jo: He does it for you, so ...

Sandi: That's right. Exactly. (Sandi 1:17 February 25/99)

This passage was very revealing. Sandi is a very busy, committed person, so her time is filled with many activities. She is quick to embrace exciting opportunities for her students (like performing a play.) Sandi would do the same with technology, but what is holding her back? At first she claimed lack of time as the reason, but then admitted she could find the time. It really was her own energy that was lacking. Working with technology and learning new skills is mentally tiring work for Sandi, and in her busy life as a teacher, she just doesn't have a lot of mental energy left over. So, even though the interest is there, so many other activities crowd each day that use of technology has become a low priority. With her focus on the project, Sandi made improvements in this area though:

> I've used the digital camera, I've done presentations for my class, you know, I'll get it out and I'll use it where before I just didn't do things like that. (Sandi 2:2 January/00)

Even in the midst of her personal frustrations, Sandi recalls moments that were important in her skill development.

Sandi: At Christmas time Anita showed me how to put, you know, people's names on the address ... so you could just go down ... a

nickname ... like that was really neat - I thought that was great. And then I did do a couple more you see, so that I went through the process and so, now I can do that. Like now I'll put you on. It'll be great.

Jo: That's good.

Sandi: And, um

Jo: So you'll find, maybe as you do that more ... do you think you would feel um, comfortable in, in saying, well, gee, I remember we did such and such and then trying to investigate on the computer to figure out how we did it?

Sandi: Mmhmm

Jo: You're okay with that.

Sandi: Yes, and I think too ... You know I shouldn't say that all of that time ... because to me it just, um, it made me feel more um, open to the computer as a, as a device in the classroom. Because you can see, it'd just be amazing the places it can go and uh, although again, I mean, as with everything, ... it's the time. Right? I mean, even if you get ... like you know - what was that guest speaker saying - that you know you put in something, you get 9000 places you can go and investigate.

Jo: Mmhmmm (chuckling) Yes.

Sandi: Holy Smokes. I mean, who has time for that? Like, I mean you really want people to say "Go to this site, really good stuff on here and you know like I mean some people are doing that now right? I mean, they're letting people know like you know, Donna was telling me about um, this really good site for the endocrine system and you know um all the tests are on it and ...

Jo: So things that are relevant to what you're teaching ...

Sandi: Exactly and I mean I think that's wonderful

Jo: Is that another teacher in your school?

> Sandi: Yeah, so I mean I wonder if we had a bank like that ... where we matched it to the curriculum, with some really good educational sites and uh, I just think that would be awesome. (Sandi 1:20 February 25/99)

Time emerged as such an important factor in the development of technology skills. After the project, Sandi told me, "I've made a time commitment too, which probably didn't happen before." (Sandi 2:3 January/00) Time to learn, time to practise, time to explore all seem necessary to Sandi to enable her to develop her own competence enough that she can teach her students the skills they need. This is another of Sandi's frustrations. She sees not only the need for her own development, but also learning how to teach her students these skills. Sandi's solution would be to watch another teacher modelling these behaviours.

> You know what probably would be, if I, if I could have the time to be in there with Marlene, while she's working with my kids. (Sandi 1:9 February 25/99)

I sensed hope in Sandi's outlook, and a plea for help, to coach her through the ever-increasing maze of technology. Sandi has dreams for her students, and wants assistance to make them reality.

> And you know the other thing that I think would be really, really neat and I would really like to do it is to get something on to the school web page. (Sandi 1:22 February 25/99)

Overall, the interviews I had with Sandi paint the picture of a teacher struggling with contradictions. She wants to embrace technology and its potential, but is unsure of how to do that. Her apprehensions hold her back and prevent her

from reaching her goals in the use of technology. Although she desires the change, she lacks the energy and skill to implement it.

Last year, I conducted research into the barriers to integrating technology in the classroom. Sandi's comments reconfirmed some of those barriers - time and energy, appropriate inservice, availability of equipment, but above all, the need for teachers to develop their own computer skill level.

Sandi is a teacher with what appears to be strong commitment to doing the best possible job of teaching her students. She is intrigued and excited by the possibilities she sees in technology, yet feels unable to integrate it successfully. It is puzzling, why, after nine years, Sandi still only uses technology minimally with her class.

The main reason for this is her own skill level, which she feels is inadequate. Sandi has a fear of running into problems on the computer, which in a sense paralyzes her and prevents her from moving ahead with new experiences and activities. Having one computer in the classroom was a problem, because dealing with the problems a student might be having on the computer would detract from what she was trying to accomplish with the rest of the class. Having two or three computers just compounded that problem, although her students did have access to keyboarding and word processing software. Venturing into applications beyond those might invite new technical challenges that Sandi was hesitant to take on.

Sandi is intrigued by the possibilities of technology, but needs to see the advantage to her students:

> Zebu [collaborative Internet project software] intrigues me but I would have to become so much better at it ... I have to know when I'm going into that program that it's got to be better for me in the long run than the group work that's happening in my classroom, and the fact that I could maybe photocopy a template and hand it out to kids. At this point in time it would take me so much longer to set it up on the computer. (Sandi 2:2 January/00)

Sandi has experienced numerous inservice sessions over the years, yet feels she has retained very little of what was presented. She can do basic word processing, but even a skill like cutting and pasting is one for which she has difficulty remembering the steps. Sandi is embarrassed by her own lack of skill, and has covered it well over the time that I have known her.

Sandi's competence with the computer has taken second place to other priorities in her life and her career. Sandi leads a full life, with many demands on her time. By her own admission, she could make time to learn on the computer, but she lacks the energy at the end of the day to tackle a task which she finds very demanding. She has maintained an interest over the years, and so has dabbled in the use of technology, but I sense that now she is prepared to turn that interest into a priority, and perhaps that priority will develop into a passion. By making a commitment to a project, Sandi hopes to find the initiative, perhaps motivated by accountability, to take the necessary steps to improve her own skills, and force herself to try some new activities with her students. Her comfort level has increased over the duration of the project, and Sandi will continue to put an effort into this area in the future:

Jo So, your whole comfort level and confidence level has increased.

> Sandi Oh, I would say a hundred percent. I mean, before it was basically just keyboarding and now I'm going beyond that. (Sandi 2:10 January/00)

Sandi's inservice experience offers an insight into possible ways to make sessions for teachers more relevant and useful. Sandi has always enjoyed computer inservice sessions, but has taken away only little bits each time. It is as if technology presents Sandi with a huge puzzle, one for which the solution can only be worked out a few pieces at a time. Then, without the investment of time in practising the new skill, what was gained in the session fades over time, until it is of no use to Sandi:

> I would have liked us to spend more time on one thing, and I would have liked some homework. I would have liked to have been forced to have to do something for next time. I think it would have helped cement it more. And then you still have to keep doing it. (Sandi 2:9 January/00)

What she may need is an ongoing series of small sessions, each one dealing with a small area of technology, which she can then go back and put into practice immediately. By using and practising the new skill, Sandi can develop confidence in its use and application in her classroom. As Sandi said, "But of course, if you don't practise how are you going to get better and faster at it?" (Sandi 2:7 January/00)

Availability of equipment is an issue, but not necessarily a blocking factor. From Sandi's viewpoint, more computers would make it easier to give her students more access, but would also present more problems (and therefore more interruptions!)

In spite of all these barriers, Sandi's imagination has been caught by the tremendous capabilities that technology can offer to her students:

> I do appreciate all the time that you've spent with me and the things I've learned. I really believe in it and I think that the potential ... it's important

> for the kids to have this ability and for them to be thinking technologically. (Sandi 2:12 January/00)

So she feels driven (or perhaps pulled somewhat reluctantly?) by a desire to know more, accomplish more, and integrate technology more effectively in her classroom. Her desire may ultimately result in a change in her teaching practice.

4.6 Suzanne

Suzanne is a teacher who has taught for over 20 years, many of them in the same suburban school where she was teaching during my research. In a settled neighbourhood, this large school has a busy, bustling air about it. Students move purposefully through the hallways and teachers seem relaxed and content.

Suzanne is a friendly, hard-working teacher who is well-liked and respected by her students. She is a highly organized person, a characteristic reflected in her orderly classroom. Suzanne enters easily into conversation, and has an ability to take on a challenging project and get it done.

Suzanne got involved in the use of computers when the first ones arrived in her school system. At that time, there were several Commodore PETs in her school, and she became intrigued with programming in Basic. Suzanne developed drill and practice programs for mathematics facts, vocabulary and spelling words - educational games which allowed teachers to input their own data. These programs were valuable because they could be used immediately in the classroom. Suzanne's only use of the computer at that time was for school purposes, and she devoted hundreds of hours to developing programs her students could use.

With the advent of the Macintosh, Suzanne was faced with a computer that was totally foreign to her. Not only did she have to learn to use a mouse, but she couldn't program it:

> Suzanne I couldn't get in and make it do what I wanted it to do at first, you know.
>
> Jo So that was frustrating?
>
> Suzanne Yeah, at first, but not for very long because it just like ... not when you've (laughing) got a driving compulsion to learn ... I have to be a person who knows all this stuff ... (Suzanne 1:4 March 22/99)

Suzanne made the effort to figure out how to operate the Macintosh computer. Interestingly enough though, Suzanne's efforts at this time were not focused on getting her students to use the computer, but on preparing materials - tests, worksheets, parents' letters, etc:

> Suzanne I got into doing ... at first it was just typing like my tests ... typing worksheets ... putting grades ... when I discovered the joys of Art Roundup you know ... all that kind of stuff ... that was the beginning of doing things with the Macs ...
>
> Jo That was doing things for yourself.
>
> Suzanne To use with the kids but not the kids on the computer ... with me doing them and that was ... that was me learning how to type my tests, to type my worksheets, to make them look good, type notes for parents ... it was pretty well all word processing at that time ... that was what I did ... (Suzanne 1:4-5 March 22/99)

Suzanne now teaches at a large, well-equipped school in a comfortable suburban neighbourhood. When a computer room was established in the school, there was a teacher who taught "computers" and Suzanne's students went regularly to the computer room:

> Once they went to the computer lab ... about the only thing I would say ... because I knew what they could do on the computer ... I would give Rick things for my kids to do ... and it would be something like ... okay ... we're doing a novel study ... could we have them do their vocabulary words ... doing some word processing ... and could have them, you know, work in the computer lab to do something that ... that I was doing in class. And I would say that there were very few teachers doing that. (Suzanne 1:5 March 22/99)

As Suzanne grew in her own skill level, she began to see the possibilities for her students:

> Suzanne I don't think ... the other teachers knew what they could do ... you know ... I don't think they knew the capabilities ... like I would do things ... with the detective ads ... for instance, we were doing our detective unit and the kids would make a big detective ad and so that was graphics thing ...
>
> Jo It's interesting that you needed to know what you could do on the computer before you knew what you wanted to do with the kids.
>
> Suzanne Yes and I thought about that a lot because ... like with Bill with this thing with the database ... he's almost feeling guilty about it and having to justify doing it because it's his own personal stuff ... and I keep telling him ... don't worry about it ... that's what he ... he keeps saying ... why do I think if I learn how to do it on this ... maybe it'll force me to learn it ... then I thought ... that's exactly ... that's what you have to do ... I didn't learn database because I was doing it with my kids ...
>
> Jo Because you thought you wanted to do database with your kids ...
>
> Suzanne Well ... you know ... maybe that's down the road and I'm thinking ... I can't integrate it with the curriculum unless I understand it really well ... and I don't think you really get yourself to really understand something unless you have some reason to do it ... so ... like I would say with the word processing for instance ... like I said I started out by doing writing my test ... writing my worksheets ... and I could see ... oh yeah ... this is really great ... you can set this up this way and that way ... gee ...

> the kids could do that ... you see ... so it's like my own knowledge came first ... when you're working with it for something you really have to do that you feel use out of it, you get good at it ... (Suzanne 1:7 March 22/99)

Suzanne has discovered that while Basic programming is no longer directly applicable in the classrom, for her it created a foundation on which to develop other skills:

> It's sorta like all my knowledge became obsolete ... and nobody cares about how to program in Basic anymore ... although I would say that having done that HyperStudio thing, the HyperLogo - my knowledge of Basic ... helped ... and at least I had reasonable feel for how ... you ... do that. (Suzanne 1:4 March 22/99)

Over the years, Suzanne has developed skills in some areas. For example, she uses databases extensively for her own organization:

> I really got to use database of course ... that was like ... like discovering gold ... (laughing) ... I've been trying to remember how I first got into database ... .I know I did the workshops with you ... and ... and I think about that because that's an interesting thing ... you ... the workshops are really important ... you don't go to the workshop unless you think it sounds like an interesting thing to you ... so you go to the workshop and you say ... yeah ... I'd like to know more about that ... but if you can find a use for it then ... then you learn it. 'Cause just to go to the workshop doesn't do it. Like I think ... a couple of workshops ... now on doing the ... umm ... searchings ... you know ... and using the Internet ... and you see I'm not that good at it ... because I don't use it very much ... and I keep thinking that with my kids too ... that until I get on it and start using it automatically myself I probably won't do it much with the kids ... (Suzanne 1:7 March 22/99)

Use of the Macintosh swung into full gear as Suzanne learned how to use HyperCard:

> HyperCard ... allowed me to be able to create my own thing ... and I could create something there ... and I think ... now this is an interesting one, because I would say with HyperStudio I saw the application ... with the students right away. And I thought about it in terms of - I could make something for them but I also thought that would be a really neat thing ... for them to do. Yeah, right ... off the bat. HyperStudio ... is a little different from the other one because ... like I could see that ... I don't use

> HyperStudio outside of school ... whereas database, word processing and all those ... I use in other ways ... (Suzanne 1:8 March 22/99)

Her interest increased as she learned how to use HyperStudio:

> What really got me into HyperStudio, of course is that project ... I was doing that with ... that multimedia project with the agriculture thing. Part of the thing with the project was the time ... I mean that's one of the big things ... it actually was a gift of time ... even though ... in spite of that (laughing) we spent hundreds of hours ... literally ... doing that ... in fact it seemed like the days when I was programming in Basic ... I'd come out on the weekend and programmed for hours and hours and hours ... (Suzanne 1:8 March 22/99)

But in anything that Suzanne has learned how to do, there had to be some personal relevance before it grabbed her and made her want to carry on:

> Jo You mentioned ... umm ... workshops ... wh ... what other factors would you say were helpful to you over the years in terms of ...
>
> Suzanne Well, workshop development helped me ... but I do know that, that I've been to some of them if I don't carry on and do it afterwards ... I'd have to go back and ... mind you ... it would be like anything else ... you learn ... pick it up ...
>
> Jo So you need some sort of a purpose to carry it on
>
> Suzanne That's right, yeah ... and that ... and this is why I was thinking about the personal purposes, particularly for ... I guess what would you say ... beginning teachers that are ... caught, you know, by the bug ... if you gave them, you know, some real things ... that they could do that would make their lives easier ... I'd do the things basically ... for instance I'd suggest they could go and set up their own personal address book ... you see, they have some reason to do that ... and then you could go from there ... and then they could say ... oh I could do this and I could do that ... (Suzanne 1:9 March 22/99)

Many of the workshop sessions that Suzanne attended as part of the project have not been useful to her because she has not had an opportunity to apply the skills directly in her classroom:

> Jo So what would it take to get you back into those?
>
> Suzanne To get me back into those ... okay ... I think it's a matter of not having the access ... with my kids in my class onto the Internet ... or at least a big proportion of it. It's very difficult for me to get time to where I could actually do anything in the computer room. It's the logistics - it's a physical thing, I think ... I think that's probably the biggest deterrent right there ... (Suzanne 1:10 March 22/99)

Suzanne also expressed frustration with trying to use one computer adequately in the classroom:

> Well, having one computer in your room is very nice. It's better than not having any computer in your room, but it's no good for me. It doesn't do that much for integrating it into the curriculum ... you can have one or two kids that can go back there and work on it. The thing we did with HyperStudio ... worked really well ... and I ended up working kids in at recess and noon hour and after school to be able to work them all into one computer ... but as far as actually doing it in class time ... I felt ... I haven't figured it out how to do that ... I'd like ... that would be a good workshop (laughing) (Suzanne 1:10 March 22/99)

In terms of integrating technology in the classroom, Suzanne feels there is a long way to go:

> I'll just tell you the whole thing with integrating technology ... I don't feel I've done it. I think that the computer should just be a tool ... that the kids just use ... the same as it is in anybody's office ... you know you go to a doctor's office and they just look it up ... they don't think about it as being computering ... they think about it as checking the appointments. And I think that's the way it has to be with the kids. I'm not sure how we do that ... not everybody has a computer ... it's not necessary for everybody to have a computer ... but ... to where they just need to do

> something ... they just go do it ... on the computer. (Suzanne 1:11 March 22/99)

When discussing support, Suzanne feels that inservice and time to work on skill and project development are both important. Having the opportunity to offer sessions has been important to her as well.

> In my case I think the things that I haven't done are just things that I just haven't had the time to do ... so ... you're going to give me more time to do them? ... give me a 30 hour day ... if I think I like it ... I want to do them ... but ... I don't know when to do them ... and ... and I have a feeling I need them at home ... I need an iMac at home (laughing) (Suzanne 1:14 March 22/99)

Suzanne already had skills in technology when she entered the project. When she worked on the HyperStudio projects with her students, she saw her role as the transmitter of knowledge, so her students learned what she taught them. In looking back, Suzanne now recognizes that the process of inquiry and discovery is important in developing independent learners:

> Suzanne As I reflect on what happened with my kids and HyperStudio ... you know ... it's almost like I did it the way ... you sit down ... here's what you do ... everybody do it ... and show them how to do it ... and we make a project of this ... you know And so some of them got really enthusiastic and they went through and they got all kinds of neat things, but a lot of them didn't ... and I think if I hadn't done that ... I'm really learning that it's the discovering, inquiring ...
>
> Jo It's the whole process
>
> Suzanne ... it's slower ... like it doesn't happen right away ... you don't see the results as quickly as you do with direct instruction thing ... but as you say ... it's relevant to them and so therefore ... they ...
>
> Jo ... they're controlling their learning ...

Suzanne Yes...exactly ... so ... the same thing should be true of teachers ... shouldn't it?

Jo Exactly!
(Suzanne 2:2 June 26/99)

Carrying this type of thinking into the professional development of teachers, Suzanne feels it is important to provide a skill base but that teachers need the opportunity to develop skills which are relevant to their classroom work. In one of her journal entries, Suzanne reflects on an experience that was very helpful for her, because she could apply it immediately.

> PD Friday, and it really was professional development for me!!! After pancake breakfast, Jo came down to my room and gave me a private lesson on Netscape Communicator. Just what I needed!!!! I think I'm actually starting to understand how all this works. Now I know that the only way I'll ever really get it is to actually DO it, which I will for my project. I've finally decided that I'm going to create a web page or even a site on Canadian government. (Suzanne's Journal:3 June 4/99)

Over the course of the project, Suzanne feels that both her capacity to integrate technology and the actual integration of it in her classroom have increased. Her goal for the next school year is to challenge her students to figure out how to do things on the computer, and to work with them as they learn together.

Suzanne feels frustration with her inability to make the best use of the technology she does have in her classroom.

> I'm at the point right now ... where I'm actually angry at myself ... because I hear people say this ... and I say ... oh wouldn't that be neat to do that ... and here sits my computer back here and the kids are not on it ... it's terrible ... My thoughts about technology ... hmmm ... At the moment I have really mixed thoughts. It's one of my favourite things, and I really believe in integrating technology into education. BUT (and it's a big

> but), I know I'm not doing it the way it should be done. I have one computer at the back of my classroom, and my students almost never use it. Sometimes they look for news from the Leader Post, but that's only if they forgot to bring it from home. Very occasionally, we look something up, or we send an email to (my son) to ask him a science question, but it's not part of their regular classroom routine. (Suzanne's Journal:1 April/99)

I think that in the course of the previous six months, Suzanne has had a chance to reflect on what she and other teachers are doing with technology. While the inservice was helpful, I think the series of group discussions were very beneficial for Suzanne - she had a chance to think about what she was doing and what was possible with her students. In retrospect, she indicated that she wants to try to become less of an "instructor" and more of a facilitator. She has had a chance to set goals for herself this fall - to move away from the directed instruction and more towards student-directed learning. This points out the importance of having support time with colleagues to discuss current practices.

4.7 Summary

These were the five teachers who participated in my research, and the stories that reflect their experiences. Although the teachers were each unique, and the situations and experiences quite different, there were elements common to the stories. In the next chapter, I will draw out the themes that emerged from the data and examine the relationship between the themes and these teachers' integration of technology in their classrooms.

CHAPTER FIVE – ANALYZING THE DATA

5.1 Introduction

When I began to analyze the data, I recognized the themes that emerged and decided to organize my analysis around those themes. As I realized the extent of some of the changes which took place, I decided it was necessary to go beyond those themes and look closely at the larger implications. Through Fullan's work on the components of change, I explored the area of teaching style and pedagogic beliefs, an area that had been of only passing interest to me at the beginning of the study. The other significant area of analysis was in terms of the community of learners approach. Both in the teachers' classrooms, and in the project group, developing a community of learners had a positive impact on the teaching and learning that took place. I then proceeded to examine the four major factors which had emerged as themes in the data.

5.2 Teaching Style and Pedagogic Beliefs

Fullan (1991) claims that there are at least three components of change which occur even in simple classroom innovations – new materials, new teaching approaches, and the possible alteration of beliefs. In my research project, change occurred in all three areas. Teachers worked with new software, the Internet, and new hardware such as the digital camera and scanner. They explored new teaching approaches as they integrated various new technology materials into curriculum areas. In some cases, a dramatic change in teaching style took place.

The change in teaching style was a surprise to me, but it affected three of the five teachers in my study. This development may be an indication of a change in pedagogic

beliefs, which as Fullan (1991) outlined are those assumptions and theories upon which teachers base their teaching practices. The most significant change occurred for Jenna. When the project began, Jenna had a directed style of teaching, with emphasis placed on the product and everything planned in advance. With some students working in the computer centre, Jenna began developing activities and group projects in other subject areas, which students worked on independently. Within a few months, she observed that her teaching style had changed from an "instructor" to a facilitator and co-learner. Jenna developed a non-directive environment, with an openness to what students would "uncover". She even involved students in curriculum development, as they discussed things such as what questions they needed to answer about other countries.

As there was not a computer room in her school, Jenna set up a group of six computers in her classroom to provide her students with access to technology. Having the computers right in the classroom provided a resource which was always available to the students. In order to use the technology as a tool, the tool had to be present in the classroom. Jenna changed the organizational style of her classroom, allowing students to move freely to the computers when needed in their work.

When faced with thirty students and only five or six computers, Jenna realized that she could not "teach" the class in a traditional manner, because there were always students working on the computers who would miss what was being taught. So she shifted to a more project-centred, cooperative group model of organization which gave the students more responsibility for their own learning. Because she was not always available to help in the computer centre, Jenna also encouraged the development of student experts,

who would learn a certain procedure, then share their knowledge with others in the class. No longer was the teacher the expert, but both teacher and students moved in and out of the expert role, a role that recognized expertise in a certain area when it was needed. Admitting her own lack of skills in technology, Jenna found herself and her students in reciprocal teaching roles at times, a development highlighted by the incident in which a student "expert" asked Jenna to help another student, because he was having trouble managing them all. Taking the role of an expert resulted in a tremendous increase in a student's self-esteem. In her work with other teachers this year, Jenna has asked teachers to choose students to train as experts, and has made a point of asking for those students who may not have many skills, but need a boost in self esteem.

The results in Jenna's classroom were a clear indication that technology was integrated in the fabric of daily classroom activities. But even more than that, Jenna's students developed independent learning skills and became more engaged in their learning activities. Jenna's classroom practice changed dramatically during my research. She changed the physical arrangement of her classroom, her organizational style in terms of student activities, and her own role in the classroom. While integrating the use of technology, Jenna reflected on other areas of her practice and made changes that supported a student-centred approach to learning. These are strong indications that changes may have taken place in Jenna's pedagogic beliefs, the assumptions and theories that form the framework for her teaching practice. The support that Jenna received during the project helped make these changes possible. This kind of support may make changes like this possible for other teachers as well.

Suzanne, in looking back, expressed recognition that the process of inquiry and discovery is important in developing independent learners. She had set herself a goal to challenge her students to explore the technology, and to work with them as they learn together in a "mutual mentoring" situation. Suzanne was frustrated by having only one computer in her classroom, and limited access to the school's computer room. She felt that she needed to create a computer corner to integrate technology effectively, so she has worked on creating one this year. Even for a teacher who had a strong computer background, there were important changes taking place in her approach to teaching and learning. Suzanne changed the organization within her classroom and the structure of her learning environment. These organizational changes may reflect a change in her assumptions and theories about her teaching practice, which in turn indicates that the project may have influenced her pedagogic beliefs.

Allison, who also had a strong computer background prior to the study, developed a new perspective on integrating technology. After reflection, Allison realized that she used to see technology as something her students used for a special project. Now the use of technology in all subject areas is a natural part of her teaching approach. This new perspective on the integration of technology may reflect some change in Allison's pedagogic beliefs, as her assumptions about the role of technology in the classroom seem to have changed.

5.3 Community of Learners

What Jenna developed in her classroom, without even realizing it, was a community of learners, where roles shifted as teacher and students learned together

(Rogoff, 1994). Somekh and Davis (1997) referred to the use of technology allowing a change in the teacher's role. These authors indicated that as students develop more autonomy in their learning, teachers gain the freedom to become enablers in terms of providing learning experiences, rather than being the source of all knowledge. The teacher can be involved in learning with the students, and at times, students shift into the role of expert.

Participation in the CyberChallenge group was, in part, a community of learners experience for the teachers who were involved. Teachers worked with each other to help and solve problems, much as students in a class work together. This assistance occurred in the training sessions but was especially effective at the school level, when more than one teacher was involved in the project. Providing this community of learners experience for teachers learning to integrate technology may provide them with a place to learn and grow, where they feel supported and encouraged by other teachers. Hedney (1998) supported the idea of teachers needing opportunities to work with their colleagues in peer learning situations.

5.4 Important Factors

All five teachers benefited from the project, whether in skills, new teaching approaches, or altered pedagogical style, which may be indicative of a change in beliefs. Scrimshaw (1997) argued that technology was a tool that could enable teachers to explore their own practice and try out new approaches to teaching and learning. The experiences of Jenna, Allison and Suzanne are consistent with Scrimshaw's view. If changes like these

were possible for teachers in this study, then providing similar experiences may help other teachers to experience similar success.

What helped these changes to occur? Four factors emerged as important from my study - support, inservice, attitude and time. In this section, I will show the important role played by each of these factors.

Fullan (1991) talks about the importance of skill-training workshops, but also the need to build supportive relationships and have opportunities to give and receive help, discussing the changes that are occurring. In terms of technology integration in my study, this need for supportive relationships appears to hold true. The most important factor for all five teachers was support, in all of its various forms such as personal contact, classroom visits, telephone calls, and email. Without support, some of these teachers would have given up on the project.

The inservice sessions, which provided instruction on the use of various software programs and pieces of equipment, also proved very helpful, although the level of the teacher's pre-existing skill seemed to determine the amount of value they received from the sessions. This result supports the opinions of the President's Committee of Advisors on Science and Technology, Panel on Educational Technology (1997), when they claimed that teachers need "in-depth, sustained assistance" (p. 15) in the areas of both technical and pedagogic support.

Time emerged as another important factor. Teachers tend to lead extremely busy lives, so being given separated blocks of time to learn about technology allowed them to focus their energy on that learning. It is also important to note that this time was out of

the classroom, not time spent after school or in the evenings. These inservice days provided an opportunity to set aside other tasks and concerns and spend time learning to use the technology.

The fourth major characteristic of the changes that occurred in the participants during the period of my research was attitude. Harris (1998) talks about a change in perspective coming "as a result of conscious, self-initiated, and willing decision by each practitioner" (p. 18). Each teacher in my study had already decided to take the risk of trying something new. The project provided them with the knowledge and support necessary to carry it out. These teachers may approach change with the willingness to take risks, so that may have played a role in their success. Other teachers, who are not willing to take similar risks, may not experience the same degree of success when faced with implementation of a change. The teachers in this study recognized their own positive attitude toward risk and change, and suggested that having such a positive attitude may have contributed to their own success in integrating technology throughout this project (Focus 1:17-18 April 13/99).

The four factors I've just described – support, inservice, attitude and time – played a major role in the success of these teachers in integrating technology in the classroom.

5.5 Support

Support is a key ingredient for success in the effort to help teachers integrate technology in the classroom. In my research all five teachers identified support as

essential, although for different reasons. I realized that I needed to recognize the various needs of the teachers and choose the most appropriate methods for delivering support.

Many forms of support were provided throughout the project. The teachers appreciated my assistance as they learned new skills and acquired the information they needed to use new procedures. Sometimes the teachers needed technical help as they organized the technology in their classrooms, while at other times, they needed quick answers to questions in order to move ahead. I played the role of a sounding board as teachers reflected on their experiences, and I offered emotional support when they were frustrated by their efforts. In some situations, I helped in the classroom as a co-teacher, providing students with step-by-step instructions, being available to answer questions as they arose, and generally modelling how to deal with difficulties that students might experience.

Suzanne and Allison came into the project with a strong background as computer users themselves, so they had most of the necessary technical skills. Allison requested support, specifically from the consultant, to provide an extension to what she already knew - providing direction in trying things with the computer that she hadn't attempted before – such as downloading sound files from the Internet and inserting them in a HyperStudio stack. She also wanted to have access to information. She could telephone or email and receive the assistance she needed quickly. Having access to the consultant also helped her to broaden her outlook and to explore new possibilities because she could discuss her situation with someone who had a broader range of experience. After a visit to Allison's school, I reflected on this in my journal.

> We went into the lab and talked about various possibilities for arrangements. She mentioned something about having trouble with the kids' disks, so I suggested the possibility of installing a MacJanet server so the kids could save directly to the server. So, I think they're going to look at that possibility. Allison commented that that's the value of having someone like me (a consultant), because they are so focussed on what they are doing, that they need someone with a broader perspective to make suggestions, and tell them about other possibilities. (Personal Journal March 3)

Suzanne found the support of the consultant and the project group helpful in giving her an opportunity to reflect on her approach to technology in the classroom. Discussing and examining the way she developed the project with her students, then comparing that with the experience of other teachers in the project, gave her new insight into ways that she might try to integrate technology more effectively.

Jayne needed the active involvement of someone who could work with her and her students in the classroom, to provide direction and encouragement in the development of the project, more than just the availability of a consultant who could provide advice and suggestions. Jayne also had a strong background in the use of technology, so she needed support in specific skill areas, such as developing web pages, which she had not done before.

This active involvement was also a key element for both Sandi and Jenna. Sandi needed regular onsite contact with the consultant, moving step-by-step through a series of activities, such as the instruction and assessment of writing skills using a word processor.

Jenna's need was not for step-by-step guidance, but rather, ongoing classroom visits to "fill in the gaps" in what she was able to do with her students. Sometimes the assistance involved solution of technical problems. At other times Jenna and her students

needed answers that would extend their skills, with the same type of assistance that Allison and Jayne appreciated. These answers were to questions like "How do you ... ?" which emerged from the context of the activities in which the students were involved. Jenna and her class also found the quick access via email to be very helpful. They might be stuck on a certain procedure which a quick question and a simple reply could clear up, enabling the students to continue.

> I needed someone to come in and kind of offer the ... not just the technical ... but show me - model to me - how will I ... how should I be teaching these Internet searches? How should I start off with the HyperStudio? Just give me just a little bit of guidelines ... working with the students ... like not just with me. I think that's the key too, to have some of those students - like the little expert group - that could help me, because they became my support group when you weren't there. They were able ... to help out. (Jenna 2:26 June 18/99)

The support Jenna received was, in fact, crucial, as she would have given up without the help that she received. In a subsequent (second) year of this project, Jenna was involved in providing support for teachers. In several cases, a teacher was frustrated and ready to give up, but Jenna and I were able to recognize the signs – frustration, wanting to change their plans or quit, missing workshops – and step in to provide needed support. Jenna was eminently qualified for this role, as she could easily relate to the feelings of those teachers. Understanding the importance of support helped us to meet the needs of teachers when they were becoming frustrated. This learning has been a direct benefit of my research. The President's Committee of Advisors on Science and Technology, Panel on Educational Technology indicated the need for teachers to have "indepth sustained

assistance" (p. 15) and my research supports this idea. When the assistance is not sustained, teachers may become easily frustrated.

It is important to recognize that support comes from many different sources. It may be from the consultant, other teachers, administrators, or technicians. All of these persons may play an important role, depending on the situation and the needs of the teacher. The role of the consultant was a strong factor for these five teachers, largely because I, as the consultant, developed the group and the project. I established contact with these teachers and intentionally provided opportunities to offer support. In terms of providing advice and assistance for teachers within their classroom, as the consultant, I played a very crucial role. This support consisted of classroom visits, telephone and email contact, as well as casual discussions during inservice sessions. Knowing there was someone to turn to for help provided a level of comfort for teachers. For technical problems, the teachers knew they could contact capable technicians who would respond by email or in person to help solve problems.

Sometimes support is perceived in surprising ways. Allison indicated her amazement the day we were putting national anthems in HyperStudio stacks. With a wide range of computers in the computer room, we ran into one obstacle after another, yet I was able to model the steps to take to overcome these obstacles. Not only was Allison encouraged by the fact that I, too, ran into technical problems with computers, but it was important for her to see a technology leader face and overcome obstacles, giving her confidence that she, too, could have this success.

The teacher group itself played an important part in supporting each other, as the teachers felt they were part of something bigger than their own classroom - they could work and interact with other teachers who had similar interests and objectives, share ideas and learn from each other. Fullan (1991) talked about the importance of peer interaction when learning to do something new. It is important to involve teachers in groups as they learn to integrate technology. Providing this opportunity gives teachers a supportive collegial structure within which they feel comfortable in discussing the changes they are implementing.

"Learning from each other" extended into the school situation as well. Allison and Suzanne were both in schools where another teacher was involved in the project. This situation gave them a chance, almost on a daily basis, to check things out, to get help in remembering how to do something, to ask advice, to be encouraged by the interest of another teacher. Allison spoke of the importance of internal support at the school.

> ... had all that internal support, so the teachers always knew if something went wrong or they tried something and it didn't work ... they knew that they didn't have to ... get hold of Jo ... or try and get whatever. There was somebody in the school. (Focus 2:20 May 4/99)

It was helpful when another teacher in the school was involved in the project and shared the same kind of experiences. Teachers felt more willing to try new things when they had someone else to work with. Jenna referred to this need as well, wishing that she had a "buddy" in her own school with whom she could work on the project. This would suggest that not only would teachers benefit from group involvement as they learn to

integrate technology, but it would be most helpful if some of those group members are teachers in the same school.

Another important source of support is that of the school administrators. In this study, the principal often played the role of enabler by acquiring equipment and software, scheduling the use of resources and resource people, arranging for outside assistance when it was needed - as well as providing ongoing encouragement for the teacher who was willing to risk and try something new. If Jenna's principal had not helped with the purchase of software and upgrading of machines, the computer centre in Jenna's room may never have become a reality. Allison also pointed out the key role her principal played in ensuring that the hardware and software resources most needed by teachers were available to them.

> Teachers need things that are easy to access. Teachers who aren't into computer technology will not - unless they are really encouraged - they will not follow through. (Focus 2:34 May 4/99)

Teachers who are trying to become more effective in integrating technology in their classrooms need a supportive environment in which to develop. As Jenna pointed out, teachers excited about the possibilities for technology may give up if they don't feel supported.

> You have to get the teachers pumped ... through whatever professional development ways that you can, whether it's BlueBook, or CyberChallenge or going out to a school that's interested in showing them what to do with that they've got. Once you get them hooked, you put them back into the classroom ... and they are so excited. That's the way I was ... I was so excited ... I'm gonna do this ... and then ... it's like ... I forget how to do this ... and that ... and oh this computer doesn't have enough memory ... this one's not ... so it was ... there was roadblocks right away. Very important ... for you to ... to answer the e-mails when they're in distress ... but just, you have to be accessible ... you have to be

> able to go out to the school. But you're going to see the ones that will shut down if they have roadblocks, just like kids will. I mean when it's really ... if something's too difficult or too frustrating you're not going to stick with that. So, you have to get them over the hump and keep them excited, so that they can see the possibilities. (Jenna 2:26 June 18/99)

With all the pieces in place - onsite encouragement and assistance from the principal and other teachers, the availability of specialized help in the form of technical support and consultant classroom visits, being part of a "support group" of like-minded teachers - there is the best possible chance of success.

In this research, teachers repeatedly indicated the crucial importance of support when they were trying to integrate technology in the classroom. Support is the single most important factor. While the availability and configuration of computers makes an impact, the approach of the teacher makes the greatest difference. To develop effective approaches to integrating technology, teachers require the support of a specialist who can share ideas, discuss plans, supply help - both technical and educational, as well as emotional support and enthusiasm to encourage the teacher who is stepping out and risking. One teacher involved in the project said:

> My own computer skills have grown tremendously and I have been able to watch my students grow in leaps and bounds and produce wonderful curriculum-based projects. I am living proof that teacher training and support make the difference! (Personal Journal June 1/99)

In terms of my initial question, it is quite clear that the most important practice of a consultant is to provide both technical and pedagogical support to teachers who are learning to integrate technology. A process of inservice and ongoing support is essential in order to sustain the involvement of teachers and to ensure their success. Ongoing support

involves regular and prompt contact by email, as well as weekly or biweekly school visits for a variety of purposes. In terms of support, I, as the consultant, need to be open to doing whatever is needed - but making the contact or connection intentionally, because the teacher will not necessarily do that. What made a difference was being there, being available, being willing to fill in the gaps in the process for the teacher - whether it was equipment and troubleshooting, assistance with the program, answering questions, or working with kids.

As the President's Committee of Advisors on Science and Technology, Panel on Educational Technology (1997) indicates:

> Most teachers, however, cannot use computers effectively unless someone is available to help not only with the technical problems that are likely to arise from time to time, but also with the deeper pedagogic challenges of choosing software, organizing projects that make use of technology, and learning how to guide students in the use of computer-based resources. (p. 15)

That kind of support requires a lot of involvement in the classroom, and a lot more relationship building. I have always believed that building relationships was essential to help teachers move ahead. The teachers' responses confirm this view. I realize now the large amount of energy that would be required to provide that support for a large number of teachers. To provide this level of support requires the involvement of a team of competent teachers, who have the understanding of the big picture of technology integration, have a strong background of classroom experience, understand the way integrating technology affects a teacher's style of teaching, have relationship skills, and the technical skills to help where needed.

The President's Committee of Advisors on Science and Technology, Panel on Educational Technology (1997) refers to a Kentucky school system as one model of teacher support:

> The 153 schools in Jefferson County, Kentucky, for example, are served by a Computer Education Support Unit staffed by 22 professionals who maintain a technical support hotline and work directly with teachers to encourage and improve the use of technology in the classroom. (p. 15)

The school division I work for has 57 schools. (Regina Public Schools, 2000) This would suggest that our system should have seven or eight teachers performing these important support roles. The first reaction to this type of suggestion might be that we can not afford it. But can we afford not to do it? With the educational gains that can be realized by integrating technology in the classroom, it is imperative that we take steps to adequately support the implementation of teaching with technology.

5.6 Inservice

The inservice provided as part of this project was seen as valuable by all of the participants, but there were different perspectives on the timing of the inservice. There were three days of inservice at the beginning of the project, one week apart. During this time, we worked with numerous software programs, Internet applications and peripheral equipment. There were also two additional halfdays during the project that provided some additional inservice and time to work on the projects.

For experienced computer users like Suzanne, Allison and Jayne, the three days at the beginning were excellent because not all of the software was new, so they had a chance

to refresh their memories and build on prior knowledge. Then, armed with all these tools, they were prepared to tackle the challenges of their projects.

For Jenna and Sandi, the three days were quite overwhelming. For both, the first day was quite enjoyable - stretching their abilities and challenging them to get involved in using the technology with their students. The next two days, while interesting, served to overburden them with a need for skill development that they felt unable to ever accomplish. As Jenna said:

> I couldn't believe how much I had forgotten in a month - I thought, I'm not that old that I can't retain anything, but that's how I felt ... (Focus 1:33 April 13/99)

The rationale for providing the inservice in this way was to expose the teachers to an array of possibilities, then give them the opportunity to choose the particular software and activities they wished to pursue in their classrooms. While this was an effective approach for more capable computer users, for those who have beginner computer skills, it was too much, too fast. So while skill development is important, and all teachers agreed that they needed to develop their own skills before they felt competent in introducing computer use to their students, different approaches needed to be applied depending on the needs of the particular teacher.

In a number of discussions, the teachers talked about the fact that the inservice has to be connected with practical applications in the classroom, so that teachers are committed to going back and using the technology. They had attended inservice sessions in the past, but then hadn't used what they learned with their students. In this study, the teachers felt it made a big difference to have to go back and apply what they had learned

to a class project. Allison summed it up, saying, "But with involvement, with involving the kids, with making a project, working with your class time, you are going to make more effort and you're going to work with it" (Focus 1:33-34 April 13/99). This points out the need to link teacher training with practical classroom applications.

Some teachers have to become comfortable with the technology for their own purposes before they are able to make the extension to use the same technology with their students. Suzanne pointed out:

> You have to see a need for it. And even at the school, when I've been working with other people personally, they'll see a need to say, set up their own um, address file, or something like that, and I figure well at least they're learning how to do it but the next step is to take it to figure out what to do with it in the classroom. (Focus 1:34 April 13/99)

Jenna agreed, indicating that it was important to learn by doing, seeing the relevance for what was being learned. She also made the connection to student learning, that students need to learn to use technology in the context of real projects as well. These comments show the need for teachers to be able to learn computer skills in a meaningful context, but also to have the pedagogical skill to integrate those computer skills in a meaningful way in student learning.

This need for relevance leads to another aspect of inservice that became clear. Inservice needs to be grounded in the curriculum in order for teachers to see its relevance. This is a key idea. Teachers can learn skills which they can use for their own purposes, but teachers may never involve their students in activities using those skills if they do not see the connection to curricular goals. Jenna commented on the difference between teaching computer skills and using technology to teach the curricula.

> If you can get people enthusiastic this ... will just go like wildfire. We have to get the teachers to see ... how this can help them do their job ... like how this can help them teach the curriculum ... not something extra. And for so long it's like ... oh yeah ... well, now we have to teach computers. (Focus 1:32 April 13/99)

Inservice needs to address not just the computer skills, but teaching strategies. Teachers need to understand how to integrate the use of technology when they go back to their classrooms. In my research, this pedagogical understanding emerged as a key area that needs to be addressed in professional development. This supports Hancock's (1997) description of an information age school, where the use of technology supports a "project-focused, research-based curriculum, integrating subject areas with information resources" (p. 62).

It is interesting to note that, in the year following the project, the teachers who participated in my study learned to use new software much more easily and quickly than they had during the original project. One commented on the fact that the software was easier to use, but in fact, the software used during the project and the software used in the subsequent year were programs with a similar degree of complexity. The skills they had struggled to master during the project became the foundation for further learning. This suggests that a spiral approach to skill development may be most effective. Teachers need an opportunity to revisit and build on prior learning in order to develop their skills. Continuity of inservice will be an important component of professional development opportunities I design in the future.

5.7 Attitude

Another common thread running through the experiences of these five teachers is their attitude. All five expressed self-awareness that they have always been interested in trying new things. Throughout the discussions, this group of teachers kept referring to their own openness to change, looking for new ideas, and willingness to take risks.

> Suzanne I think, gee, that sounds neat, I think I'll try that. And it tends to be a certain type of person that's always wanting to look at something new.
>
> Jenna So most teachers should be the risktakers, wanting to learn something new.
>
> Suzanne You said that most teachers should be but I don't think most teachers are. When you, you look at the resistance to change ...
>
> Sandi Yeah, that's true. And it's so amazing - you, you're in your own room and you think that everybody thinks the way you do. (Focus 1:18 April 13/99)

This positive attitude was responsible for getting them involved in the project in the beginning, and allowed them to try out new approaches in their classrooms in an effort to improve their teaching practice. Suzanne talked about a willingness to "jump in and try things" (Focus 1:17-18 April 13/99) which was common to the teachers in this study. These teachers indicated that they had an interest, so they made time to learn and get involved, while other teachers may use lack of time as an excuse not to get involved.

All five teachers admitted that they have always been interested in trying new things. But as well as being interested in technology, Sandi admitted to feeling a sense of guilt and responsibility for getting her students involved with technology.

> Sandi I don't know it and I think it's important for the kids in my class to be going somewhere on computers and I don't feel, um, that I've done enough ... you know, uh, over the years to, to really justify the number of years that I've had a computer in my classroom - I don't think that I've done enough, so this was a real push
>
> Suzanne But there's a difference here, in the fact that you, when you recognize that you don't have that, you wanted to do something about it and you jumped into this kind of program saying, oh, I really want to get at it. Whereas another teacher would say, naw, I don't know about that and I don't care about that and I don't need it and you're not gonna get me to do it. (Focus 1:23 April 13/99)

The other teachers in the group encouraged Sandi to recognize that she was at least willing to rise to the challenge, while other teachers (who didn't volunteer to be involved in the project) might also feel guilty but turn away. Reducing guilt is likely a motivation for some teachers to get involved with technology, but the question remains as to whether it will carry them through as they learn to integrate technology, or whether an interest in technology has to develop to keep them going.

When reflecting on other teachers in the field, some participants expressed opinions that some of their colleagues may finally reach the point where they find it necessary to just jump in and use technology with their students. These teachers begin to realize that technology is an important part of life today and that they need to explore technology with their students. Access to their own personal computers may have contributed to this awareness. As Allison said,

> There are more and more teachers are now getting computers at home and they're seeing how useful they are and how much time they're spending on them at home, so ... that carries over ... (Focus 2:36 May 4/99)

There was also agreement among the teachers that a current payroll purchase plan offered by our school division has had an impact on the number of teachers with computers at home, and the resulting interest in using technology. This interest indicates that this type of policy is helpful to encourage teachers to use computers in the classroom and supports Hedney's (1998) assertion that "it is unrealistic to expect teachers to become competent users unless they have computers to use during their personal time" (p. 15).

The teachers involved in this study have an expressed interest in technology, which they credit in part to their own attitude towards change. They welcome new ideas and embrace change as a useful ally in their quest to be more effective teachers. This attitude seemed to play an integral role in their success with learning and applying technology in their classrooms.

5.8 Time

In the busy life of a teacher, time is a precious commodity. With more and more demands placed on them from students, administrators and parents, teachers are finding it increasingly difficult to do everything they feel should be done. The five teachers in this study found this to be true in their own experience, and often what gets left out is taking the time to explore and develop new teaching activities. As Suzanne pointed out:

> And there are some people who simply don't (want to try something new). And those people never can find the time. (Focus 1:18 April 13/99)

This project provided some time, albeit a limited amount, where teachers could work with technology, become more comfortable and proficient with it, try out new ideas, and then take steps to implement the new ideas in their classrooms. Having time to

work with new technology – time to learn, practise and explore - was important to these teachers. As Jenna indicated, "you hear that comment, those words used a lot in there - okay, all I need is just some time to play with this" (Focus 1:14 April 13/99).

Because the project was clearly defined in terms of its expectations within a specific time frame, the participants felt responsibility for project completion. So in terms of "finding the time" this project became a priority and they allocated more time in order to be successful with their project. They also felt that because they had an interest in technology, it was easier to make that time commitment.

> Jenna We're not just here at an inservice though - we're in a project that there is an expectation.
>
> Sandi That's right.
>
> Suzanne And that's why you said that you need some accountability.
>
> Jenna That's why we're still here. Because of the expectations. I probably would have packed it in after the second time, just because I felt overwhelmed. I felt that I wasn't good enough - didn't know enough - in the group. (Focus 1:31 April 13/99)

Yet Jenna remained involved in the project, and spent the necessary time because she had made a commitment.

> Well I knew I had to do something because I couldn't get out of this CyberChallenge. I had to do something, because I have to finish these projects ... I've committed myself. So, the commitment was a real key for me - if I hadn't had the project I would not have learned as much as I did. (Jenna 2:41 June 18/99)

This sense of responsibility has important implications for future projects. If teachers make a commitment to a longterm project with defined expectations, they may be more likely to find the time necessary to work with the technology.

This project provided time for teachers to learn and think in the company of other teachers. This was a valuable part of the experience. Time is often a factor for teachers; in fact, many teachers use lack of time as an excuse not to get involved with technology. Others, like Sandi, simply do not find the time even though the interest is there. Sandi expressed a need to be pushed into doing things that otherwise she would put on the side. Yet some teachers are willing to make the time for something they believe should be a priority. Time spent in inservice sessions and group discussions, coupled with time for individual practice can help teachers experience success with technology.

One of Stephen Covey's (1989) principles for effective living is "First things first." This principle means that the priorities in terms of our commitment of time and energy should accurately reflect those things in life that we value most. We need to use the hours that we have wisely. When teachers are passionate about a topic or a project, they manage their time around the project, giving it high priority. If teachers have the passion for technology that will allow them to let other things go, their desires can be realized.

5.9 Implications for Further Research

By looking into the experience of five teachers, I have been able to identify the relationship between training, support, and the teachers' capacity to change their teaching practice so that they can integrate technology with the curriculum. At the same time, I believe I have uncovered a number of questions that may lead to more effective technology integration.

5.9.1 Inservice. Inservice emerged as an important factor in my research, but the inservice needs to be ongoing in nature. How can inservice for teachers be structured so as to be practical and of lasting value? How can a school system provide the kind of time and instruction necessary to help teachers develop their own computer skill levels, as well as techniques for using technology with students? Is it possible for teachers who began teaching before the invention of personal computers to become competent enough to use the computer as an effective tool across the curriculum?

5.9.2 Resources. In terms of resources, we need to consider human resources as well as financial resources. How can a school system enable teachers, with all the demands on their time and energy, to gain competence in an area which itself demands a great deal of time and energy? How can a school system with limited resources supply enough computer equipment to allow all students equitable and adequate access? The location of the equipment in a school raises interesting questions as well. Is there a relationship between the configuration of computers in a school and success in technology integration?

5.9.4 Pedagogic beliefs. Looking beyond the skills and abilities involved in learning to integrate technology, there seems to be a link between true integration of technology and teaching style. This connection would provide a rich field of research, as researchers try to understand the role technology can play as a catalyst in transforming the teaching and learning environment. Further study is necessary to explore the connection between technology integration in the classroom, and the possible change in a teacher's pedagogic beliefs. In what ways does technology integration help teachers to reflect on their

assumptions and theories about teaching? Is the development of a community of learners a natural consequence of fully integrating technology in the classroom? Technology may provide the vehicle for changing the classroom learning environment, by helping teachers to explore their pedagogic beliefs. There are many exciting possibilities for further study in this area.

5.10 Conclusion

What has become clear to me throughout this study is that the work of a consultant in helping teachers to integrate technology effectively in their classrooms is very much like the work of a good teacher. It is important to be a facilitator, trying to provide the right components to make a teacher's learning experience and change effort successful. The consultant must model behaviours and techniques when working with teachers, which can be learned by teachers and implemented in their own classrooms.

We know that there are factors that influence the learning that takes place in our classrooms. In the same way, there are factors which influence the capacity of teachers to integrate technology and effect change in their own teaching practice. Just as every student is an individual, so is every teacher, and each requires different kinds of assistance in order to become an independent learner in the area of technology, able to connect the use of technology with the curriculum and integrate it in their students' learning experiences.

There appears to be something about a specific teacher's approach to life and work that draws them to be involved with technology - some risk taking and welcoming change. I think it comes down to how they approach and deal with change.

In this study, I believe that all three areas identified by Fullan as components of change were addressed – new teaching materials, new teaching approaches and alteration of beliefs. Teachers were exposed to new software programs and new pieces of technology, developing the necessary skills to use them effectively. While not the intent of the project, teachers also tried some new teaching approaches. Jenna, in particular, changed her overall teaching approach from directed instruction to a student-centred, independent learning model. During the group discussions, I think all of the teachers had a chance to reflect on their own pedagogic beliefs about teaching and learning, and to examine them in light of the experiences of all teachers in the group. As Allison told me, her definition of integrating technology has changed, and that has had an impact on her classroom.

Fullan (1991) also talks about the "primacy of personal contact" - the necessity of one-on-one and group opportunities for teachers to give and receive help. The importance of contact was evident in my study as well - the need for support came out as the most important single factor involved in the integration of technology in the classroom.

Support needs to be available in a number of ways. Teachers need access to help from an expert like the consultant. This help would include onsite visits with the teacher and/or students, as well as being available for consultation by email or phone. In-school support from colleagues is helpful to teachers as well as support from the school administrators in terms of getting equipment and software, scheduling and making arrangements. Technical support is always needed, whether it be from the school

division's technical services department, or a help desk. Belonging to a group of teachers who can offer mutual support is also a key ingredient to success for teachers learning to integrate technology.

Technology has such an impact on teaching and learning that we need to put resources into training and support of teachers. We need to develop new avenues for support, because helping teachers learn to integrate technology is a very important task. Ensuring that the resources are in place to make the change is an important form of support. Resources in this case include both hardware and software, but also the pedagogical assistance to make the project work in the classroom. Support emerged as a critical factor for teachers - and was definitely a key to reducing the frustration that teachers experienced.

All of the teachers in the study agreed on the importance of the inservice sessions. The learning of skills was an integral component of the project's success. For some teachers, more individualized instruction was necessary to help them develop these skills. In order to reduce the anxiety level of teachers, it is important to structure skill sessions to meet their needs.

As a result of my research, I have developed some new directions for my work with teachers. My own pedagogic beliefs have been altered as I have worked with the teachers in this project. I realize the importance of providing appropriate ongoing inservice and consistent support, and I have seen firsthand the dramatic effects that technology integration can have in the classroom. The challenge facing those who promote the use of technology in education is to understand and meet the needs of teachers, and to

continue to offer new avenues of exploration and development to excite and inspire teachers to reach beyond themselves, in order to embrace the wonderful potential that technology offers in the classroom.

REFERENCES

Anderson, Stephen E. (1997). Understanding Teacher Change: Revisiting the Concerns Based Adoption Model. Curriculum Inquiry 27 (3), 332-367.

Bailey, Gerald B., & Pownell, David. (1998, November). Technology Staff-Development and Support Programs. Learning and Leading with Technology 26 (3), 47-51, 64.

Covey, Stephen R. (1989). The 7 Habits of Highly Effective People. New York: Simon and Schuster.

Dede, Chris. (1998). Six Challenges for Educational Technology [On-line]. Available: http://www.virtual.gmu.edu/pdf/ASCD.pdf

Dede, Christopher, & Sprague, Debra. (1999, September) If I Teach This Way, Am I Doing My Job? Learning and Leading with Technology, 27 (1), 6-9, 16-17.

Dexter, Sara L., Anderson, Ronald E., & Becker, Henry Jay. (1999). Teachers' Views of Computers as Catalysts for Changes in Their Teaching Practice. Journal of Research on Computing in Education, 31 (3), 221-239.

Dwyer, David. (1992). Comments for the National Education Goals Panel. Apple Classrooms of Tomorrow.

Fullan, Michael G., & Stiegelbauer, Suzanne. (1991). The New Meaning of Educational Change. New York: Teachers College Press.

Hall, Gene E., & Hord, Shirley M. (1987). Change in Schools: Facilitating the Process. Albany, NY: State University of New York Press.

Hancock, Vicki (1997, November). Creating the Information Age School. Educational Leadership, 60-62.

Harris, Judi. (1998). Design Tools for the Internet-Supported Classroom. Alexandria, VA: Association for Supervision and Curriculum Development.

Hedney, Brian. (1998, June). The Professional Development of Teachers in an Information Technology Era. Output, 19 (1), 1, 15-17.

Loucks-Horsley, Susan. (1996). The Concerns-Based Adoption Model (CBAM): A Model for Change in Individuals. [On-line]. Available: http://www.nas.edu/rise/backg4a.htm

Maddux, Cleborne D. (1997). The Newest Technology Crisis: Teacher Expertise and How to Foster It. Computers in the Schools, 13 (3/4), 5-12.

McNiff, Jean. (1988). Action Research: Principles and Practice. New York: Routledge.

Milone, Jr., Michael N. (1998, March). Staff Development Success Stories. Technology and Learning, 44-45, 48-52.

Moersch, Christopher. (1995, November). Levels of Technology Implementation (LoTI): A Framework for Measuring Classroom Technology Use. Learning and Leading with Technology, 40-42.

President's Committee of Advisors on Science and Technology, Panel on Educational Technology. (1997, March). Report to the President on the Use of Technology to Strengthen K-12 Education in the United States [On-line].

Available: http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/PCAST/k-12ed.html

Regina Public Schools. (2000). Indicators Report. Regina, Saskatchewan: Regina Public Schools

Rogoff, Barbara. (1994). Developing Understanding of the Idea of Communities of Learners. Mind, Culture, and Activity 1 (4), 209-229.

Saye, John W. (1998, Spring). Technology in the Classroom: The Role of Dispositions in Teacher Gatekeeping. Journal of Curriculum and Supervision 13 (3), 210-234.

Scrimshaw, Peter. (1997). Computers and the teacher's role. In Bridget Somekh & Niki Davis (Eds.), Using Information Technology Effectively in Teaching and Learning. (pp. 100-113). New York: Routledge.

Somekh, Bridget, & Davis, Niki (Eds). (1997). Using Information Technology Effectively in Teaching and Learning. New York: Routledge.

Szostak, Jo Anne. (1998). [Technology Implementation in the Classroom: What are the Barriers to Staff Development?] Unpublished raw data.

APPENDICES

APPENDIX A

UNIVERSITY OF REGINA

FACULTY OF GRADUATE STUDIES AND RESEARCH

MEMORANDU

DATE: February 9, 1999

TO: J. Szostak
6 Thorn Crescent
Regina, SK
S4N 4H8

FROM: G.W. Maslany, Chair
Research Ethics Review Committee

Re: Technology Integration in the Classroom: Identifying Practices which may Positively Influence a Teacher's Ability

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Please be advised that the committee has considered this proposal and has agreed that it is:

__X__ 1. Acceptable as submitted.
(Note: Only those applications designated in this way have ethical approval for the research on which they are based to proceed.)

_____ 2. Acceptable subject to the following changes and precautions (see attached):
Note: These changes must be resubmitted to the Committee and deemed acceptable by it prior to the initiation of the research. Once the changes are regarded as acceptable a new approval form will be sent out indicating it is acceptable as submitted.
Please address the concerns raised by the reviewer(s) by means of a supplementary memo.

_____ 3. Unacceptable to the Committee as submitted. Please contact the Chair for advise on whether or how the project proposal might be revised to become acceptable (4775.)

G.W. Maslany

cc: V. Maeers, E. Cooper, supervisors

GM/ab/ethics2.dot

Human Subject Research Ethics Review Committee
Application for Approval of Research Procedures

Section I: Identification and Purposes

1. Date: Dec 20, 1998

   Name of Applicant: Jo Anne Szostak

   Address: 6 Thorn Cres
   Regina, Sask.
   S4N 4H8

   Title of Research: Technology Integration in the Classroom: Identifying Practices which may Positively Influence a Teacher's Ability

2. If the project will be part of a thesis or class requirement, give the name of the supervisor:

   Dr. Elizabeth Cooper and Dr. Vi Maeers

   This project is the research for my master's thesis.

   Department or Faculty:

   Education (Grad Studies)

3. Purposes. Give a brief outline of the main features and variables of the research problem. Include a brief statement which describes the significance and potential benefits of the study.

   The purpose of this study is to provide an indepth description of a group of teachers involved in learning to integrate computer-related technology in the classroom.

   This study will be significant in that it will provide information which will help me (and other technology consultants) to design more effective professional development for teachers in the area of educational technology. The potential benefit of effective professional development for teachers will be improved instruction in the classroom.

Section II: Subjects

1. Briefly describe the number and kind of subjects required for data collection.

   Approximately 5 teachers working in elementary public

schools in Regina will be involved in the project. These teachers are currently receiving inservice in computer-related technology.

2. What information about the research problem and their role in the project will potential subjects be given?

Each potential participant will receive a letter outlining the purpose of the research, what's involved in the research, the time commitment of the participants, and inviting them to participate in the project. (A copy of the letter is appended.)

3. How will the consent of the subjects to participate be obtained? Please indicate whether a consent form will be used and how consent will be obtained (e.g. Who will approach the subject? How will the name/addresses/phone numbers of potential participants be obtained? What will potential participants be told when they are presented with a consent form?)

A consent form will be attached to the letter to participants. Participants who agree to be involved will be asked to sign and return the consent form to the researcher. Volunteers will be solicited from teachers participating in CyberChallenge 99, an initiative of Regina Public Schools. Teachers will be told that this research is a master's thesis project under the supervision of Dr. Cooper and Dr. Maeers, and telephone numbers of the supervisors will be included in case there are any concerns.

4. What will the subjects be required to do in the course of the project?

Teachers who volunteer will:

- participate in inservice
- participate in 2 interviews
- make entries in a reflective journal throughout the project
- participate in 5 focus group sessions

5. What assurances will the subject be given and what precautions will be taken regarding the confidentiality of the data or information which they provide in the study?

All tapes and transcripts will be identified by a pseudonym chosen by the participant at the time of the interview. All names of participants will be changed and anything which might identify the participants will be removed when the research report is written. .

6. Will children be used as a source of data?

Yes (No)

If Yes, indicate how consent will be obtained on their behalf.

7. Will the researcher or any member of the research team be in a position of power or authority in relation to the subjects? (For example: A teacher doing research and using a class as subjects or a counselor collecting research data from clients).

Yes (No)

If Yes, indicate how coercion of subjects will be avoided.

Any potential participant can refuse to be involved in the project without fear of any problems arising. Answers received will not be used in any way that is detrimental or demeaning to the participant. Participants will be given these assurances in the initial letter.

8. Will deception of any kind be necessary in the project?

Yes (No)

If Yes, explain why and indicate how subjects will be debriefed after the study.

Section III: Access to Data and Findings

1. Who will have access to the original data of the study?

Only the researcher, her thesis supervisor and committee will have access to the data. Participants wil have access to transcripts of their own interviews and of all focus groups in which they are participants.

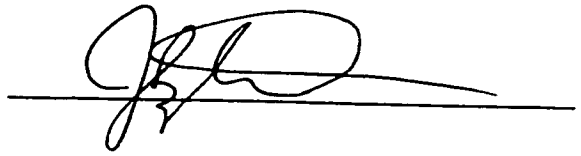
2. Will subjects have some access to the findings of the study?

Participants will have total access to the findings of the study and will receive a copy of the final thesis. They will also receive a copy of any published materials.

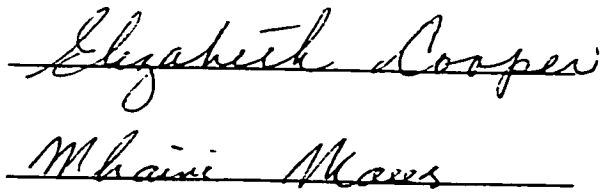
3. What will be the final disposition of the original data after the study is completed?

Original tapes and transcripts will be retained by the researcher for a period of three years and will then be destroyed.

Signature of Applicant:



Signatures of Advisors:



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UNIVERSITY OF REGINA
FACULTY OF EDUCATION

February 10, 1999

Dear Colleague,

As a research project for my Master's Thesis at the University of Regina, I am planning to do research on the subject "Technology Integration in the Classroom: Identifying Practices which may Positively Influence a Teacher's Ability". As a result of the research, I hope to be able to develop some guidelines for more effective professional development for teachers in the area of educational technology.

The research will involve working closely with a small group of teachers over a period of several months to offer inservice and other support. During this time, the teachers will participate in two interviews, keep a reflective journal of their experiences and participate in a series of five focus group sessions.

The purpose of this letter is to invite you to participate in this research project. I would like to work with teachers who are currently involved in CyberChallenge 99, as that project already includes a series of inservice sessions. More inservice and consultation would be available to you at your request. Your involvement would require participation in two interviews, each approximately half an hour in length (one at the beginning and one at the end of the study), maintaining a reflective journal in which you record your reflections on your experiences during this project, and participating in five focus group discussions (approximately one hour in length) with the other participants.

In my thesis, which may be published in some form, I will change the names of participants and remove any information which may identify participants. Specific data will be accessible only to me, the person who provided it, and my thesis committee. Where appropriate, a summary of focus group data will be made available to the focus group. Participants will have total access to the findings of the study and will receive a copy of my thesis and any published materials. Information received will not be used in any way that is detrimental or demeaning to the participant.

I hope that you will agree to participate in this study. However, should you choose not to be involved, be assured that it will not reflect negatively on you, and you needn't be concerned that any problems would arise from your refusal.

If you would be willing to participate in the project, please sign the consent form below and return it to me at your earliest convenience. By signing the consent form, you are indicating:

1) That you have received this consent form
2) Permission to use information collected in this study
3) Permission to audiotape interviews and focus group meetings
4) Permission to use the contents of your reflective journal

If at any time you should choose to discontinue your participation in this research study, you have the right to withdraw without penalty and without risk of jeopardizing any services provided to you.

As I indicated before, this is a thesis project. My supervisors are Dr. Elizabeth Cooper and Dr. Vi Maeers, and their telephone numbers are 585-4518 and 585-4601, respectively. Please feel free to contact them if you have any concerns about this project.

If you wish to contact me regarding any of the procedures or goals of the study, the following is my contact information:

Jo Szostak
Educational Technology Consultant
Regina Public Schools
1600 4th Ave
Regina, SK

791-8248 jszostak@rbe.sk.ca

This project was approved by the Research Ethics Board, University of Regina. If research subjects have any questions or concerns about their rights or treatment as subjects, they may contact the Chair of the Research Ethics Board at 585-4775 or by email: ann.bishop@uregina.ca

Thank you for considering my request to participate in this research.

Sincerely,

Jo Szostak

* * * * * * * * * * * * *

I, _____, agree to participate in the research project "Technology Integration in the Classroom: Identifying Practices which may Positively Influence a Teacher's Ability"

_____
Participant's Signature

_____
Date

APPENDIX B

THE BOARD OF EDUCATION OF THE
REGINA SCHOOL DIVISION
NO. 4 OF SASKATCHEWAN

J.A. Burnett Education Centre
1600 4th Ave., Regina, Sask., S4R 8C8
Ph: (306) 791-8200
Fax: (306) 352-2898

February 12, 1999

Jo Szostak
Educational Technology Consultant
Regina Board of Education
1600 - 4th Avenue
Regina, SK
S4R 8C8

Dear Jo:

Re: Thesis Research Project

Please accept this letter as approval to proceed with your research on the subject, "Technology Integration in the Classroom: Identifying Practices which may Positively Influence a Teacher's Ability." We will need to be informed when the University Research Ethics Board has provided approval.

I am enclosing a copy of Policy MFE of the Board of Education with respect to research. Please note in particular:

a) participation by any subject is voluntary,
b) anonymity must be guaranteed,
c) a copy of your completed study must be forwarded to this office.

We look forward to seeing the results of your research. Best wishes with your continued studies.

Yours sincerely

Brian Malley
Assistant Superintendent
Curriculum and Support Services

BM/ms

c.c. L. Elford, Director of Education

February 9, 1999

Mr. Brian Malley,
Assistant Superintendent,
Curriculum and Support Services
Regina Board of Education

Dear Mr. Malley,

For my Master's Thesis at the University of Regina, I am planning to do research on the subject "Technology Integration in the Classroom: Identifying Practices which may Positively Influence a Teacher's Ability" As a result of the research, I hope to be able to develop some guidelines for more effective professional development for teachers in the area of educational technology.

The research will involve working closely with a small group of teachers over a period of several months to offer inservice and other support. During this time, the teachers will participate in two interviews, keep a reflective journal of their experiences and participate in a series of five focus group sessions.

The purpose of this letter is to request approval to conduct this research within Regina Public Schools. I would like to work with teachers who are currently involved in CyberChallenge 99, as that project already includes a series of inservice sessions. More inservice and consultation would be available at the teacher's request. The involvement for each teacher would require participation in two interviews, each approximately half an hour in length (one at the beginning and one at the end of the study), maintaining a reflective journal to record experiences during this project, and participating in five focus group discussions (approximately one hour in length) with the other participants.

In my thesis, which may be published in some form, I will change the names of participants and remove any information which may identify participants. Specific data will be accessible only to me, the person who provided it, my thesis supervisor and committee. Participants will have total access to the findings of the study and will receive a copy of any published materials. Information received will not be used in any way that is detrimental or demeaning to the participant.

A copy of the letter and consent form to be sent to potential participants is attached for your reference. I have also attached a copy of the questions to be asked at the interview.

As I indicated before, this is a thesis research project. My supervisors are Dr. Elizabeth Cooper and Dr. Vi Maeers, and their telephone numbers are 585-4518 and 585-4601, respectively. Please feel free to contact them if you have any concerns about this project.

Thank you for considering my request to conduct this research.

Sincerely,

Jo Szostak