RESPONSIVE INSTRUCTIONAL DESIGN IN TECHNOLOGY-SUPPORTED TEACHER EDUCATION: CASE STUDIES FROM THE PDP

by

Tracy L. Roberts
Bachelor of Arts, Simon Fraser University, 1999

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

In the
Faculty
of
Education

© Tracy L. Roberts 2004

SIMON FRASER UNIVERSITY

August 2004

APPROVAL

NAME   Tracy Lynn Roberts

DEGREE   Master of Arts

TITLE   Responsive Instructional Design in Teacher Education: Case Studies from the PDP

EXAMINING COMMITTEE:

    Chair   Michael Ling

_____

David Zandvliet, Assistant Professor
Senior Supervisor

_____

Meguido Zola, Associate Professor
Member

_____

Dr. David Booth, Professor, Curriculum, Teaching and
Learning, University of Toronto,
252 Bloor Street West, Toronto, Ontario M5S 1V6
Examiner

    Date   August 13, 2004

SIMON FRASER UNIVERSITY

Partial Copyright Licence

ABSTRACT

"Infusing Technology" initiatives involving information and communications technology (ICT) are on the rise in teacher education programs, such as the Professional Development Program (PDP) at Simon Fraser University. Pilot study data and observations of the first two years of computer conferencing in the PDP reveal it was used primarily to facilitate simple course management tasks (assignment submission, resource sharing, notices) and social activity. Given the demonstrated potential of computer conferencing to support teaching and learning, and the importance for teacher education programs to model and use technology in pedagogically meaningful ways, the purpose of this study is to explore and document new ways of designing and using computer conferencing in the PDP. This collective case study focuses on teacher educators and their experiences as they participate in a responsive instructional design process (Ertmer, 2001) to plan, design, and use computer conferencing to support their work with preservice teachers. Teacher beliefs, preferred practices, computer skills, computer attitudes, and computer self-efficacy are explored in an effort to better understand and assist teacher educators in the process of designing and implementing approaches to technology use in the PDP. First and second-order barriers to technology change, and relationships between these and teacher educators' ways of using technology are also considered. Findings suggest that strong computer skills, positive computer attitudes, and high computer self-efficacy aren't essential for using technology in pedagogically meaningful ways. Rather, teacher educators with a sense of "designer self-efficacy" and flexible or symbolic perceptions of technology and its function(s) are more likely to integrate technology into their practice in ways that extend and support specific teaching and learning goals and processes. Results of this study have implications for current and future technology use in the PDP, and for teacher educators and those who support them to plan, develop, and use ICT to support teaching and learning in teacher education.

Dedication

To one of my earliest and most important teachers, Joy DeProy, I owe so much. It is a blessing to know her, a challenge to emulate her, and the greatest privilege to call her my Nana. This project is the result of a slow-growing seed planted during the roommate years; thank you.

I'm fortunate to have caring and intelligent parents who loved and encouraged me unconditionally in anything I ever wanted to do – thank you Dad, Judy, Mom and Neil.

And an enormous, heartfelt thanks to Steve Obadia for encouragement and patience through the daily grind of this process. I am grateful for opportunities to think out loud and hear your thoughts, but mostly, I'm grateful to share my life with such an outstanding person.

Acknowledgements

Table of Contents

List of Figures and Tables

Chapter One:
Introduction

*There is a current and pervasive belief that technology has
enormous potential for enhancing teaching and learning
(Mayer-Smith et al, 1998)*

Technology & Teacher Education in Canada

In Canada, Information and Communications Technology (ICT) are increasingly
present in all levels of education. Statistics Canada reports that in the 2003/4 school
year, Canadian K-12 schools had some of the highest ratios of students to computers in
the world (median 5:1), and "less than one percent of elementary and secondary schools
in Canada were without computers" (p. 8). In addition, 50-87% of schools in Canada
provide access to internet-connected computers during school hours (more secondary
and larger schools offer this access than do elementary and smaller schools). And while
the sharp increase in acquiring home Internet access has levelled off since the late
1990's, Statistics Canada reports access has remained consistent, with the most recent
numbers available (2002) indicating 64% of Canadian households have Internet access.
According to Statistics Canada, Canadian students seem well-connected, with 85% of
students surveyed having "frequent access to computers both at school and at home",
and over 77% having access to the Internet at school and home.

In step with greater access to technology in the lives of Canadian students is the
increased expectation that technology will be used to support teaching and learning in
their schools. These expectations are often communicated and encouraged in the form
of grants, standards and guidelines set by local, national, and international
researchers, organizations, institutions, and governments (e.g., PT3/Preparing
Tomorrow's Teachers to use Technology grants, BC Ministry of Education ICT
Standards, Canada's SchoolNet, Society for Information Technology and Teacher
Education, International Society of Technology in Education's National Educational
Technology Standards, or "NETS"). Parent Advisory groups across the country are also
active in securing technology resources for schools through various fundraising efforts

(Smith & Robinson, 2003), as they have been for years (Cuban, 1986, p. 76), and even local grocery stores are fundraising for computers in B.C. classrooms (e.g., IGA has raised over $775,000 in the past 4 years through its *IGA 4 Schools* program). And, there is some evidence to suggest that in the current employment climate, new teachers with experience and comfort with technology are more likely to get jobs than those without (DeTure, L., & Gregory, E., 2001; Smith & Robinson, 2003).

Research over the past several years has indicated that ICT can effectively support learning in various ways, such as promoting critical thinking and higher-order reasoning (Cradler, McNabb, Freeman, & Burchett, 2002; Jonassen, Carr, & Yueh, 1998), metacognition and self-regulated learning (Gordon, 1996), motivation (García-Barbosa & Mascazine, 2002), improved research and organizational skills (Cradler, McNabb, Freeman, & Burchett, 2002), providing means for collaborative work, and constructivist and learner-centred teaching and learning (Jonassen et al, 1995 in McCabe, 1998). The main issue emerging time and again in such studies is not *whether* using technology "works" in teaching situations, but how using technology *can* work. In other words, the effectiveness of technology in any teaching and learning situation depends on the goals, design of instruction, how students respond, and so on: *how* technology is used in classrooms is key. This, it would seem, is a compelling and fertile topic for any teacher education program in the 21st century.

Indeed, the obvious link between teachers' technology readiness and their work in the classroom is teacher education programs. So, to prepare tomorrow's teachers to effectively integrate technology, several of the bodies mentioned previously (BC Ministry of Education, Canada's SchoolNet, Society for Information Technology and Teacher Education, International Society of Technology in Education), are calling for more ICT resources and instruction in these programs. Critics (e.g., Smith & Robinson, 2003; Duran, 2001; Carr, 1997) have long argued that in spite of the well established and widely recognized need for technology preparation in teacher education programs, steps have not been taken to "provide preservice teachers with the kinds of experience necessary to prepare them to use information technology effectively in their future practice" (Duran, 2001, p. 103). One doesn't expect that access to technology is the problem here: teacher education programs typically operate within Faculties of Education in large universities with established technology infrastructure and budgets to support it. Therefore, if expectations and support for ICT exist in teacher education programs, and if there is evidence to suggest that ICT can effectively support learning and increase new teachers' job prospects, why aren't new teachers better prepared to use technology upon leaving teacher education programs?

A closer look at how ICT is used in supporting teacher education programs reveals that computer conferencing (CMC) is often a tool of choice. While studies investigating the role and effectiveness of CMC in the teacher education context are mixed, two themes persist in the literature: 1) attention and improvements to instructional design in technology-supported preservice teacher education instruction are desirable, and 2) more support is needed to accomplish this. In addition, one finds that the experiences and perceptions of preservice teachers have received the majority of research attention in this area, which is surprising given the essential roles teacher educators play in designing, planning, and delivering instruction in these programs, and in training and mentoring preservice teachers.

One goal of the study, therefore, is to explore this relatively uncharted area. It is hoped that working closely with teacher educators in their efforts to design and implement effective uses of CMC in their teaching will reveal insight into their needs, challenges, and the design process, and suggest guidelines for future development of technology-supported teacher education.

Teacher Education at SFU: the PDP

The Professional Development Program (PDP) at Simon Fraser University is a year-long teacher education program with 16 cohorts and over 500 graduates per year. The Faculty of Education has a long tradition of integrating theory and practice, which is evident in the design of the program, its curriculum, and the differentiated staffing model made of up professors and practicing teachers (faculty associates).

Over three semesters, preservice teachers alternate between theory and practice cycles to develop their understanding and skills as reflective practitioners. During a theory cycle, students take courses taught by university faculty. During practice cycles and throughout the entire program, they receive supervision, instruction, and mentoring from faculty associates, who are K-12 teachers seconded to the PDP for a two year term. This "differentiated staffing arrangement creates a dynamic environment in which the curriculum is continually re-formed and re-created in light of student learning needs" (Grimmett, 2004).

Faculty Associates in the PDP

In a recent book, Beynon, Grout & Wideen (2004) provide a rich and detailed account of the complex dynamics and relationships involved in being a faculty associate. They found that when relating experiences of being in the PDP, faculty

associates, "use language characteristic of those peak times when we are exhilarated and overwhelmed by change that leads to long-term growth. They use words of power and intensity, impact, and totality." (Beynon, Grout & Wideen, 2002, p. 17). In this statement, and throughout their book, these authors capture the essence of conversations and observations I've experienced over the past few years working with faculty associates in the PDP. The faculty associate community is, in many ways, a family in every sense of the word: they work and play, argue and agree, and ultimately come together for various rituals to celebrate and affirm their community. There is intensity in this community arising in part from a heavy workload, frequent change (of community members, daily routines, responsibilities, and work locations) and relationships with others, such as faculty members, school associates, and of course preservice teachers. Each group has its interests and in many ways, faculty associates act as brokers or agents in the process of educating preservice teachers. Through all this, there is a strong sense of respect and partnership between faculty associate pairs and among all faculty associates.

Technology in the PDP

In January 2001, to address Ministry of Education guidelines and bring more educational technology learning opportunities to the PDP, the multi-faceted "Infusing Technology into Preservice Teacher Education" initiative was introduced. The idea was to expose preservice teachers to a variety of technologies, technology issues, and technology-supported learning experiences in the context of their program. Educational technology skills and understanding were meant to be developed through hands-on experiences and activities throughout the PDP community and its work, not "covered" as content in a separate technology course. So, in addition to a wireless network and a variety of software and hardware (computers, video equipment, digital cameras), there were support people put in place for individuals and groups wishing to learn and use these resources, particularly video (filming, editing), iMovie (video editing), and computer conferencing (FirstClass) in whatever way(s) they choose. Sometimes, preservice teachers take advantage of the video services, for example, if they are in a cohort which requires them to do a video self-study of their teaching. Similarly, sometimes faculty associates schedule an iMovie workshop for their cohort, but this type of activity varies greatly each semester and across cohorts: it "can be nearly 80% to less than half, but they do occur each semester" (Laura Buker, Personal Communication, April 7, 2004)

This flexible and choice-driven provision of technology in the PDP means that faculty associates are faced with many choices: they can opt to use all, some, or none of the ICT resources available to them, and in whatever way they see fit. There are no requirements that faculty associates use technology in their cohorts, nor are there any requirements that preservice teachers demonstrate any level of ICT competency in order to graduate from the program. Whatever technology is used in each cohort is decided by faculty associates for that cohort because they are the ones who plan *all* activities and assignments for their students. In other words, it's within their duties to provide or arrange for instruction and/or exposure to issues and strategies around the integration of technology in teaching practice, but there is no requirement that they do so.

One technology which has been widely adopted and used by this community as a result of the Infusing Technology initiative is computer conferencing (CMC) through a program called "FirstClass". In September 2001, FirstClass was made available to the PDP community on an optional basis. One year later, all but three of 16 PDP cohorts had signed on and remain so today.

Before FirstClass was introduced to the PDP community for the first time, a planning discussion was held by a group of stakeholders, including two faculty associates, members of the Infusing Technology team, computer lab support staff, and me (in my role as instructional design and support person for FirstClass). We discussed the type of work they did in their cohort, how CMC might support it, and what sort of online spaces we might create for them. As a group, we came up with an online desktop prototype, which included things like "Notices", "Assignment Drop Box", "Readings", "Resources", and "Social".

Figure 1: FirstClass Desktop Prototype for the PDP Cohorts (2001)
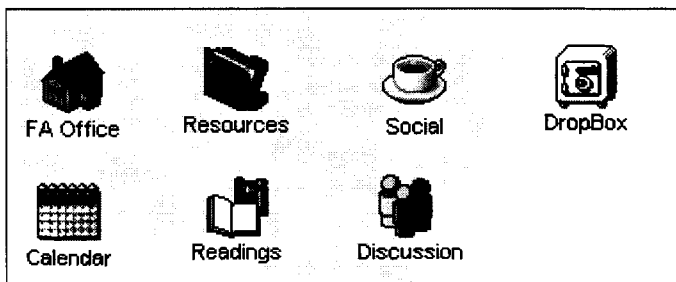
Perhaps unsurprisingly, my pilot research indicated that the PDP cohorts tend to use FirstClass as an "administrative" and social tool. True to the prototype we

developed – which nearly all adopted and used it *as is* – they used FirstClass broadcast messages and notices, submit and return assignments, share resources, and socialize.

From Pilot to Present: Development of the current study

One could argue that simply using FirstClass provides some professional development for preservice teachers because it is widely used in local school districts in British Columbia (e.g., Richmond, Surrey, Abbotsford, Burnaby). And, as "groupware", it is a better fit for the communication needs and style of the group than is email (many-to-many vs. one-to-many). Finally, simply having FirstClass in the everyday work of preservice teachers fulfils some of the goals of the Infusing Technology plan: technology is a regular part of the teaching and learning environment.

Still, I had questions about the way(s) this tool was being used, particularly in the context of a teacher education program. Whose vision of instructional design does – or should – the FirstClass template embody? Is a template even appropriate? How/did we attend to individual teaching and learning goals of faculty associates and of the PDP? How/are faculty associates and preservice teachers actually using it as a tool for teaching and learning activities? What are we modelling for student teachers about using educational technology in teaching and learning environments?

It later occurred to me that in our initial design process, we had asked the wrong questions because we had the wrong focus. We had focussed on the technology, and asked how it might be *used* – a common mistake, according to Cuban (1986, p. 83). We did not focus on the teachers (faculty associates) and what they believed about teaching and learning, or how CMC might support their own learning objectives, pedagogical orientations and goals, or those of the PDP. I believe the early design and subsequent use of FirstClass in the PDP reflected this important difference.

If a shift toward the teachers is important in designing the use of technology in teaching, who are the teachers in the PDP? First, they are K-12 teachers. As previously mentioned, they are seconded classroom teachers who design and deliver instruction in the PDP for a two-year term. This is important for the program itself and for this study because it sets them apart from other programs and other studies; they are unique. They are not university faculty members, nor are they technology trainers. They are master practitioners who come from the K-12 school system to share their expertise with the next generation of teachers. For the most part, this means they come from a place – public schools – where technology resources and support are typically inadequate or nonexistent. In addition, the use of technology is often seen as relatively

unimportant – even contradictory – to the work they do with children. Whether or not they are "computer people" in their personal lives (and the vast majority are not), attempts at using technology in their K-12 teaching are often frustrating due to a lack of resources, support, or personal experience. Many have given up, or simply chosen not to attempt it because it is known in their professional world to be frustrating, difficult, and a waste of time.

However, faculty associates' teaching experiences, including those involving technology are so important; they shape the PDP and the education and guidance preservice teachers will receive. Faculty associates are on the front line of the PDP and have the most contact and influence on preservice teachers[1] because they travel the entire PDP journey with them, mentoring and evaluating them through significant personal and professional landmarks like establishing individual teaching philosophies, writing individual credos, creating lessons and units, and being in the classroom for the first time. Regardless of any policy, expectation, or guideline that exists in the school system, the PDP, or elsewhere, the relationship between faculty associates and preservice teachers is the most consistent and potentially powerful for developing teaching practices, including those involving technology. Because faculty associates' experiences with technology in teaching tend to be negative, it is often this – or nothing – that gets passed on to preservice teachers in the PDP. Rather than integrating technology into the work of the program, it's more likely that faculty associates leave it for preservice teachers to sort out on their own later, through trial-and-error or perhaps professional development.

Now, in 2004, three years after the Infusing Technology initiative began, the Faculty of Education has expressed a continued commitment to pursue educational technology use in informed and pedagogically sensitive ways. A recent report (Grimmett, 2003) articulates the following goals, which have resonance and relevance to this study:

1. Develop compelling, meaningful, and effective uses of new ICTs for learning and teaching.

2. Ensure that design work in [Educational Technology] makes appropriate accommodation of the human factor and pedagogy.

---

[1] School associates (K-12 teachers who host preservice teachers in their classrooms during practica) are also very important mentors. However, faculty associates bear the greater and longer responsibility for mentoring and assessing preservice teachers as they are with them throughout the entire year-long program.

Additionally, in the same report, the Faculty of Education recognizes that:

> While the obvious challenge is the proliferation of on-line programs and courses offered by other universities, we perceive the greater challenge is to lead the Faculty and the field in the pedagogically sound use of technology. A prerequisite for this leadership role must be to increase the Faculty's human and technical capacity to use new learning technologies to improve conditions for learning.

This work of this study shares these goals and pursues them by working with faculty associates in a human way, with the intention to "develop...compelling, meaningful, and effective uses of...ICT for teaching and learning" (Grimmett, 2003) in the PDP specifically. It is hoped that through exploring experiences of teacher educators working in this program, we may come closer to a better understanding of how ICT is used or not used, and how it could best be used to support faculty associates' important work with preservice teachers in the PDP. In particular, the following research goals and questions were pursued:

Research Goals

1. To engage in different approach to the design and use of computer conferencing in the PDP based on Ertmer's (2001) responsive instructional design model. This approach includes supporting faculty associates in their design efforts, providing training and encouragement to increase their skills and confidence in planning technology supported teaching.

2. To document and analyze the design process and its outcomes with faculty associates in three cohorts, using a case study approach and several data sources.

3. To co-develop, with faculty associates, some practical, pedagogically meaningful approaches to CMC use and share any emerging guidelines and best practices with others in the PDP community.

Research Questions

1. How can faculty associates be assisted and supported in developing strategies for using computer conferencing which reflect and support their teaching beliefs, learning objectives, and the goals of the PDP?

2. How/do computer abilities and attitudes, teaching beliefs and practices, learning goals, and perceived barriers impact faculty associates' decisions for using computer conferencing in the PDP?

3. What themes, situations, and challenges emerge as teacher educators work within the proposed design process, and take greater responsibility and control over their cohorts' online space?

4. What are outcomes of the proposed design process in the "visible" online spaces? What is the impact on practice in the PDP?

About the Study

This study examined teaching beliefs, practices, goals, computer attitudes and skills of six teacher educators as they worked to design and use CMC in their work with preservice teachers. This research is intended to advance our understanding of factors contributing to teacher educators' choosing – or not choosing – to use technology in their work, and how they may be best supported in their technology efforts.

Interviews, private electronic mail, surveys, and observations between June and December 2003 served as the primary means of communication and data collection. Participants and the researcher were partners in an authentic, "living" design process in which approaches to online instructional design were developed and used immediately in participants' work with preservice teachers during the fall 2003 semester.

Conceptual Framework of the Study

Ertmer's (2001) Responsive Instructional Design model provides a framework for the process of instructional design in this study. Self-efficacy theory (Bandura, 1994) provides a useful theoretical lens for examining key issues that emerged, and, in conjunction with case study methodology (Lincoln & Guba, 1985; Merriam, 2001, Stake, 1995), was used to analyze participants' experiences and develop richer understandings about the process and outcomes of working with technology in teacher education.

Ertmer's (2001) Responsive Instructional Design model was chosen because it fits well with the PDP culture, and supported the open-ended, flexible process needed for the study. The PDP is a consultative community that cares about people and their individual needs and differences. Similarly, the Responsive Instructional Design model places individual needs and differences at the centre of design decisions; it is a process

that attends to teachers before technology. In addition, the process easily supports qualitative methods and different outcomes (i.e., it's not a template), and it shares many features of traditional instructional design models (e.g., Dick and Carey, 1996), which are widely used in many contexts.

Self-efficacy is a well known and well supported construct in psychological research that describes people's beliefs about their ability to be successful in their undertakings (Bandura, 1994). While self-efficacy theory was not part of the initial framework for the study, it emerged repeatedly from the data as an important factor in understanding faculty associates' perspectives, experiences and choices. Therefore, it became an important analytical lens for this study.

Significance of the Study

In addition to shedding light on perspectives and experiences of teacher educators using ICT in their work in the PDP, this study, by nature of its participants (seconded K-12 teachers), may also illuminate current understanding of issues involving K-12 teachers and technology. It builds upon work done by Ertmer (2001) and others concerned with supporting preservice and in-service teachers struggling to find ways to integrate technology in their teaching.

In this study, teacher educators are treated with respect and care, and are considered to be expert partners in the process. Cuban (1986) notes that teachers are too often blamed for the "failure" of educational technology efforts, where the "problem" of teachers' low levels of use and enthusiasm may spring from other aspects of the environment in which they work (p. 81). In this case, I am suggesting one problem was the initial introduction and plan for CMC use in this context. It could have been better, but through strong partnerships and useful processes, the instructional design and subsequent use of ICT can improve.

One of the implicit goals of this study is to invite teacher educators to start thinking like – and thinking of themselves as – technology using teachers. In doing so, it is hoped they will find ways to provide pedagogical continuity between the classroom and online modes, thus more fully integrating computer conferencing into the thinking and learning challenges for students. Good teaching comes from good teachers, and I share the same concerns about the rapid and often under-supported introduction of technology in teaching as Palmer (1998) expresses about educational reform in general:

In our rush to reform education, we have forgotten a simple truth: reform will never be achieved by renewing appropriations, restructuring schools, rewriting curricula, and revising texts if we continue to demean and dishearten the human resource called the teacher on whom so much depends. Teachers must be better compensated, freed from bureaucratic harassment, given a role in academic governance, and provided with the best possible methods and materials. But none of that will transform education if we fail to cherish – and challenge – the human heart that is the source of good teaching. (p. 3)

This study is situated in one unique teacher education program, and explores the experiences, perspectives, and choices of six teacher educators who use technology to support their work with preservice teachers. Like Palmer, I am concerned with the "human heart that is the source of good teaching", and throughout this study I have made every effort to listen for its voice and respond to it faithfully in my work with teacher educators and in my reporting of our work together.

Chapter Two:
Literature Review

ICT in Teacher Education

The student-teaching experience places newcomers in classrooms where, for the most part, veteran teachers only occasionally use [media & technology]. After serving the apprenticeship, it is the luck of the draw whether or not a teacher ends up in a school where media use is encouraged. Hence, there is little in the formal training and early years of a teachers' career that nurtures the use of [...] technology.
(Cuban, 1986)

Much of the literature involving technology in teacher education focuses on preservice teachers' experiences and perceptions through the implementation of various technologies into their program of study (e.g., Hidalgo, Lu, & Miller, 2000; Burkett, Macy, White & Feyten, 2001; Hutchinson et al., 2001; Keating & Evans, 2001; Brownlee, Purdie & Boulton-Lewis, 2001). Another concern of researchers in this area is the need to increase preservice teachers' computer skills (Chatel, 2001; DeTure & Gregory, 2001; Duran, 2001, Hidalgo, Lu, & Miller, 2000; Keating & Evans, 2001, Ragan, Lacey & Korithoski, 2001) either by "infusing technology" throughout the program, or through a single technology course. The movement seems to be toward infusion. Researchers claim this approach is more likely to prepare preservice teachers to skilfully integrate technology in pedagogically sound ways than simply teaching them "how-to" skills on various applications (Hargrave & Hsu, 2000; Clouse & Alexander, 1997; Grandgenett et al, 1992).

When thinking about teacher education programs, it is important to recognize and distinguish preservice teachers (the *students*) and teacher educators (*instructors*). In most cases, research calling for better support in these programs is referring to preservice teachers, not teacher educators. So while Abbott & Faris (2000), among others, argue that sensitivity and understanding toward preservice teacher dispositions is critical in implementing any technology initiative, I believe that researchers like Ertmer (2001), Fuller (2000), Hargrave & Hsu (2000), and Woodrow (1991) argue more

convincingly that successful initiatives depend upon the support and attitudes of teachers, which in this case means *teacher educators.*

There is surprisingly little research focussed specifically on teacher educators in technology-supported teacher education programs, though the essential role they play in preparing tomorrow's teachers to skilfully integrate technology is documented by a few researchers (e.g., Hargrave & Hsu, 2000; Clouse & Alexander, 1997) . Granted, many teacher educators are university faculty, and there is no shortage of studies on technology use in undergraduate and graduate course settings. However, not all teacher educators who teach with and about technology in teacher education programs are university faculty. Often they are non-academic technology support staff, or trainers brought in specifically to teach technology skills in a workshop setting. In this study, teacher educators are K-12 teachers, who have been seconded to the university for a two-year term. In addition, the instructional context of a teacher education program is potentially quite different from a regular semester-long university course in terms of things like program length, required activities, learning outcomes, and assessment. So in trying to understand the challenges facing teacher educators in technology-supported programs where they are not university faculty, the existing literature may provide little in the way of guidance.

While computer conferencing (CMC) technology is playing an increasing and important role in supporting teacher education, research findings are varied and mixed. Some reports claim that CMC provides effective support for communication, organization, resource sharing, social/emotional support (Admiraal, Lockhorst, Wubbels, Korthagan and Veen, 1998), time/place independence (Poole, 2000), and critical reflection of learning, (Egbert & Thomas, 2001). In addition, CMC is said to provide opportunities for increased individual participation, more individualized feedback, resource-rich learning environments (Egbert & Thomas, 2001), and effective supervision and mentoring (Admiraal, Lockhorst, Wubbels, Korthagen, and Veen, 1998).

However, there are also reports detailing problems and disappointments in implementing CMC in the teacher education context. Some problems arise from technology-specific issues, such as deficiencies in users' basic computer skills, restricted home access, a lack of technical support, inadequate computer resources, or poor interface design (Egbert & Thomas, 2001; Sandholtz, 2001). Other problems involve the *way* the online activity was structured and played out for students. There is evidence of disappointment in the amount, type and quality of learner support offered, particularly in areas of intellectual, reflective, and resource development. For example,

in their study of CMC in four teacher education institutions, Admiraal, Lockhorst, Wubbels, Korthagan and Veen (1998) found that preservice teachers were "disappointed about the exchange of informational support", and indicated that the "number and the quality" of instructive, resource-rich materials "fell short" (p. 67).

Clouse & Alexander (1997) argue that this type of learner disappointment is largely due to the fact that instructors often don't have the understanding, experience, or appropriate support to effectively integrate technology into their teaching. This leads to the misuse and under use of technology, and often results in technology being treated as a mere "add on" (Clouse & Alexander, 1997; Mayer-Smith, Pedretti & Woodrow, 1998). Sandholtz (2001) agrees that technology use in classrooms typically fails to reach its potential due to a lack of teacher comfort with technology, and argues that this situation will remain unchanged unless teachers are better supported in their technology design and implementation efforts – a sentiment echoed in several other studies (e.g., Egbert & Thomas, 2001; Levin, Waddoups, Levin & Buell, 2001; Fuller, 2000; Woodrow, 1991; Admiraal, Lockhorst, Wubbels, Korthagan and Veen, 1998; Clouse & Alexander, 1997). So, it seems clear that technology, and in particular, computer conferencing, has the potential to support teaching and learning in the teacher education context, but it seems that its success depends upon the degree to which teacher educators are supported in the design and implementation process to create a useful vehicle for their instruction. As Clark (1983) argued in his seminal paper on media learning, "media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (p. 445)

Instructional Design in Technology-Supported Teaching & Learning

Seeking to better understand the dynamics of technology-supported learning environments, researchers and practitioners are turning their attention to instructional design issues, processes and possibilities to help educators "traverse, chart, and settle in this new digital wilderness" (Egbert & Thomas, 2001). Research in the area of instructional designer decision making indicates that "expert" designers spend more time in the problem understanding phase, constructing a rich representation of the problem, and using process models as a guide (Rowland, 1992). Unfortunately, design process approaches would constitute the kind of support which has been reported to be lacking in many cases, and so they appear to be under-used in technology implementation efforts. More than a decade ago, Means (1993) argued that an essential

element often missing from technology implementation initiatives is professional development that helps teachers "think about how technology can support [their] own instructional goals and learn how to orchestrate a class in which student are doing challenging projects" (p. 4). More recently, Egbert and Thomas (2001) claim there is still "a sense of groping for guidelines, models...[and] best practices for the design and delivery of online instruction" (p. 391).

In the context of preservice teacher education, teacher educators are in the position to make the practical instructional design decisions around technology use. Whether these decisions are "designed", or not is another matter. In their study on four teacher education programs, Admiraal, Lockhorst, Wubbels, Korthagen and Veen (1998) found that a lack of "structure", or design, in the online environment led to a lack of "reflection, discussions over issues..., debates, and exchanges of pedagogical content knowledge" (p. 61). Instead, preservice teachers used computer conferencing primarily for emotional support.

In the case of the present study, these ideas have resonance: in the early stages of implementation, teacher educators were taught how to use the technology, but the design work had been done for them. Pilot research demonstrated that a generic "template" design provided was, for the most part, kept and used *as is* across all the cohorts, and that the technology was most used for social interaction – much like the cases analyzed by Admiraal, Lickhorst, Wubbels, Korthagen and Veen(1998). In the PDP, there is no specific, structured "design/development period", where teacher educators might do the development and planning work with the technology in mind, as is typical for expert designers. So, a process approach makes sense, but which process?

Responsive Instructional Design: The Model

Ertmer (2001) describes a "responsive instructional design" model for working with instructors to develop technology-supported learning environments which "builds on, and responds to, teachers' unique needs" (p. 33). This approach assumes that it is important to acknowledge and work directly with instructors' educational beliefs and efficacy beliefs around computers when designing technology-supported instruction (p. 34), and to avoid starting off dealing with technology details. Ertmer's five-step process shares key features with traditional instructional design models (e.g., Dick & Carey, ADDIE), and includes the following stages:

- **Reveal**: teachers articulate goals, perceived contextual barriers and concerns, teaching beliefs, classroom practices and teaching/learning style preferences, and motivation for teaching. Information gathered at this stage contributes to the creation of an individual teacher profile (ITP).

- **Propose**: teachers are supported in co-developing an individual teaching/technology plan which meets specific needs identified in the ITP.

- **Implement**: technology plan is put into place, and teachers' success should be safeguarded by support.

- **Reflect**: teachers consider what has occurred compared to their expectations, and focus reflections specifically on what the students did/not do.

- **Refine**: teachers share outcomes with others and consider changes.

Figure 2: Responsive Instructional Design Model
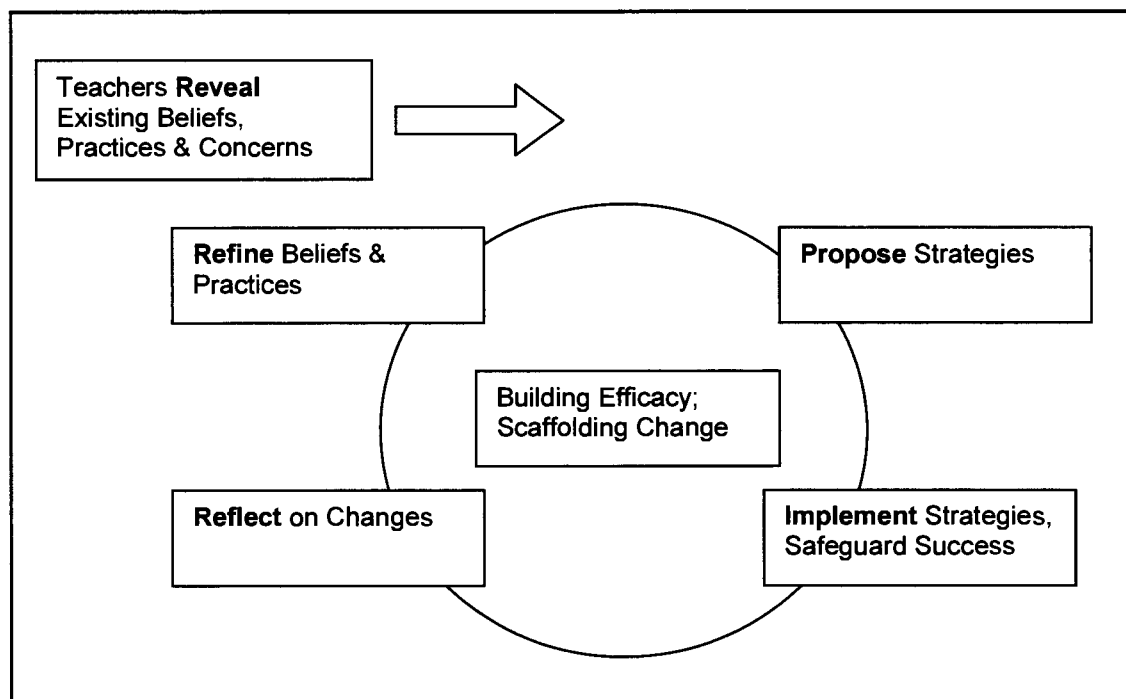
Source: Ertmer, 2001 (Used with permission)

Understanding Teachers' Use of Technology

There is disagreement among researchers regarding the factors that influence if and how teachers integrate technology into their practice, but predominant themes include the practical application of technology, teacher belief, and teachers' computer

skills. Another factor receiving increasing research attention in this area is computer self-efficacy.

On one level, teachers appear to choose technology to fulfil practical "priority needs", such as managing files and information or presenting information to students in a teaching situation (Woodrow, 1991); they use technology as an "aid for efficiency" (Hinostroza & Mellar, 2000, p. 402). The adoption literature makes this point as well: people need to feel convinced they should invest the time and effort in learning and using technology, and managing day-to-day tasks is often where they start (Anderson, Varnhagen & Campbell, 1998; Rogers, 1995). Teachers, like anyone, are motivated by practical application, and may be more willing to learn and adopt technology when they can see a time-saving reason for doing so.

Some researchers suggest that teachers' beliefs are the most important thing to consider when trying to understand how and why teachers use technology. Ertmer (2001) argues that teachers' beliefs are always very important, but particularly when new practices are concerned, because such change can represent a challenge to teachers' beliefs. She claims no change to practice will take root if beliefs aren't adequately supported or represented (Ertmer, 2001). Annand (1997) agrees that teachers' beliefs and pedagogical preferences are the most critical, and where technology is concerned, it's often beliefs related to pedagogical preferences, such as honouring different learning styles and encouraging dialogue, which prompt teachers to make use of ICT in their teaching. Mullen's (2001) work in this area has a similar tone; she argues that teachers' beliefs are complex, sometimes contradictory, and highly influential in both "instructional and curricular decisions" (p. 450) because beliefs create and re-create teachers' images of themselves, which in turn lead to particular types of practice. In her work with preservice teachers, Mullen (2001) found that their beliefs and ideas about "computer literate teachers" were largely skills-focused, and thus lacked maturity and an understanding of using technology in richer, more pedagogical ways (p. 461).

In thinking about teacher belief, it is useful to include beliefs specifically about using computers in teaching. Cuban (1986) suggests that many teachers come to teaching with beliefs about various media as vehicles for entertainment, rendering them "somewhat tainted as teaching tools" (61). Woodrow's (1991) work supports this idea that teachers may not readily view computers as teaching and learning tools; her participants gave lower ratings to computer applications that were intended to be used as learning tools than to applications which served other needs, such as managing files and information, or presenting information to students.

17

Larner & Timberlake (1995) suggest that of all the variables identified in the literature relating to the ways teachers integrate technology into their teaching (knowledge, anxiety, personal and professional attitudes, school support, and school resources); computer skill is most often cited as the most critical. This argument appears elsewhere in reference to teachers generally, and goes like this: if they can (technically), they will (in practice); therefore, they need computer skills training. Studies making this simple connection between skills and use appear less frequently in current literature, possibly because in spite of more availability and use of things like email, internet, and software (word processing, educational software) in school and home life, integrating technology into teaching is still a challenge. More likely, the shift in focus away from simple skills is due to the amount of recent research which suggests there are more complex dynamics at play. More recently, researchers are pointing to a deeper connection between computer skill and computer self efficacy, suggesting that there is a positive correlation between the two (Albion, 2001; Milbrath & Kinzie, 2000). We can imagine how having some skill is likely to lead to more successful experiences, thus increasing efficacy beliefs around computer use, and perhaps continued or expanded use.

The central role of self-efficacy in people's ability to achieve things and their willingness to try is well established in the literature. According to Albert Bandura (1994), "self-efficacy is people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave" (p. 71). The words "self-efficacy" have been tacked on to many nouns to birth new constructs and questionnaires for psychological inquiry and to explain people's feelings and behaviour in relation to various things: occupational self-efficacy, exercise self-efficacy, drinking refusal self-efficacy, mental health services self-efficacy, internet teaching self-efficacy, and of course, computer self-efficacy. Bandura (1994) explains that self-efficacy beliefs are developed through four types of experiences: mastery, experiences, vicarious experiences, social persuasion, and somatic and emotional states. Furthermore, "successes build a robust belief in one's personal efficacy. Failures undermine it, especially if failures occur before a sense of efficacy is firmly established" (Bandura, 1994, p. 71). The link between self-efficacy and teachers' adoption and use of technology in teaching has been made (e.g., for a summary, see Albion, 2001), either directly (i.e., self-efficacy is a predictor of subsequent use), or indirectly (e.g., self-efficacy mediates or flows from other factors, such as computer experience).

However, for teachers, it may be more important to have a way of discussing efficacy with respect to being a *technology-using teacher* rather than a technology user. A teacher who is able to use a web browser or word processor to in their personal or professional life may not necessarily be able to design instruction with pedagogically meaningful use of technology. Mullen (2001) starts to go in this direction in her discussion of preservice teachers' images of themselves (e.g., self as teacher, self as math teacher), though participants in her study didn't describe themselves as technology-using teachers. Rather, they saw technology as separate, and often associated with didactic methods of instruction, which, regardless of what they do in practice, is often contradictory to how preservice teachers wish to see themselves (Mullen, 2001, p. 458).

Chapter Three:
Methodology

As discussed in Chapter 2, the literature is mixed with respect to understanding teachers' motivation for adoption and use of ICT in their teaching. Some studies point to computer skills and attitudes, others to computer efficacy, and still others to teacher belief or practical application as key factors for teachers. And as discussed in Chapter 1, there is room to explore more pedagogical uses of technology in teacher education and in the PDP in particular. The plan for this study, therefore, was to work toward both greater understanding and different kinds of computer conferencing use in the PDP. To get there, a process approach was needed that would not only invite and attend to the key factors identified in the literature (e.g., skills, attitudes, efficacy, teacher belief) if and when they emerged, but also to create conditions where practical approaches to computer conferencing use could be generated in collaboration with faculty associates. In other words, it was important to have a process where we might better understand how and why technology is and could be used in the PDP, and at the same time, actually do something about it.

This lead to the adoption of Ertmer's (2001) Responsive Instructional Design model, which places teachers' needs, beliefs, concerns, and goals at the centre of a design process. This model supports the key research goals of this study, which included using and documenting a different, more supportive design approach for planning the use of FirstClass conferencing in the PDP and co-developing strategies for computer conferencing use with faculty associates. An important part of the new design process is to support faculty associates' skills and confidence in designing technology-supported instruction and invite them to think of themselves as technology-using teachers, or "designers. From these general goals, the following research questions were pursued:

Research Questions

1. How can faculty associates be assisted and supported in developing strategies for using computer conferencing which reflect and support their teaching beliefs, learning objectives, and the goals of the PDP?

2. How/do computer abilities and attitudes, teaching beliefs and practices, learning goals, and perceived barriers impact faculty associates' decisions for using computer conferencing in the PDP?

3. What themes, situations, and challenges emerge as teacher educators work within the proposed design process, and take greater responsibility and control over their cohorts' online space?

4. What are the outcomes of the proposed design process in the "visible" online spaces? What is the impact on practice in the PDP?

The research design for this study mirrors Ertmer's (2001) Responsive Instructional Design model: each stage in the model presented natural opportunities for research activities, including data collection, member checking, and analysis. This chapter will describe findings from a pilot study done in preparation for this research, the methodology used in the current study, its rationale, and its relationship to the stages of Ertmer's (2001) model, summarized below:

Figure 3: Relationship between Ertmer's (2001) Model & Methodology

Stages of Responsive Instructional Design Model	Research Activities
1. REVEAL *Focus*: teacher beliefs, goals, concerns, barriers. Technology issues secondary.	Develop Teacher Profile through interviews, surveys, and member checks.
2. PROPOSE *Focus*: co-develop individual teaching/technology plan (ITTP), connected to needs and goals identified in Teacher Profile.	Co-develop ITTPs through interviews and member checks. ITTPs include specific strategies & practices to address stated needs and goals. Online space is planned in detail.
3. IMPLEMENT (ITTP) *Focus*: safeguard success.	Observations, ongoing contact with participants regarding progress. Proactive and reactive support.
4. REFLECT *Focus*: consider processes and outcomes in light of beliefs, compare experience to expectations, focus on what students did/not do.	Final Interviews. Member checks on preliminary analyses.
5. REFINE *Focus*: discuss changes with others, consider revisions.	Participants share experiences with others in the PDP community and beyond.

Summary of Pilot Study Data

During the fall of 2002, the following pilot activities were conducted in preparation for this study:

1. Pilot: Analysis of Online Activity

Analysis of online activity in three cohorts during the fall 2001 semester supported the assumption that FirstClass was being used primarily as tool for "administrative" and "social" communication. Administrative messages typically involved timekeeping and instructions: confirming or changing details of meetings, observation schedules, and deadlines, and assigning readings and activities. Social messages typically included things like party planning, messages of individual or whole-group moral support, jokes or thoughts of the day, and personal news sharing.

Table 1: Pilot Data – Online Activity (messages), fall 2001 semester

	Cohort 1	Cohort 3	Cohort 3
Notices & Calendaring	149	271	29
Social	202	270	58
Assignment submission	41	258	89
Online Discussion	59	0	0
Resources, Readings, Handouts	183	34	2

Considering the nature of a computer conferencing tool/groupware like FirstClass (i.e., it is designed to facilitate group discussion), it was perhaps surprising to see how little discussions featured in the online activities. However, it is important to note that reflective assignments (which varied greatly in length, number and frequency across cohorts) were submitted to faculty associates privately through "closed" drop boxes, and were full of rich content about the students' ideas, emerging teaching philosophies, and practicum experiences in the classroom. So, it seems that deeper writings about educational issues did occur, though they passed privately between students and faculty associates, and were not shared with the whole group.

2. *Pilot: Interviews*

Structured interviews of 35 minutes each were held with two faculty associates (neither of whom is a participant in the current study). Interviews focussed on teaching beliefs and how FirstClass was used in their cohort. In addition, I asked whether they thought their teacher beliefs and learning objectives were reflected in the way their cohort used FirstClass.

With respect to teaching beliefs, participants reported a high priority on creating a safe learning community, promoting student-centred learning, using activities that support self-directed learning, different learning styles, and multiple representations of learning. They described their commitment to supporting students' engagement in authentic learning experiences, group work, and personal reflection.

Participants agreed that FirstClass was used primarily as a group communication tool, and so any community-building that happened to arise from that activity reflected their beliefs and goals. Beyond that, they did not find the use of FirstClass to be strongly connected to teaching beliefs and goals. Faculty associates were pleased with the ease and convenience with which they could post notices, reminders, and readings, send quick notes to students, and receive/return assignments. They also suggested that FirstClass was superior to email for their purposes because it is a shared space, and separate from their (and their students') regular email: all material in FirstClass was PDP-related.

Current Study: Qualitative Case Study Methods

Qualitative research methods were used to explore and learn from the perceptions of six faculty associates in three cohorts. This study unfolded over seven months, beginning in the summer of 2003. Between June and September, I worked with faculty associates individually and in pairs, using Ertmer's (2001) Responsive Instructional Design model as a guide, to plan the use of computer conferencing to support their work with preservice teachers in the fall 2003 semester. Once the fall term had begun, we continued to discuss and adjust the online spaces and practice, and I maintained a helpful presence throughout the term in order to "safeguard success" (Ertmer, 2001), providing assistance and training as needed. Mayer-Smith, Pedretti & Woodrow (1998) describe the powerful potential for "significant technological

reform" when working in a "culture of collaboration" featuring teacher-researcher partnerships (p. 127), and this study was conducted in the spirit of such a partnership.

Qualitative methods were necessary for this study for a number of reasons. First, this study explores an open-ended process of instructional design new to this context, and seeks to describe both the process and its outcomes. It was important to have a methodology that would support this exploratory approach within the natural setting under study, permit the discovery of new information as the process unfolded (Creswell, 1998; Hoepfl, 1997), and provide rich descriptions embodying the context in which actions and experiences occurred.

Second, this research seeks to understand and describe the experiences and decisions of faculty associates working with technology in context, how they think about and approach teaching and technology (particularly computer conferencing), and how they respond to invitations to engage in "design work" through changes to their professional practice. It was therefore important to have a methodology that supports the exploration and description of participants' actions and experiences.

Based on my own professional experiences working with the PDP community, I believed Ertmer's (2001) model would be useful for working with teacher educators in this context for a number of reasons. First, it reflects existing technology implementation philosophies and processes in the department, which are working with other technologies (e.g., iMovie, Internet). Second, it honours and attends to the needs and expertise of teacher educators, who are "content experts" at the centre of instruction and supervision. Third, it recognizes the need for focussed time devoted to the challenge of instructional design and to develop teacher educator proficiency along the way – something that has come up repeatedly in the literature. Research shows that experience, both with designing instruction and with computers – represent the most important variables affecting the ability of designers to design effective computer-based instruction (Spector, Muraida & Marlino, 1992). Finally, this process is collaborative, emergent, person-centred, and flexible – these are values and qualities deeply embedded in the PDP community, and so I believe it would resonate with its members.

Case study methods were used, and each faculty associate is considered a case. A case study approach is useful because it requires the placement of action and events in context (Stake, 1995). Understanding the way faculty associates use technology in the PDP depends very much on understanding the context in which they find themselves. This context includes what they bring to the situation (e.g., their beliefs

about teaching, goals for the current semester, computer experience, attitudes, assumptions, and skills), and what they find in the situation (relationships with their teaching partner, students' response to their efforts at working with technology, technical and other pedagogical support). Following Lincoln and Guba's (1985) case study structure, this study examines the problem, context, issues, and lessons learned from using the Responsive Instructional Design approach advocated by Ertmer (2001).

One of the defining features of the PDP is diversity – of its community members, of their type and amount of experience, of their personal and professional backgrounds, of the thematic focus of cohorts, of the relationship and distance to the physical campus, and so on. Trying to study the entire program as a case is beyond the scope of this research project. However, I wanted a way to capture and reflect some of the differences among faculty associates in the program, so a "multiple" or "collective" case study strategy (Stake, 1995) was chosen. Creswell (1998) warns that in multiple-case studies, care must be taken to avoid diluting the overall analysis of a single case, and suggests taking on no more than four cases (p. 63). Seeking a large number of cases, she argues, comes from a desire to be able to generalize, which isn't the goal of qualitative research. So, in heeding this advice, but also wishing to capture some of the diversity of this program, I worked with six faculty associates in three cohorts, but focussed the analysis and discussion on the experiences and work of four faculty associates in two cohorts.

Validity is safeguarded in this study in a number of ways. First, a variety of sources and methods enabled triangulation of data (Guba & Lincoln, 1982; Denzien, 1970). Second, purposeful sampling, a long data collection period, and multiple interviews all served to ensure the trustworthiness of data in relation to the research questions. Third, member checks with participants throughout the study, both formally and informally, in writing and in person, served as a constant quality control of data analysis and interpretation.

Participants & Sampling

I was fortunate to have worked in my research setting for over two years prior to starting the study. This experience provided me with entry into the community and an opportunity to build on existing working relationships, and facilitated purposeful sampling for the study.

A maximum variation sampling strategy (Glaser & Strauss, 1967) was used in an effort to include participants from the "widest possible range of ...characteristics of

interest for the study" (Merriam, 2001). Patton (1990) argues that common patterns emerging from small but diverse samples "are of particular interest and value in capturing the core experiences and central, shared aspects or impacts of a program" (p. 172). Creswell (1998) also supports this sampling strategy as a way to get different perspectives on the problem or context (p. 62). To this end, I sought and was able to work with faculty associates who were male and female, new and experienced, on and off site, and those who I knew to be more and less enthusiastic and experienced with respect to technology. This represents a good cross-section of key characteristics of members of the PDP community.

I worked closely and according to my initial research plan with four faculty associates in two cohorts: Rita and Nathan from Cohort A, and Karen and Nora from Cohort B. Two other faculty associates from a third cohort, Carol and Paul, chose to participate to a lesser extent, through multiple interviews, member checks, and questionnaires. This approach was taken in order to gain greater insight into the faculty associate experience by including more voices, but I was committed to keeping the number of analyzed cases to the recommended number of four (Creswell, 1998).

Hoepfl (1997) warns researchers of three types of sampling error that can arise in spite of the benefits of purposeful sampling. She points out that "distortions" can result from insufficient breadth or depth in sampling, from changes over time, and from a lack of depth in data collection. In response to these concerns, I have used a maximum variation sampling strategy, and collected significant data from multiple sources over a seven month period.

Cohort A: the instructional team of Rita & Nathan

Rita is a 40-year old teacher with over 16 years of experience in K-12 and ESL classrooms. In addition, she has a Masters Degree in special education, and has spent several years in administrative and leadership positions. At the time of the study, she was in her second and final year as a faculty associate with an on-site cohort, and was beginning the semester with the same students, but a new partner: Nathan.

Nathan is a 39-year old teacher with 15 years experience in elementary and middle school, and a Masters degree in Education. This was his first semester as faculty associate, and he was in a challenging position of joining a cohort that was halfway through completion.

Together, Rita and Nathan develop and deliver a program of pre-service teacher education which focuses along a theme of community and collaboration for elementary school practice, and they share teaching and supervision responsibility for 32 students.

Cohort B: the instructional team of Karen & Nora

Karen is a 34-year old teacher with over 10 years teaching experience in public schools and a Masters degree in Education. At the time of the study, she was entering her second and final year as a faculty associate in the PDP in an off site cohort, and starting up with a new group of students and a new partner, Nora.

Nora is a 47 year-old teacher with a Masters Degree and 18 years experience teaching secondary school and working in special programs for at-risk youth. At the time of the study, she was entering her first semester as a faculty associate in the PDP.

Together, Karen and Nora provide training and mentorship to their off-campus cohort for 32 preservice teachers. This cohort prepares preservice teachers to teach at both the elementary and secondary level.

Data Collection

Data for the study were collected over seven months between June and December, 2003, thus encompassing the Fall 2003 term and the three months leading up to it. A variety of data sources were used, including surveys, semi-structured interviews, observations of online and in class activity, document analysis, archives of online interfaces, and electronic correspondence with faculty associates throughout the duration of the study. In addition to using several sources, triangulating, and member checking, the long period of data collection enhances the trustworthiness of the data (Ely, 1991, p. 96).

Surveys

Three surveys were used to help create a robust picture of participants' attitudes, skills, and practice toward teaching and technology. Each is described below, with rationale for its inclusion in the study (see Appendix A, B, and C for complete surveys).

1. Teaching Perspectives Inventory (TPI v 1.0)

At the heart of Ertmer's (2001) design process are teacher's beliefs and perspectives about teaching and learning. The TPI includes a range of questions about factors such as educational beliefs, intentions, and actions. Participants rate their agreement with statements on a five-point Likert scale. According to John Collins, co-creator of the TPI, this survey has been used and tested extensively with teachers and teacher educators from all over the world, and in addition to the numerical results it generates, it provides the researcher with a useful "prop" for discussions with teachers in the context of qualitative interviews (Collins, personal communication, 2003). Sample questions from the TPI are included below; see Appendix C for the full survey.

Figure 4: Sample Questions from TPI

Strongly **D**isagree | **D**isagree | **N**eutral | **A**gree | **S**trongly **A**gree					
Teaching Beliefs and Teaching Intentions...	**SD**	**D**	**N**	**A**	**SA**
Teaching should focus on developing qualitative changes in thinking.					
My intent is to help people develop more complex ways of reasoning					
My intent is to build people's self-confidence and self-esteem as learners.					
Never | **R**arely | **S**ometimes | **U**sually | **A**lways					
Teaching Actions...	**N**	**R**	**S**	**U**	**A**
I model the skills and methods of good practice					
I make it very clear to people what they are to learn.					
I see to it that novices learn from more experienced people					

2. Teachers' Attitudes Toward Information Technology (TAT v 2.0)

Ertmer (2001) highlights the importance of unearthing any perceived barriers at the outset of any technology design effort with teachers. For the purposes of this study, this was interpreted to mean barriers in the teaching context in a broader sense, as well as barriers related to technology. Barriers of both sorts were explored through interviews, but given the importance of technology in this context, I wanted to assess attitudes toward technology in this additional way. The short survey includes questions about attitudes toward specific technologies (e.g., email, Internet, and multimedia), as

well as attitudes toward using computers for professional productivity and classroom purposes. According to Knezek, G., & Christensen, R. (1998), the scales on the TAT demonstrate good reliability according to relevant guidelines for this measure proposed by DeVellis (1991).

Figure 5: Sample Question from TAT

To me, Electronic Mail is:		
important	O O O O O O O	unimportant
boring	O O O O O O O	interesting
relevant	O O O O O O O	irrelevant
exciting	O O O O O O O	unexciting
means nothing	O O O O O O O	means a lot
appealing	O O O O O O O	unappealing
fascinating	O O O O O O O	mundane
worthless	O O O O O O O	valuable
involving	O O O O O O O	uninvolving
not needed	O O O O O O O	needed

3. Technology Proficiency Self-Assessment (TPSA v1.0)

Larner & Timberlake (1995) found that of the six of the most important variables identified in determining the degree to which teachers integrate computers into their teaching and planning, knowledge of computers is the most critical. In an effort to understand what technologies and processes faculty associates felt comfortable using, I administered the Technology Proficiency Self Assessment (TPSA v1.0; Ropp, 1999).

The TPSA is a 20-item Likert-type instrument designed to reflect four domains included in the International Technology in Education (ISTE) National educational technology standards for teachers. The self-assessment consists of 20 items, 5 each from the following domains of proficiency: 1) Electronic mail, 2) World Wide Web, 3) Integrated Applications, and 4) Integrating Technology into Teaching. Participants rate their confidence in their ability to perform tasks, making it essentially a measure of computer self-efficacy (Robinson, 2003). Ropp, M. M. (1999) reports a high reliability alpha (.95) for this scale from a set of responses from 506 in-service teachers. Alphas

29

were also reported for each of the four subscales: Electronic mail (.78), WWW (.81), Integrated Applications (.84) and Teaching with Technology (.88).

Figure 6: Sample Questions from TPSA

I feel confident that I could...	SD	D	U	A	SA
send e-mail to a friend.					
search for and find the Smithsonian Institution Web site.					
create my own web site and publish it on the SFU server.					
find primary sources of information on the Internet that I can use in my teaching.					
use a spreadsheet to create a pie chart of the proportions of the different colours of M&Ms in a bag.					
use the computer to create a slideshow presentation.					
create a lesson or unit that incorporates subject matter software as an integral part.					

Interviews

To complement the three questionnaires used, semi-structured interviews of 60-90 minutes were conducted with each participant. The sequence of interviews was as follows: two interviews prior to the beginning of the semester in (June – September 2003), and one at the end of the semester (December, 2003). For the first interview, I met privately with each participant. For the second interviews, participants were invited to choose to meet with me privately or with their partner. In addition to scheduled interviews, I had weekly – and, at times, daily – contact with participants, providing many opportunities for impromptu discussions in person, on the telephone, and via email. These conversations and emails were recorded and included in the data as field notes.

Each interview consisted of open-ended questions, allowing for individual variation (Hoepfl, 1997). The first interviews focussed on participants as teachers, and were conducted with an interview schedule of standardized, open-ended questions, but in an "informal, conversational" style (Hoepfl, 1997). According to Ertmer's (2001) model, it is important to focus on teaching beliefs, practices, needs and goals *before* technology needs and goals, so the first part of the first interviews centred on these issues. Toward the end of the first interview, we explored participants' experiences with technology. Half of the participants had been teaching in the PDP for a year, and

so had already been using computer conferencing technology in this context; the other half were new to the PDP and to using computer conferencing in their teaching.

The second interview clarified issues raised in the first, and explored ways to extend the current use of computer conferencing in the cohort to support faculty associates' stated goals and priorities for their preservice teachers. In two of the three cohorts I worked with, this second interview was conducted with both faculty associates present, which resulted in a collaborative dialogue and brainstorming session about how the technology might support their goals and priorities for the upcoming semester. With the third cohort, I met with faculty associates separately as before.

Final interviews were held at the end of the semester, and focussed on the changes we had made and participants' perspectives on the outcome of the change efforts: what seemed to work, what did not, and why. In addition, issues that had emerged from the interview and survey data across all cohorts were presented to participants for their interpretations and feedback. This served as a final member check of my interpretations of themes and patterns that emerged from the data.

All interviews were tape recorded and transcribed verbatim, with explanatory or clarifying comments in parenthesis. During transcription, I noted emerging codes and themes for subsequent analysis, as well as any questions or issues to be clarified with participants in subsequent interviews and member checks. Following transcription, the interview data were systematically reviewed several times. Reviews of early interviews focussed on drawing out elements from the data that would complete the Teacher Profile described by Ertmer (2001). For example, information about teaching philosophy and beliefs, and preferred ways of teaching and learning were coded and then summarized in the Teacher Profile. Subsequent reviews included drawing out data corresponding to the rest of Ertmer's (2001) elements, including specific goals and needs for the upcoming semester, and any perceived barriers. This information was compiled and brought to subsequent interview discussions about instructional design– it was important that our design conversations were grounded in what faculty associates had expressed as needs, goals, and challenges.

Teacher Profiles

In Ertmer's (2001) model, a 'teacher profile' is a summary of essential information designers need to know about teachers in order to support them in rethinking and extending their practice. Ertmer (2001) suggests a teacher profile might

31

include information about teaching beliefs, preferred ways of teaching and learning, motivation for teaching, and any perceived barriers (p. 835).

In this study, teacher profiles were developed through interviews and surveys, and included all of Ertmer's (2001) elements (teaching beliefs, preferred ways of teaching and learning, motivation for teaching, any perceived barriers), as well as information about computer attitudes and skills.

Individual Teaching/Technology Plan (ITP)

Where the Teacher Profile focuses on the teacher, the Individual Teaching/Technology plan (ITP) focuses on the action: what steps will be taken to bring the teachers' needs, goals, and beliefs into action? Ertmer (2001) says, "after reviewing the issues teachers face, designers help translate these important questions into technology-based learning opportunities" (p. 35). The Teaching/Technology Plan is a concrete representation of, "what will we do now?" Unlike Ertmer's work, this study focuses on teachers working in teams, so while the basic idea and formation of the ITP remains the same, in this study, the plan is not "individual", but encompasses both teachers' goals and needs.

The ITP for each cohort emerged by the end of the second interview and as a result of our time together discussing teacher beliefs, perceived barriers, goals for the semester, and so on. These plans were grounded in those discussions, and were meant to reflect a thoughtful merging of participants' needs, goals, beliefs and practices. I was careful to approach the co-construction of the ITPs with no preconceived ideas about what the "product" would look like, and remain focussed on the teaching principles, beliefs, priorities and learning objectives expressed by faculty associates. Below is a conceptual representation of the ITP, and an example of an item from an ITP:

Figure 7: Individual Teaching/Technology Plan (sample item)

Need, Goal, Learning Outcome →	**Teaching Beliefs, Preferred Practices** →	**Online strategy that meets need, goal, or outcome and is consistent with beliefs & teaching**
Goal: Preservice teachers to engage in critical reflection of practice, and use theory to make sense of teaching experiences →	**Beliefs & Practices**: Collaborative Learning, Group work, peer support, "we are all teachers and learners" →	**Strategy**: Preservice teachers share classroom incidents and discuss practical and theoretical implications with peers in specific online area for that purpose

Teacher Profiles and Teaching/Technology Plans were member checked approximately halfway through the semester. Each participant was provided with an electronic copy of both documents, and was asked for feedback. Participants were invited to comment on any part of the documents. The focus of member checks on the Teaching/Technology Plans was on participants' previously-stated goals for the semester, and whether they believed our use of FirstClass was supporting them. I offered tentative interpretations about which goals were or were not being supported, and requested feedback on my interpretations. In all cases, participants assured me of the accuracy of the documents, and confirmed my interpretations. Some participants added to their Teacher Profile to clarify the way their beliefs were presented. Both member checking and revising the Teacher Profiles and Individual Teaching/Technology Plans helped to ensure that my understanding of participants' needs and goals was clear, and that we were using the online space in such a way that reflected these goals as much as possible.

The final stage of the "responsive instructional design" model involves sharing one's work with others. To this end, I invited and encouraged all participants to share their work with their peers at the end of semester "Program". This meeting is held each semester over several days, and provides a way for all faculty associates to come together, reflect on their work with preservice teachers and make plans for the upcoming semester. It is both a professional development opportunity and a community affirming event.

Participants were asked to share their thoughts and experiences on the following themes: 1) How FirstClass is used to support the process of becoming a teacher through different kinds of online dialogue, and 2) Online practices that make their work easier and more efficient. In particular, I invited participants to share details of the new online practices developed this semester. All agreed, and the response from the community was both swift and encouraging: many other faculty associates chose to adopt some of the practices we developed this term. It is worth noting that such sharing is a common practice in this community; therefore, participants were able to talk to peers in this session without identifying themselves as research participants.

Data Analysis

Data were collected and analyzed simultaneously throughout the study according to qualitative research guidelines for case study research and cross-case analysis (Creswell, 1998; Merriam, 2001). In the early stages of data collection and analysis, transcripts and survey responses were examined to construct preliminary portraits of participants and tentative lists of themes. As data collection and analysis proceeded, revisions and re-writes of portraits were done, and themes were either developed or discarded, depending on whether subsequent data bore them out.

Upon completion of the final interviews, data for each faculty associate (case) was revisited to finalize each portrait and clarify emerging themes to provide a starting place for cross-case analysis (Creswell, 1998). Cross-case analysis involved examining details of major events related to predominant themes common to all cases. For example, I examined changes made to the online space, and noted whether the change was: 1) initiated by the faculty associate, 2) implemented by the faculty associate, 3) implemented correctly. This was done in order to get a sense of what changes were being made, and how much faculty associates were apparently "taking control" over their online space.

Once all data were collected, I engaged in a process of categorical aggregation, which involves seeking "a collection of instances from the data [to uncover] issue-relevant meanings" (Creswell, 1998). This process led to the development of codes and revealed emerging themes.

Records of face-to-face and online communication with participants, as well as field notes of observations were summarized into a single document. Once gathered, data were analyzed in terms of the chronology of the entire process. In particular, I sought information about the major decisions and changes faculty associates made for

their online spaces through a close reading of relevant interview transcripts, field notes, and electronic messages. I also looked for indications of teacher beliefs and perceived barriers to see how these may or may impact faculty associates' technology choices.

My "start list" (Miles & Huberman, 1984) included codes related to the items in the teacher profiles: teaching goals and beliefs, attitudes toward technology, and perceived barriers. During analysis, other categories emerged from the data, such as "the faculty associate experience", which included subcategories like "relationship with partner". Codes were added, dropped, or refined as necessary during subsequent readings of the transcripts.

Role of the Researcher

I became a member of the PDP community when – and because – computer conferencing was introduced three years ago. My role in the PDP community before, during, and after the present study involves supporting faculty associates to design, plan, and use computer conferencing with their cohorts. This meant I had professional relationships with at least one faculty associate in all cohorts when the study began, and as discussed earlier, this helped to facilitate sampling because I was already part of the community. It also made it natural for me to occupy the role of participant observer, because I had been both participating in and observing the community in professional, but informal ways (vis-à-vis formal research) for three years. We've spent time together in workshops, corridor conversations, synchronous and asynchronous online discussions, troubleshooting phone calls during evenings and weekends, and even the odd coffee break.

The difference between our usual way of working together and the way we worked during the timeframe of the study – systematic data collection and analysis aside – was the gentle introduction of the new design process. As before, we planned the use of computer conferencing for the cohort, implemented a plan, made changes as we went along, and so on. But because the process during the study period was shaped by Ertmer's model, we spent much more time in planning discussions, and in particular, we talked much more about faculty associates' teacher beliefs and goals, and how to connect these to the use of technology. This corresponds to Rowland's (1992) assertion that better design comes from more time trying to understand the context before making any design decisions. There was also much more emphasis on encouraging faculty associates to take more control over the online space; not only did they make more decisions, but they did more of the hands-on work to put them into

place. My role during the study was, as it had always been, one of technical and emotional support for these technology-using teachers, but because I have knowledge and a place in the history and context of FirstClass in the PDP, I believe I was able to work more effectively with participants than would a stranger.

However, because of the familiarity I have with participants in the study, it was important for me to consider and address the issue of researcher bias when planning and conducting this study. It has also been important to remain aware of assumptions I had, and those embedded in the design of this study. Both issues will be discussed next.

I came to this study assuming that FirstClass was being used primarily as an administrative and social tool (because of pilot data and informal observations over a long period of time), and that a different design approach might lead to different kinds of use. This made it important for me to participate in and record the design process, but not attempt to control it. While working with faculty associates, I offered suggestions about different online strategies, but they were always connected to faculty associates' previously-stated beliefs and goals, and these were member checked. And, where my ideas or suggestions were rejected – which happened as often as not – I was careful to record these, but not attempt to push them in another direction. It was important that faculty associates made their own decisions.

Another assumption I brought to the study was that a process approach – and in particular, Ertmer's (2001) process approach – was a useful tool to use in this context. A danger in this is looking too hard for evidence of a "successful" outcome of the process (i.e., use of computer conferencing that went beyond social or administrative), or overemphasizing "different" uses that were not necessarily in support of faculty associates previously stated needs or goals, but merely different to what had been done before. To address this issue, I was careful to look for confirming and disconfirming evidence of themes as they emerged, to rely heavily on the participants' words, to code and re-code with rigour and consistency, to member check my interpretations with participants throughout the study, and to collaborate with my thesis supervisors over my interpretations in light of the data.

Chapter Four:
Responsive Instructional Design
in Two Cohorts

FA Mae
Wake up FAs we think we've got something to say to you...
Well it's April Program and you're thinkin' 'bout going back to school.
We know FirstClass keeps you amused, but your car is tired from use...
Oh FAs you couldn't have driven anymore!
You spent a lot of time away from home, so your students wouldn't be alone
You've written so many forms that your fingers really hurt!

I suppose you'll collect your books and get back to school...
Or steal someone else's cue and make a living doing something new.
Whatever you choose to do, we hope happiness follows you...
Oh "Old" FAs we like to say farewell

You made a FirstClass fool out of me,
But we're happy as fools can be...
You stole our hearts and we'll miss you every day!

FAs we wish you peace and happiness (repeat 4X)

Song sung by FA band, "Out of Synch" at April 2004 Program

The above song nicely illustrates a few defining features of the faculty associate community. Perhaps the most obvious is they're a fun-loving bunch; this type of song and performance is the norm at any faculty associate function. Another is they spend a great deal of time running around and doing paperwork in their job (another common target for this community's humour is expense and mileage claims). We are also reminded that, for many faculty associates, the end of the PDP experience is a time to reflect and either return to their previous teaching position in K-12 schools, or go on to something else – administrative positions in schools or in the PDP, further graduate work, and sometimes teaching in other countries. A final aspect of the above song is the degree to which FirstClass has become a part of the community culture and folklore in a few short years. Through the case studies in this chapter, I'll explore in greater detail how technology is used and understood in the PDP culture.

Cohort A: Rita & Nathan

Meet Rita

Rita has taught in the primary grades for over a decade in mid-sized public schools in the suburbs of Vancouver, British Columbia. A self-proclaimed "eclectic practitioner" who is concerned more with students' process than "product" in her classroom; she is a fan of cooperative learning and drill-and-practice, whole language and phonics. She takes care to individualize instruction as much as possible to meet students' needs, and she enjoys watching them learn and celebrating their achievements. Rita believes very passionately that with the right support, all children can learn.

For herself, she loves the variety of opportunities in the teaching profession. There are opportunities to do different things every day, move to different schools, work with different students and teachers, and take on different roles in administration and leadership. Rita finds there are many prospects for rewarding challenges and growth in this profession.

Technology has not been one of those rewarding challenges for Rita. In fact, it's quite the opposite, and her position on this issue is strong and clear: technology resources and support for teachers are not as good as they ought to be, so there's no point in trying to integrate technology into teaching unless this changes.

As a faculty associate, Rita comes across as a spunky, energetic, caring member of the community – always bubbling over with support and encouragement in her dealings with people. She is highly organized, responsible, and detail-oriented, leaving the impression that her many years in teaching, administrative and leadership roles have been successful ones. Rita is very active in the PDP community; she's the first to volunteer for committee work no matter how busy she is, and to bring snacks to the endless parade of food sharing events.

Meet Nathan

Nathan has taught in primary and middle school grades in a suburb of Vancouver for the past fifteen years. He's committed to building in equality and inclusion in his classroom: everyone is treated as an equal and valued member of the class, everyone has many opportunities to participate, and everyone, regardless of ability, experiences success. Play is a very important part of Nathan's classroom – he likes to find ways for students "to learn without realizing it". His motivation for

teaching is simple and something he says he doesn't analyze too much because it's a "heart thing" more than a "head thing" – he enjoys the camaraderie and partnerships with his students as they spend time working and learning together.

Nathan's views of technology in classrooms are mixed. Like many of his colleagues, he feels it is more appropriate in the higher grades, starting with middle school. However, he feels that times are changing, and integrating technology can play an important role where student motivation is concerned. With respect to preservice teachers, Nathan feels that having some technology skill and experience is an asset in today's competitive job market: anything one hopeful applicant can do more or better than another increases the likelihood of getting a job. His own level of computer skill and comfort were evident early in our dealings; he was the only participant who chose to complete all surveys electronically rather than in print, and he had no trouble with tasks like saving documents in different file formats and emailing them.

As a faculty associate, Nathan is a soft spoken, avuncular sort of fellow – the kind most parents probably appreciate having as their child's teacher because he's pleasant, easy to talk to, and never overbearing. He has a quiet, subtle wit, and comes across as more of a listener than talker. We all learn a lot from colleagues at the office Christmas party, and such was my experience with Nathan. A grade four class had come to sing for our festive luncheon, and after their performance, naturally, the room burst into appreciative applause. As noisy as the crowd was, there was one noisier than the rest. I looked over, and saw soft-spoken Nathan leaping to his feet to start a standing ovation, cheering and clapping with more vigour and volume than anyone else in the room. Clearly, he loves children.

Cohort A: The Responsive Instructional Design Process

When we began discussing the upcoming semester, Rita had been using FirstClass for a year in the PDP context. Her previous faculty associate partner was enthusiastic and comfortable using technology, and usually took the lead in decisions and hands-on work in online space. For Rita, the new semester meant working with the same students, but a new partner. Early in our discussions, I asked her how she felt about rethinking, and perhaps extending, the way Cohort A used computer conferencing. Until now, her cohort had been very active online, using the space for everyday communication and exchanging teaching resources. I thought it might be particularly useful to re-examine the way they worked online because the students' situation and needs were changing this semester: they would be off campus on their

39

long practica. This means they are spread out in different schools throughout the Vancouver area, and wouldn't meet regularly as a group as they had done previously. To my questions and rationale, she replied:

> I think we already did a lot with FirstClass, I really do, and given time constraints... I can't see us using it more...

Establishing Goals, Creating a Teaching/Technology Plan

Because the students were entering their long practica, taking more responsibility and teaching for longer periods of time, Rita's goals for this semester centred around preparing them for this new challenge. It was important to Rita that they be able to "take responsibility for the whole day" and keep up with the pace of "real teaching" without burning out. Rita also felt it was essential that preservice teachers gather and share as many resources as possible, on topics like classroom management, lesson planning, and basic "teacher lingo".

Nathan was the new partner in this cohort, joining with them halfway through their program. Coming in to this situation, his first goal was to establish himself in the group, but his other goals for the semester were similar to Rita's in that they focussed on working with preservice teachers as they step into the reality of longer teaching days. He wanted to find ways to support preservice teachers as they "put theory into practice", which, for him means getting a handle on classroom management and realizing "there will never be enough time to learn everything *before* you start teaching, because teaching is a continuing learning process." Nathan wanted to share his own approach to classroom teaching, which he describes as integrating play whenever possible as an alternative to "stand and deliver" instruction. Nathan also felt it was important that preservice teachers confront and work through their "preconceived ideas of what a teacher is, and is not".

For both faculty associates, regular classroom observations of preservice teachers, coupled with the "Weekly Plan" (a reflective and planning assignment submitted online each week) provided the essential window to students' activities and progress. They both saw the Weekly Plan as an important vehicle for supervising students' growth as professionals and practitioners, giving them feedback on their work, and keeping track of the entire process, as well as any "red flags" (areas of concern). In previous semesters, preservice teachers were given print copies of guidelines for writing the Weekly Plans, though Rita confessed they often, "forgot to

complete a section or respond to an important aspect of the assignment, and we had to chase after them for it".

Based on the goals and priorities Rita and Nathan expressed, it was important to continue with the established practice of sharing resources online. I also felt there was an opportunity to extend the types of discussion that occurred online, such as encouraging preservice teachers to share their "stories from the field" as a way of learning from each other, engaging in reflective and supportive professional dialogue on issues, giving each other feedback and ideas, and keeping the community in touch during their long periods apart. Nathan was excited about this idea, and imagined it could be "like telling stories around the campfire". In addition, because the Weekly Plan was so important, I wanted to explore ways to better support it, both in terms of the preservice teachers' writing it, and the way it was sent back and forth to faculty associates for feedback. These three elements (sharing resources, extending online dialogue, supporting the Weekly Plan) were the foci of the Individual Teaching/Technology Plan (ITP) for this cohort.

In the end, we worked with two of the three: resources and the Weekly Plan. The third, extending online dialogue, presented a challenge we would not overcome. Rita expressed concern over confidentiality, and with preservice teachers' ability to cope with the responsibility of upholding confidentiality in a public forum:

> [Preservice teachers] are supposed to behave under the code of ethics...they can't speak about another professional to another colleague [...] we have to be careful. And we have to be careful of... [K-12] students' names and all those privacy issues too. I think teachers who have been teaching for a long time have troubles with that... [,] so I think it would be really hard for the [preservice teachers] to get clear on what they can say and what they can't... if we open that up it may cause more problems for them... there's so much they can't say in that forum because of confidentiality...I would be concerned in opening that up because of all those issues. They'd find it hard.

By the end of August, we began putting the Teaching/Technology Plan into place. Of the two faculty associates, Rita, the senior partner, was the most involved in decision making, and had the power of veto over ideas Nathan or I raised. However, both partners agreed to try an online form to provide greater structure to the submission and return of the Weekly Plan. Students would now respond online to specific writing prompts in an online form, and send it to their faculty associates, who would respond online in visually distinct text so comments could be seen easily.

Figure 8: Online Form - Weekly Plan for Cohort A

Name:	Date:	Week:

1. Looking Back – Reflections on last week:

In what ways did you achieve your goals?

How would you do things differently?

What are you discovering that relates to your Inquiry Project and what is your next step?

2. Looking Ahead – Plans for next week:

What the PDP goal(s) /profiles will you focus on this week?

What specifically will you do in your practice to achieve that/these goal(s) or profile(s)?

What classroom management area/strategy will you try this week?

What assessment strategy (or strategies) will you incorporate into your practice this week? What will it tell you about the students' learning? (Indicate the subject area, tool you will use and any other pertinent information.)

In preparation for the upcoming semester, I archived messages previously posted to the online space to provide a fresh start for fall and created some new discussion areas at Rita's request. These are the types of online management or "housekeeping" tasks I wanted to encourage faculty associates to start taking on themselves, so they could gain a greater sense of control over their online space. Sometimes when I provide training in this area, faculty associates report feeling more empowered when they're able to do these things themselves:

> the more I've learned about it, the more comfortable I am, I'm wanting to learn more, and when you taught me simple things, like how to put my own icons on the desktop, that was very empowering...(Carol)

Some faculty associates describe the online space as an extension of their classroom space, and so managing the online space independently is like being able to control the placement of furniture and the presentation and/or timing of certain information or instruction. In addition to this, my sense was that if faculty associates took more control over the online space, they may start to think about new ways of using it, and perhaps come up with new strategies or online practices that better suit their needs and goals: they would start becoming "designers" of this space. To this end, I spent time face-to-face with all faculty associates before the semester began, training

them how to do simple but common online management tasks (e.g., archiving to keep things current, creating new discussion spaces, setting permissions to create different types of online spaces, and so on). These instructions were also provided to faculty associates electronically. With this procedural knowledge taken care of, it was my hope that we could spend our time thinking about creative, relevant ways to use the online space.

By the first week of September, the Rita and Nathan were making attempts to manage their online space independently, using the training from August. I received a few messages along these lines:

> Help! How do I add an icon to our resources page! After all the training and I can't remember. Help! (Rita)

I provided both the needed instructions and encouragement, and the next day, Rita was well on her way, creating five new online spaces for discussion and distribution of resources, though not entirely successfully. Some of the details we had covered in training (e.g., setting user permissions) were forgotten, but I reminded her of these, and she was off again, making changes, creating things on her own, and making fewer errors in doing so.

Toward the end of September, I followed up on an idea Nathan had suggested in an earlier planning discussion, which was to establish a way for preservice teachers to present themselves online as "human resources" to the rest of the cohort. This is an extension of an activity that they do in class with big sheets of poster paper: everyone writes his or her name on various lists to indicate they're interested in researching and being a resource person for others in the cohort on that topic or issue (e.g., Math resources, classroom management strategies). The idea was to create an area and guidelines for doing this online. We had discussed advantages of putting this information online: it's easy for preservice teachers to log in and access the information wherever they are, the information won't get lost, and the lists can be updated by individuals as they gain expertise in other areas, or change their mind about their interests.

When the idea first came up, we agreed it was a simple, but good use of the technology. I was particularly keen to support this idea because it originated with Nathan, the new partner, but I was also keen to support any changes they initiated, thinking they might start finding other, more pedagogically driven ways to support their work with preservice teachers. In the end, Rita vetoed Nathan's idea:

> The students have all the info they need right now - we have just linked them [in class] to people with similar interests so I think we should leave things as they are...

During the first two weeks of October, Rita continued to take the lead role in Cohort A, and was doing more of the online managing tasks she had previously asked me to do. Toward the end of October, Rita requested that I set up a way to support a new assignment, and to do it in the same way as the Weekly Plan. This development was encouraging for two reasons: the strategy we had implemented earlier (using online forms to structure content and handling of assignments) was obviously working well enough that she wanted to expand it to other areas, and, she was looking at the online space as a dynamic place which she could change as needed.

At the end of October, we revisited the goals Rita and Nathan had stated for the preservice teachers and reflected on the degree to which our use of computer conferencing was supporting those goals. Rita and Nathan's main goals for preservice teachers were:

1. Gathering teaching resources (e.g., ideas for classroom practice)

2. Lesson Planning, creating and sharing lesson plans

3. Accessing and understanding IRPs (provincial curriculum)

4. Understanding "teacher lingo", developing understanding of the professional vocabulary of teaching

5. Taking responsibility for teaching longer periods of time

6. Managing the workload and avoiding burnout

7. Taking risks (e.g., planning, but not scripting lessons)

We agreed that the first four goals were well supported directly through the use of computer conferencing: students were actively sharing resources and accessing information provided by Rita and Nathan. The other three goals were supported through the students' Weekly Plans, which were submitted and returned through FirstClass using the new online form.

At this point in the term, Nathan felt he had overcome the barrier of joining a community-in-progress and was feeling more comfortable about his position in the cohort and his relationships with the students. For him, the online exchange of Weekly Plans was the most effective tool for staying in touch with students in terms of their progress toward meeting their learning goals. In addition, he felt that the ability to

communicate easily and frequently online with the group and with individuals helped him to keep up a supportive presence with students.

Throughout November, Rita continued to manage the online space, and with greater skill than the beginning of term, and much more so than in her first year as an faculty associate. While nothing new emerged in their online practice, she was managing the online space independently.

In December, I invited all faculty associates to share their experiences of using FirstClass with PDP colleagues at the annual December sharing session. I specifically asked Rita and Nathan to discuss their use of online forms, since this was a new strategy they tried, and it seemed to work well for them. They agreed and spoke at length to their colleagues about their experiences using the forms, which led to a number of their colleagues requesting this tool after hearing about it.

Cohort A: Summary & Reflections

The faculty associates in Cohort A participated in the instructional design process, though took almost no opportunities to make changes to their online practice. Changes made were essentially "surface" changes, or variations on things they were already doing, and things that were in the original template design: sharing resources, posting notices, socializing, and assignment submission and return. In spite of invitations, suggestions, and support for expanding online practice, other concerns and priorities won out.

There are a few interesting inconsistencies when comparing Rita and Nathan's survey responses with their choices and actions in practice. First, both describe the main function of FirstClass as a community building tool, and yet opportunities to extend community dialogue were not explored. Second, both Rita and Nathan rate "computers in the classroom" higher on the attitude scale than "computers for professional productivity", yet their actual use is more related to efficiency and productivity. Before and after, the use of FirstClass in this cohort is largely administrative. While I had hoped that the instructional design process might lead to use that was more connected to supporting learning among preservice teachers, the use of FirstClass *does* reflect the priorities and goals set by Rita and Nathan at the beginning – it's just that these were largely administrative.

While Rita, the senior partner, took the lead on decision making and discouraged Nathan's early suggestions to extend online discussions, he accepted her lead in this way as "natural" because she had been in the PDP longer:

I think both Rita and I are both fairly un-technology [laughs] knowledgeable...I think it's natural in [the PDP] when a new person comes in and doesn't know what the heck's happening half the time, they just follow along, so Rita would have taken a bigger role that way, and that's why we laugh about it because she was the 'techno-wizard' in our two.

Because Rita and Nathan's goals were largely administrative, or productivity-oriented to begin with, and because they were successful in supporting these goals in slightly expanded ways compared to previous semesters, I would say the process contributed something to the development of the practical part of their online practice, or their "priority needs", as Woodrow (1991) says. In particular, through the process, we identified a need and a way to improve an important part of practice for this cohort: The Weekly Plan. Rita and Nathan were happy with the online form because it streamlined the process of submission and return, made giving feedback easier, and allowed for easy and accurate record keeping. Rita was also pleased because preservice teachers provided more complete and specific responses than they had done in previous semesters due to the structure of the form. The other successful aspect was Rita's greater skill level and independence in managing the online space herself. If we had another semester together, we may have built upon this and explored other uses for the technology, but Rita's two years are up, and next semester Nathan will be in charge.

Cohort B: Karen & Nora

Retreat

Another moment of listening to the stories of an other.
Stories of pain and injustice. Of rebellion and crisis.
My friend quietly sheds tears.
The past of unspoken hurt and injustice well up, unexpected.
The burdens suffered by her people that have allowed her to be present in this place,
In this role. Today.
She is beautiful. Dignified and quiet.
Tears inform us.
Words will not suffice - I caress her and walk on for I know she is strong. I know she will find her way and it is better this is done alone.
Love always protects, trusts, hopes, perseveres.

The multiplicity of my roles challenge me.
Parent, child.
Mother, lover.
Teacher, learner.
Country, city.
Uneducated, Educated.
Compassionate, Impatient.
Proud, humble.

Love never fails.

--Poem written by Karen following an off-campus retreat with faculty associates. Used with permission.

Meet Karen

Karen has taught primary and middle school for over 10 years in a rural suburb of Vancouver, B.C. She believes in excellence, high expectations, and providing students with an abundance of support and resources to reach those. One of her goals as a teacher is to create conditions where students can experience themselves as authors, scientists, historians, athletes, and artists.

Karen's identity is strongly entwined with teaching – she describes herself as a nurturer and helper, and derives great pleasure from the personal connections she has with students. Karen is deeply committed to supporting students in their struggle toward reaching their individual growth and independence. One of her favourite things is running into former students at the grocery store years later and finding them a head taller than she, bursting with stories of their current activities and future plans.

Being a faculty associate in the PDP has been both rewarding and challenging, professionally and personally. At times she has felt like an outsider and has struggled with the "theory vs. practice" tension that runs beneath the surface of the community. She considers herself equally a teacher and scholar, which leaves her feeling, at times, in a "no-man's land" between the faculty associates and the faculty members. At times she has wished for a better fit with her faculty associate partners in the PDP, and at times the challenges of her particular role and responsibilities in the community have seemed overwhelming and underappreciated.

I first met Karen at a computer workshop I was giving during the first week of her first year as faculty associate. She later told me that during the session she was, "so insecure", and "having a cow" about having to use computer conferencing in her PDP work. And at the time, her frustration was intense, tangible, radiating off her like a heat source. This struck me as quite unusual for this community, which is known for its relaxed atmosphere, easy-going folks, and "soft start times". She rushed up to me at the end of the workshop and spat, "This is a *huge* waste of time"!

So much for first impressions. From that rough start, we embarked on what would prove to be a very rewarding and productive partnership with educational technology use in the PDP through this process.

Meet Nora

Nora is a secondary school teacher, and has taught in a rural suburb of Vancouver for nearly a decade. She describes her practice as community-based, where feelings of connectedness and belongingness create an environment in which students can experience success. Nora's approach to students is to recognize their potential and help them discover and build upon it. She enjoys the process of helping students articulate their goals, and then providing support so they can get the needed skills and self-esteem to reach them. It's important to Nora that students feel their time in school is meaningful and relevant.

Nora is the new partner in Cohort B, and found the transition from secondary school teaching to the PDP to be a challenge. She feels it's such a big job on its own, made bigger by the fact that there is so little written down to guide new faculty associates. She feels simultaneously forced and resistant to depend on Karen for help with all the things she doesn't know – even the language of education and the PDP feel so foreign. As a result, Nora began her PDP experience feeling somewhat isolated, and missing the collegiality and familiarity of the school community she left behind.

Of all the faculty associates, Nora had the most extensive experience with planning and using educational technology in a post-secondary setting. As a part of her Masters degree, she had created an online course, and in her recent work with secondary students, she made extensive use of the web, email, and various software in her teaching. I looked forward to her insight and input, and thought that her fresh perspective might give rise to great new ideas. Unfortunately, like many first-year faculty associates, Nora was quite pre-occupied with all the new tasks of "the impostor year", as they call it, and chose to participate very little in conversations and decisions around the use of computer conferencing in Cohort B.

Cohort B: The Responsive Instructional Design Process

Cohort B began the fall 2003 term with new students and one new faculty associate partner (Nora). The preservice teachers were entering their "blended" semester, where they would spend some time in classrooms observing and assisting a sponsor teacher (School Associate), as well as doing theory/coursework.

Establishing Goals, Creating a Teaching/Technology Plan

Karen and Nora's goals for the semester echoed the dominant forces found in the PDP: striking a balance between theory and practice. Karen knows, "at this stage, [preservice teachers] *only* want the practical stuff." It was important to her to introduce the basics (e.g., classroom management, teaching strategies), but in tandem with theoretical and philosophical ideas about teaching so preservice teachers could "use theories to help understand the process they're going through" and make sound pedagogical decisions in their planning, assignments, and time in the classroom. Based on her experience teaching in the PDP, one of Karen's priority goals is to give preservice teachers more instruction and support on lesson planning, assessment, and the connection between the two.

Actively supporting the process of "becoming a professional" is also very important to Karen. For her, it means being are able to step in to a school and fit in to the culture. It means understanding how to observe and contribute to the school community, taking professional development opportunities seriously, and understanding and respecting the professional code of ethics. For some, the transition between university student and preservice teacher is a shock. It was important to Karen that preservice teachers conduct themselves in a manner that would reflect well on themselves as teachers, and on the PDP.

Finally, Karen was committed to promoting action research in her cohort. Most cohorts either encourage or require preservice teachers to complete an assignment focussed on an issue in their classrooms, but in this cohort, much care is taken to ensure it is "real" action research in terms of appropriate methodology, research design, process, analysis, and reporting.

Nora's goals for the semester were to encourage positive relationships with the students' sponsor teachers, believing this to be a crucial link in getting the skills and resources that would allow them to continue on their teaching journeys. It was also important to Nora that preservice teachers become more confident in the classroom, while understanding the great responsibility of being a teacher. Finally, Nora hoped that each preservice teacher would have an experience this term that would provide a measure of assurance that they had chosen the right profession, and she wanted to create opportunities for them to discuss those with others in the group.

The assignments and activities in Cohort B were extensive and plentiful. Preservice teachers in this cohort were expected to do Weekly Plans, ongoing professional readings, lesson and unit planning, portfolios, and exams. In addition, they were required to write a Teaching Credo (statement of personal teaching philosophy), and complete both a Child Study, and a Video Self-Assessment of their own teaching. The Child Study is a written report of behaviours and performance following close and structured observations of children in their practicum classrooms. The Video Self-Assessment requires preservice teachers to videotape themselves teaching, review and assess what they saw in the video, reflect on it, and have a discussion with their faculty associate and school associate to jointly evaluate their classroom teaching performance.

As with Cohort A, the faculty associate with more experience in the PDP – but less experience with technology – took a much more active role in decision-making around the online space. The process and outcome of working with Cohort B, and in particular with Karen, was very different than with Cohort A. When we began our discussions, Karen, like Rita from Cohort A, had been working with FirstClass conferencing in the PDP context for a year. Unlike Rita, Karen's previous partner was not enthusiastic about technology, and in fact their working relationship in general was very difficult and strained at times. Karen was therefore hopeful that she would find more of a positive, collaborative partnership with Nora, though when we began talking, they had met only recently. This combination of issues may have contributed to the fact that Karen and I developed a strong partnership around the planning and use of FirstClass in Cohort B.

50

From our earliest conversations, I noticed Karen was open and receptive to trying new things in the online practice, in spite of sharing similar concerns as Rita about the implications of doing so. One example of this is the concern about confidentiality that arose for Rita when presented with the idea of expanding how students share their practicum experiences with each other online. Where Rita saw this as a barrier to this kind of sharing, Karen was open to problem solving, because she saw the value in students' sharing their stories openly with each other, and with experienced mentors:

> [this] gives all the students the benefit of reading about the insights and growth of each other's experiences...they ask for feedback or give each other food for thought, [and] it is a chance for faculty associates, faculty Members, and coordinators to also give feedback for all to see and learn from.

At the end of July, discussions turned to concrete plans for the online space for Cohort B. From experience, Karen anticipated that her partner Nora, new to the PDP, would spend much of the first semester of her two-year term just getting acquainted with the new people, procedures, and responsibilities of the job (i.e., the "impostor year"). Still, we discussed the importance of keeping a space open for Nora to contribute to the planning and organizing of the online aspect of the cohort's work once she got into the swing of things.

In August, the three of us worked collaboratively to organize an orientation workshop for the new students. Karen and I worked on the schedule, logistics, and topics to cover, and Nora helped prepare instructions for getting university computer accounts established. Nora received FirstClass training, and spent time in the days leading up to the workshop playing with the software so she would be ready to go when the students came online.

A unique feature of this cohort is the high involvement of their designated faculty member, Dr. Jones. While all cohorts have an appointed faculty member, the level of their involvement varies greatly across cohorts. Dr. Jones was very involved and eager to get online and participate right from the beginning. Karen went to great lengths to instigate and support this involvement, and I noticed some of her early "online design thinking" came through in trying to accommodate Dr. Jones in the online space. For example, she suggested we create a special area for communication between Dr. Jones and the students, and even talked about connecting this to the idea of "shared reflections" or "stories from the field": she thought perhaps students could ask

Dr. Jones, who has a background in special education, for her input and feedback on things they observed or experienced in the classroom. While Karen was thinking aloud about this, she was cognizant of the confidentiality issue (at one point toying with the idea of anonymous postings), but eager to work through it to make it happen because she saw the pedagogical value of encouraging this kind of whole-group sharing and storytelling online.

In the end, the shared reflections area – *Voyages* - comes to life. Karen describes her design of it thus:

> A theme we will use is inspired by the Dr. Seuss book *Oh, The Places You'll Go*. It can be a spot where reflections are posted and responses by all can be added. It will be a public space...we need to emphasize responsibility in terms of confidentiality. I've decided against these being anonymous – it's counterproductive to the ideas we are trying to cultivate about professionalism.

Karen is on a roll now, adding more features to the online space. She wants a live chat room and a calendar (which she intends to manage herself), and a way for students to collaboratively track their professional tasks so they can be fed into their teaching portfolios. And in addition to Dr. Jones, she wants to include others involved with the cohort (administrative staff, Director of the PDP) in the online space, because:

> "Like our classrooms where our doors are always open, all our colleagues are welcome to access our FirstClass space".

She also decides to try the online forms to provide structure to the submission of the students' assignments (see Figure 7). We go back and forth several times on the content and layout of the form because while she likes the idea of it, it is important to Karen that it doesn't become a fill-in-the-blanks exercise. Several drafts are passed electronically, and while Nora didn't respond directly to any of them, Karen informed me it was discussed between them. In the end, Karen decides on a form which reflects not only the learning goals she had established for preservice teachers, but also some of the key PDP goals. In particular, question four focuses preservice teachers' attention on making connections between their actions and observations in classrooms with the PDP dispositions (pedagogical sensitivity, critical mindedness, reflective capacity, and other-directedness). I have not observed such a detailed and specific set of guidelines in any other cohort before or since.

Figure 9: Online Form - Weekly Plan for Cohort B

Do not use real names in your writing.

1. LOOKING BACK

Ways in which I achieved my goals this week:
Connections I made with others this week: (students, staff, student teachers, parents, etc.)
My AHA:
Event or moment to give my FA greater insight into growth and journey:

2. LOOKING AHEAD
The PDP goal I will focus on this week (Please quote a section from goals 1-3):

Specifically how I will achieve this:
Classroom management strategy/routine I tried this week:
Assessment and evaluation strategies I will try this week:
I accommodated different learning styles and needs this week, in this way:
Different instructional methods I used this week:

3. Recall, relate, reflect.

Recall an incident (briefly, this is not intended to be a summary of your week).

How does what you have observed, relate to what you have read or discussed?
Reflect on how this connects to your current understanding of teaching and learning?

I used to think . . . but now I think . . .
I wonder . . .
I learned . . .
I think . . .

4. Connect your observations/learning of the week to the PDP dispositions:

Pedagogical sensitivity -- how has this helped you understand the issue through the eyes of the child, how does this relate to the adult/child relationship of teaching;

Critical mindedness -- consider all the possibilities and options of a potential challenge. Think of it as an opportunity, a challenge, something that is problematic, something to be curious about.

Reflective capacity -- find the interconnectedness of events, how will your actions be based upon your learning of the past, how will you change, how will you gain insight from your observations and experiences?

Other-directedness -- see each incident through the eyes of the 'other.' Consider why someone may be acting in a particular way. Look for the strengths in others.

In addition to the new things she's added to the online space, Karen is also managing it more independently, and with access in mind. She's moving things around, and organizing in an effort to make things readable and intuitive. It's important to her that the preservice teachers are able to draw on it as a source of

material and community support because entry into the PDP is often quite overwhelming for preservice teachers. Karen says they often go through their own "impostor's syndrome – they need reassuring, they feel like they don't deserve to be there". Karen believes that providing them with resources, information, and access to each other may help to ease that.

Our conversations about computer conferencing branch out into conversations about other technologies, and the idea of supporting any preservice teachers who may wish to experiment with things like digital portfolios. We arrange workshops and assistance from various resource people in the PDP and in Cohort B's school district. This further snowballs into an idea about having students set a "tech goal". I liked the idea of a tech goal, and suggested that a useful one might be for preservice teachers to find out what their schools have in terms of technology, and how teachers in their schools are (or are not) using technology. This could lead preservice teachers to understand what roles computers play in schools today, and invite them to think creatively about what they could do with technology in their lesson planning.

While she is hesitant to assign it as a requirement, Karen wants her preservice teachers to think about pursuing technology Pro-D like any other:

> They've got a lot [of assignments] on their plate, and I don't want them to view the tech goal as just another task -- I think we'll keep it informal and I'll suggest it to them as an individual choice. I think we need to keep it really individualized; they are so diverse in where they are at, it's important they seek what they need. I don't want to get into having a mandatory workshop – it seems counterproductive...I really want to promote the idea of professionalism and them seeking what they need.

By the time October rolls around, the online space for Cohort B looks nothing like it did the year before, or even like it did in September, and it's still evolving. Karen continues to revisit the design and add things to support and extend the work they do face-to-face. We add a space for preservice teachers to exchange their polished lesson plans and units, another one for Professional Development opportunities and materials, and yet another for ongoing brainstorming and discussion about preparing to enter their practicum schools – all things that featured prominently in Karen's goals for the cohort. Karen also adds a space for technology-related instructions. In the course of adding these new things, I provided support and some training as needed, but Karen is running the show, and she's pleased with her efforts:

Thanks -- the desktop looks amazing!! I love the level of organization, the access, availability, the potential for student sharing! Looks really impressive I think!

In mid-October, the cohort participated in an iMovie workshop. Karen's plan for this session was to have preservice teachers create a video response to the idea of "Teacher As...", and in doing so, she said:

..."they needed to represent their understandings of the PDP dispositions: critical mindedness, reflective capacity, pedagogical sensitivity, other-directedness through the media of video or iMovie...

Hands-on in iMovie training was provided before the preservice teachers broke into groups to script, act, film, and edit their movies before the "film festival" at the end of the day. Throughout the workshop, Karen was actively participating and gently reminding students to keep the goal in mind and not let the excitement of the cameras seduce them away from the purpose of the exercise. This corresponds to her own increasing use of computer conferencing: she's beginning to use computer conferencing for more explicit pedagogical reasons.

> The workshop now over, the preservice teachers are like race horses bursting out of a gate. Off they go...video cameras, tripods, and papers in hand, rushing to bring their ideas to life on screen. As I wander with my own camera in hand, I see makeshift costumes appear, laughter and intensity. Over here, someone has "borrowed" a fake plant from some office. Over there, they are making good use of the sunny day and an unsuspecting, but good natured passer-by. And over there, Karen sits with a group on the floor, working and laughing with them, asking questions, inviting them back to the purpose of the exercise.
>
> At last, it's show time! The lights dim and we're treated to half a dozen short movies: Teacher as Detective, Teacher as Explorer, Teacher as Artist...they get it. We are wild with laughter and applause and interest in the great variety of responses to the challenge.
>
> *Researcher Field Notes, October 2003*

Nora was noticeably absent from the majority of this workshop, taking care of "impostor year" paperwork. I later learned that she viewed technology as "Karen's

thing", although this workshop was far from a technical "how-to" session. It was definitely designed and conducted as an opportunity for students to represent and share their ideas about teacher identity. As we milled about pushing chairs back to their proper places, Karen mused:

> if you wait until you are ready to use technology like this, you'll never do it, but if you give it to the kids, they're amazingly resourceful. It's a risk for teachers...

Throughout the day, I had the opportunity to observe and interact with preservice teachers and talk about technology in their practicum classrooms. They all told me their sponsor teachers don't use technology in their classrooms, but they thought technology might support different learning styles, and motivate certain students. This is important: they're not necessarily getting this exposure in schools, on their practica.

At the end of the day, I put all their finished movies online for all to view and review. It was an exciting day; the preservice teachers had fun and did wonderful work. They also ended up using the skills again to tape themselves teach, and Karen was optimistic about more use down the road:

> I hope and expect they may do this [filming] in their last week in classrooms and incorporate the iMovie idea (perhaps) as a culminating event! Or perhaps it will come out in 405. We have heard very positive feedback through the portfolios on the [iMovie workshop] experience!

A few days after the workshop, a preservice teacher from Cohort B asked Karen if it was possible to create an online space for coordinating sharing of physical or material resources among preservice teachers. Karen's response to the student was supportive and encouraging, both toward the student and her idea, and in terms of her own confidence and attitude toward the technology:

> ...nearly anything is possible in FirstClass!! Great suggestion about sharing resources. How about if we set up what you suggest in the Reading and Resources section and not in "Social". "Social" is the non-teaching/academic part of what we do. Tracy -- can you set this up?

Two other things stood out for me with her response. The first is, it's evident that she has the design of the online space in her head – she knows where things

should go and why – this is quite different from most faculty associates who haven't built the space themselves, and so don't "own" it in this way. The second is she asks me to set up the new area, which is a task she has done repeatedly and successfully on her own for the past few months. It may be that she wished to involve me in this latest development, but these kinds of requests popped up from time to time from all faculty associates, and I expect more than anything, it's a matter of them appreciating the support available to help them do their very busy jobs.

The collaborative reflection and redesign of the online space continues throughout October. It's apparent that the online space is becoming more strongly connected to their face-to-face work as the changes made reflect the activities, practices, and priorities that occur in their face-to-face sessions. Karen and I have long discussions online and in person about ways to manage the increasing online traffic, organize the online elements to represent priorities and connections, and make accessing material easier. Suggestions I offer are either accepted or rejected for reasons that reflect Karen's beliefs and goal priorities. For example, at one point I suggest separating assigned readings (posted articles and documents) from resources (a public forum where people can post teaching resources, such as URLs, book titles, and so on). Karen decides against this because:

> We don't have very many 'readings' per se [posted online]. And all this stuff is for their professional development and the close integration of theory and practice. I don't think I'd like to see it separate...we want to promote the idea of being generalists...

As our discussions continue, Karen wants help setting up a way to emphasize teaching strategies – this reflects her earlier goal about being explicit about specific classroom strategies as they experience them. Her idea is to create:

> ...a space [for] a description and rationale of specific instructional strategies after we model this strategy in our own [face-to-face] sessions. These are strategies we encourage ST to incorporate into their own planning. Benefits? They see it modelled, they can easily access it when needed, they have the rationale behind when and why it can be useful, they have an expanded repertoire of strategies to include in their planning.

Though she wasn't sure exactly how it would work, she had the idea and the confidence that we could come up with a way:

> I know that FC has way more capabilities than I even know about, if I think of something, you always seem to make it happen!

We did make it happen, and this would prove to be one of the ideas that is picked up by other cohorts when they learned about it at the end of the semester; it's simple, but useful for what they do. It was set up to function like a database, and students could easily print a booklet of all these strategies, in alphabetical order, at the end of PDP.

As Karen continues through October and November to tinker with the online space like an old pro, I notice her skill level has increased dramatically. She's successfully implementing changes with virtually no errors, and doing more and more of them without talking to me about it first. By the end of October, I would have missed some of her work had I not been doing my "virtual rounds" (observations) throughout the online space. She's also developing the attitude many of us who teach online hold about keeping things organized:

> I would love for you to post some hints on keeping things organized. I feel I am 'over-posting' to the site and individuals who aren't so inclined organizationally think I'm too picky -- but it bugs me when things are in the wrong place. It's interesting isn't it, when we see how different people would 'sort and classify'?

More and more, I'm noticing her using the online space as a teaching space. She shapes the preservice teachers' work online around the goals and priorities she set out at the beginning, creating "online invitations" for them to engage in particular, purposeful discussions, share their hard work, plans, and goals publicly, and consult only select resources. Her use of the online space is very particular, focussed, and connected to the bigger picture goals of the PDP she has in mind for preservice teachers.

As with Cohort A, we revisit the goals and priorities for the semester to see how they may or may not support our use of FirstClass. The main goals Karen and Nora stated for Cohort B are:

1. Balance & Connect Educational Theory and Practice

    a. In planning

    b. In tasks, assignments, and time in the classroom

    c. In reflecting on experiences

2. Teaching Strategies: develop familiarity of a variety of classroom strategies

3. Unit Planning

4. Connecting objectives to assessment

5. Timing/Sequencing of learning experiences

6. Professionalism & Professional conduct: develop awareness and provide opportunities for rehearsal

7. Action Research

We agree that many of the goals and activities are being supported by the use of computer conferencing, and that the use of computer conferencing this term is greatly improved over the previous year. There are still a number of important aspects of the cohorts' work and the faculty associate goals that were classroom-based (e.g., Child Study, Video Self-Assessment, exams), and therefore are not reflected online, but our purpose is to find useful ways to support the cohort's work, not get everything online for the sake of having it online.

At the end of November, I was invited to give a talk about "hybrid" or "mixed mode" (a blend of online and face-to-face) teaching and learning at a conference of educational technology leaders in British Columbia. The audience was comprised of administrators, technical support people, computer programmers, instructional designers, and instructors from universities, government and the private sector who were involved in online education in some way. Seeing an opportunity to extend Ertmer's final phase – sharing work with others – I invited Karen to co-present with me, and share her experiences as a teacher in the PDP. While I took responsibility for creating the presentation, we agreed that Karen would talk through a few PowerPoint slides pertaining specifically to the work she was doing with her preservice teachers. I prepared the presentation and sent it to her a few days before the conference.

The convention room is enormous...three stories high and loaded with state-of-the-art technology. The expansive front wall is the projection screen; surely no one has ever presented a PowerPoint presentation *that* large? I notice how strange the language must sound: *wikis, blogs, learning objects!* The keynote speaker, a middle-aged man dressed in business casual, casts a long shadow over his gigantic, corporate-looking PowerPoint and speaks at length about "deploying courses" and "student-consumers". He goes on to reason with the crowd that there is no reason to have more than ONE version of Psychology 100 offered by distance education in the entire province of British Columbia. Basically, why sell a redundant product? I can almost see the hair on the back of Karen's neck prickle; I would later learn that this is the point she started feeling nauseous. It's our turn. Once on stage, she's frozen: her mind blank, and her mouth "full of flour". She feels like a fish out of water here – if she can't relate to these techno-wizards, however are they going to relate to her, a teacher? She manages to talk through her few slides, giving a halting explanation of her unique and evolving work with student teachers, and how they use computer conferencing to extend and support the learning they do together face-to-face. At long last, it ends. Relieved, she slips out of the conference early. She is surprised and a little embarrassed by how challenged she felt by it all – she can't remember being so nervous or feeling so incompetent. Still, she feels it was a worthwhile experience – "it's always good to be stretched..."
Researcher Field Notes, November, 2003

Our presentation that day *was* a stark contrast to most of the others, with its focus on students, teachers, and organic teaching-learning relationships (as opposed to online efficiency and ideas about student-as-customer). It is unfortunate Karen missed the overwhelmingly positive feedback from others at the coffee break: to hear them tell it, it was grounding for the "techies" to be reminded of the human face behind the screens. Several people that day inquired further about our work, and expressed thanks for the message to remember the importance teaching and teachers, and the value of a hybrid or "mixed mode" approach to technology use.

The day after the presentation, I was puzzled to find Karen seemed to revert to a much earlier, lower skill level and was asking me "how-to" questions about basic things

she had been doing independently for the past two months. What had happened? We talk about the conference, which, aside from her nervousness, Karen describes as a positive, professional growth opportunity. In any case, a few days later, Karen is back on track, carrying on as before.

As the semester winds down, I invite Karen and Nora to share their approach to FirstClass with their faculty associate peers. In particular, I hoped they would share the unique practices Karen had developed this semester around supporting teaching strategies, structuring the students' submission of Weekly Reflective Plans, and encouraging students to share their stories from the field ("Voyages"). While Karen was unable to attend that session, Nora and I speak about their work this semester to an appreciative crowd, many of whom immediately request assistance in bringing these same practices to their online spaces.

Cohort B: Summary & Reflections

Only one of the faculty associates in Cohort B – Karen – engaged in the instructional design process. Nora was largely absent from discussions (online and off), decisions and activity around the use of computer conferencing in this cohort. This can be attributed to her position as a new faculty associate, or perhaps to her feeling that it was more "Karen's thing". In any case, the story of Cohort B is Karen's story.

Karen took many opportunities to engage in "designer thinking", to experiment, reflect upon, and refine her online practice. She tried new approaches that she invented herself to extend and support students' learning. She exploited the communicative power of FirstClass to bring others, such as Dr. Jones and the Director of the PDP, into more frequent contact with preservice teachers in Cohort B. She increased her hands-on technical skills and took on the responsibility of managing the online space herself. And, she took risks in sharing her practice with people both within and outside of the PDP community. Her efforts and accomplishments this semester – and the distance she travelled from our first unfriendly meeting – remind me of a comment she made about her belief in excellence:

> I believe in excellence. Not perfection, but in excellence. If you're going to do something, you should do it really well, and to the best of your ability, and I instil that in my students. I have really high expectations of my students, but I don't plunk those expectations on them and expect them to meet them; I find out where the student is at, and help them take those steps...

I hope that she felt similarly supported in developing her skills and thinking by our partnership throughout this process, and I expect she did based on positive comments she made and the tremendous difference in her attitude and approach to using FirstClass compared with her first year. In terms of advancing online practice in the PDP, there were two broad goals or themes for Cohort B, which we were successful in supporting through specific online strategies. Many of these concepts were designed by Karen herself, others we collaborated on.

1. **Promoting Growth as Reflective Practitioners through...**

   a. ***Voyages***: a space for open dialogue among preservice teachers, faculty associates, and other invited guests (e.g., Dr. Jones, other faculty members with specific expertise) about significant classroom experiences. Preservice teachers volunteered (or were invited by Karen) to post their experiences and reflections on things that occurred during their practica, and other responded with questions, suggestions, comments, and support. This concept of "open reflections" was one I wanted to try, having seen the rich reflections being submitted privately to faculty associates in all cohorts. It was pioneered in this cohort, and inviting others (Dr. Jones) to share in the process was Karen's idea.

   b. ***Reflections***: submitted privately to faculty associates using online forms to provide structure for students' writing of reflective assignments. The online forms were a manifestation of the assignment itself, and were developed carefully to ensure students were addressing and making connections to specific the PDP goals, as well as demonstrating purposeful choices around strategies for assessment, classroom management, etc. The practice of using forms in this way was new to the PDP, but not unique to Cohort B. However, the forms for Cohort B became increasingly specific and robust, after several passes back and forth between Karen and I, and collaboration among Karen and Nat.

2. **Promoting Development as Teaching Professionals through...**

   a. ***Stepping in Schools***: a place to collaboratively prepare to enter and conduct oneself in classrooms. Students and faculty associates brainstormed ideas for making their first steps into classrooms successful: How can they prepare? How can they contribute? How can they help their sponsor teacher? How can they fit in as quickly as possible? Together, they identified information they needed to get (office procedures, routines,

schedules, school policies, etc), relationships they needed to build (with students, sponsor teacher, parents, principal, administrative staff), and other issues to be aware of (establishing their credibility, their professional and legal responsibilities). Then, they found and shared answers where possible, and brainstormed strategies for addressing other issues. Creating a space for this was Karen's idea, and was one of those things I would have missed had I not been watching the space carefully.

b. **Strategies**: works like a database of classroom strategies – all are posted in alphabetical order by name (e.g., jigsaw, KWL, think/pair/share, journaling, debate, carousel, etc). Descriptions of strategies and rationale/suggestions for use were added to this area by Karen once they have been introduced and experienced by preservice teachers in class. Students refer to this area when planning their own lessons. Many cohorts share strategies online, but the idea of designing it to work in such a way (connected to the classroom experience, and presented in this specific format) was Karen's idea. It was one of several things she had in her head, and simply needed help to make it work.

c. **Tasks**: a shared record of all professional tasks and activities done throughout the program which could be usefully highlighted in professional teaching portfolios. Again, this was an idea Karen developed. The purpose was to support the creation of teaching portfolios, and she wanted a way to help students identify useful experience they had which could be highlighted.

d. **Readings & Resources**: emphasis on collecting and annotating professional resources. This is a common practice in all the PDP cohorts, but one thing that stood out in Cohort B was the emphasis on professional/theoretical readings; there were more of these than links to curriculum resources, which is unusual, but relates to Karen's commitment keeping theory at the forefront, in spite of preservice teachers' desire for practice tips and tricks at this point in their program.

e. **Lesson/Unit Plans**: a repository of lesson and unit plans created by preservice teachers in Cohort B, usually with commentary on how the lesson went for the author. Like the Readings & Resources area, this is a common feature of all the PDP cohorts, but in Cohort B, the emphasis was on lessons

and units created by preservice teachers rather than those culled from elsewhere (general websites, etc).

These approaches to FirstClass, new and modified, reflect the kind of small but relevant practices that can emerge when effort is put toward planning and design that connects practice to faculty associates' goals and beliefs.

Chapter Five:
Resultant Themes

The purpose of this study is to explore a different approach to planning and using computer conferencing in the PDP in an attempt to understand the needs and perspectives of faculty associates, and hopefully, to discover different uses of computer conferencing for current and future practice. To accomplish these goals, research attention was paid to faculty associates' computer skills and attitudes, teaching beliefs and practices, and specific teaching and learning goals for their cohort. Also, before and during the fall 2003 semester, faculty associates were supported and encouraged while they planned and taught with computer conferencing in the PDP. Qualitative research methods were used, and several themes emerged from the case studies described in Chapter 4. These themes provide insight to faculty associates' experiences with technology in the PDP, and both support and challenge existing literature seeking to explain the key factors related to teachers' choices and uses of technology in their teaching.

Theme: Teaching Partners & Technology

What's up, FA?
You're here for a short stay!
--Rap lyric, sung at April Program, 2002

"Your FA partnership IS like a marriage"
--From, Survival Tips We Learned from our FA partners, a list compiled and presented at April Program, 2002

Faculty associate partnerships in the PDP are very important; all faculty associates describe them as one of the most defining features of their PDP experience. For most, they are respectful, productive partnerships and fertile ground for collaboration and growth in the art and science of teaching. For some, they are all that and more, as deep personal friendships take root. And for others, these partnerships can seem like an unhappy marriage: at times cool, and unconnected, or even confrontational and frustrating. One way or another, they mentor 32 preservice teachers, though the degree to which they do this together varies greatly. For two of the

three pairs in this study, strong and respectful working partnerships were evident. In both my private and three-way conversations with them, faculty associate partners expressed a personal and professional admiration for the other person, and a strong desire to continue working together. There was a clear sense of shared values, teaching beliefs, and goals and expectations for their preservice teachers. In the third cohort, the partners had developed a way to share the workload, but didn't seem to present a united front – they split up the 32 preservice teachers and each worked mostly with their own 16.

One reality of the faculty associate job is captured well in the short rap lyric above: it is a short stay. It's two jam packed years, with the first being the oft-confusing "impostor year", and the second being the year when, as faculty associates often wryly note, they finally figure out what's going on, just in time to leave. In most cohorts, only one partner is new, thus enabling mentoring and apprenticeship by an experienced partner.

Assertion: In faculty associate partnerships, the responsibility for technology decisions falls to the senior partner, regardless of their technology skills or attitudes.

Faculty associate partnerships have a great deal of influence over the way technology is used in the cohorts. In all of cohorts I worked with, the senior partner was in control of technology decisions and managing the online space, regardless of her computer skills or attitudes. For example, Nathan, the new partner in Cohort A, demonstrated higher computer skills early on and was eager to try different things, including the idea of "shared reflections" among preservice teachers, but was overruled by Rita. And Nora, the new partner in Cohort B, had much more experience using technology in teaching, and was all but absent in any planning or decisions around technology. Karen talks about Nora's absence, and the tension she felt between wanting to "leave a space" for Nora, and wanting to finalize plans:

> You know I have to say that [Nora's lack of participation] is something I've been struggling with because I've been waiting and creating space and not being dominant you know what I mean? But I sort of got to a point where I just have to pick up the ball here and do it, there's been a few things where I've made a decision on things where I'd really like to consult, and I will consult but I've just gone ahead on a few things recently where I've made decisions about things, the *Voyages* [shared reflections] was one.

It's easy to imagine how the momentum of technology use (or any practice, for that matter) can be passed from generation to generation of a cohort, or disappear in a single generation. Consider Cohort B: Karen was the innovator and decision-maker with respect to technology, and developed useful practices that supported learning goals and activities of the cohort. However, Karen is on her way out. Nora will soon be the senior partner, and without having been actively involved in the technology practice for the cohort, what will happen once Karen is gone? Also consider Cohort A. Two generations ago, this cohort was led by two faculty associates who were very excited about using technology to extend the activities and discussion that went on in face-to-face sessions. But as they left and others replaced them, the use of FirstClass changed, becoming more focussed on exchanging resources and less focussed on discussion. Today, we find very little online discussion in Cohort A.

Theme: Computer Ability & Attitudes

Assertion: For faculty associates, neither high computer skill, nor high computer self-efficacy is essential for using technology in pedagogically meaningful ways.

In all cases, faculty associates' self-reports of their computer skills and my observations of their skills are consistent. Faculty associates tend to describe themselves as highly skilled with email and the Internet, less skilled with certain features of Word processing (e.g., using tables, putting text into columns) and with PowerPoint, and even less skilled with tasks like creating spreadsheets, websites, and databases. However, for the type of work they currently do in the PDP, including their work with FirstClass, basic email and Internet skills are enough.

Figure 10:   Technology Proficiency Self-Assessment
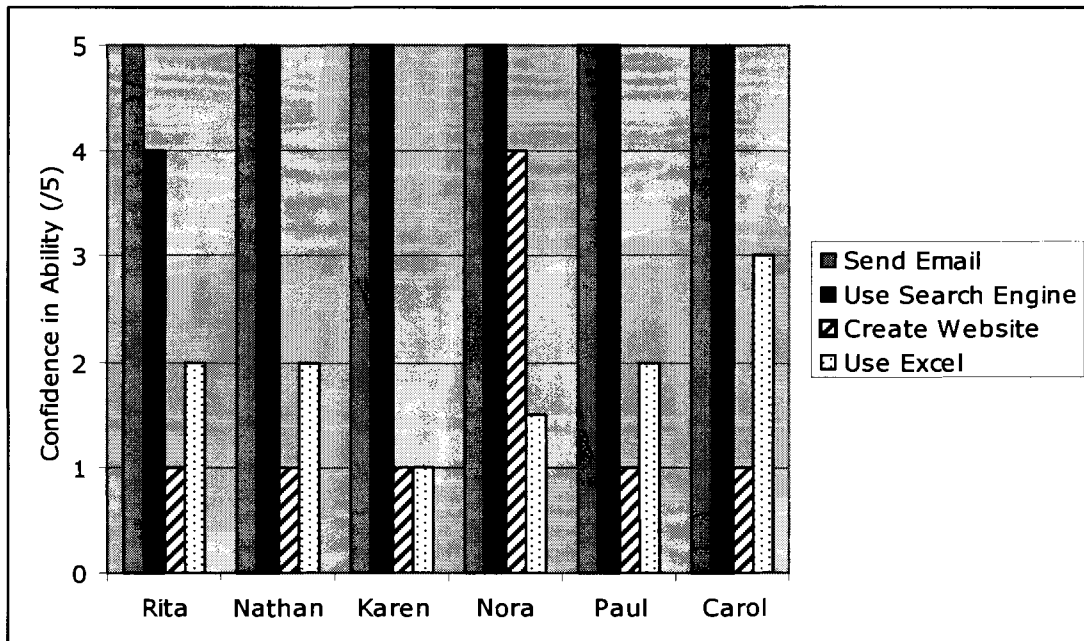
It's also interesting to note how faculty associates arrive at their skills; none seem to take courses or "tinker" with computers for fun or interest. In fact, all participants describe their technology learning as something that occurs on a "need-to-know basis", and no more:

> I don't know all there is to know about computers, I don't think I ever will, but I need to know what I need to know to help me do what I need to do, and that's it...(Nora)

✦✦✦

> there's things I've learnt[....,] and there's things I think I could figure out if I wanted to do them, but there's other things that I haven't a clue how to even start, so technology and the use of technology is something that I'm not particularly skilled at. I guess it's all relative. I don't feel motivated. I guess my only motivation for learning how to use it is if I need to use it, so just to go out and figure out how to do something for the sake of doing it, isn't something I'd do... (Karen)

Most faculty associates seem comfortable with their current level of computer skill for the work they do, and in the PDP, there is no pressure for them to upgrade

skills beyond their current proficiency with email and the Internet. Only Paul seemed concerned about his skills; he explained that for him, technology is like an egg:

> It's an egg that's hatching because my sense of using technology is quite fragile because I don't understand. I might break it, it's not going to work, or [...] achieve what I want it to, and it's hatching, but I don't know what it's going to hatch into. Not like there's a cute little yellow chick popping out; I don't know **what** it's going to be. I don't know what's inside...

This metaphor communicates a sense of unseen potential, but much more concern, and even anxiety, that it's all going to fall apart. And for Paul, the most fragile part – the shell – represents his own ability. He describes fear of embarrassment arising from incompetence: "[the egg] breaking has to do with me not knowing how to use it", or fix it, if something goes wrong:

> I don't know how to fix it if it's broken, so there's a level of incompetence, if I'm going to start something and it breaks and I don't know how to fix it, then it's not helping me, it's like doing a PowerPoint presentation[...] what if the machine doesn't work? It's embarrassing, I feel stupid, and is it worth all that?

This metaphor also illustrates how low computer self-efficacy can lead some teachers to avoid using technology. Concerns over first-order barriers (broken equipment, things outside the teachers' control) can present too great a risk for busy teachers. But for Paul, the main thing may be that he doesn't have a clear picture of the possible benefits, even if the machines do cooperate. Coupling this with concerns about his ability to troubleshoot problems, the more compelling choice for teachers in Paul's situation might be to adopt a "hands-off" approach.

But this is not always the case. Karen, who describes her computer skills as quite low overall (except for email and Internet), does manage to use technology in meaningful ways in her PDP and K-12 classrooms. It's important to note that the technology she chooses includes – but is not limited to – email and the Internet. In other words, she finds ways to go outside her own skill set. In the PDP and in her K-12 classrooms, she draws on the support of others to create situations where technology can play an important role.

In her K-12 teaching, one thing Karen does is "hire" a student to be responsible for equipment at the computer station, to be the class "tech expert". But this practice is

not as much about technology as leadership, responsibility, and most importantly, addressing specific needs of a student:

> I have a program called the 'leadership program'. I would have teachers in the school post little jobs they wanted done, and I would take students through the process of writing a resume and applying for these "jobs". One of the jobs was the computer assistant, and the student was in charge of maintaining the computers to the level that they could. So if something broke or the printer wasn't working, the kids and I would ask the computer assistant. The [school...] tech person would also come in once in awhile to teach [the computer assistant] something new...[This] is a really good example of [technology] integration because he was learning a life skill [...] I can still see the look in his eyes and how into it he got. He was a bit...'flat' is a bad description, but it was hard to get a spark in him. Once he got this 'job', he had a really significant, real, responsibility. Man, he just stepped right up to the plate! He was the kind of kid where responsibility issues were always a bit of a problem, you know, homework, taking care of things around the classroom, pitching in and doing his part [....] I remember meetings with his parents about the homework issue, his parents were totally frustrated [...], but once he started doing this job, in all areas of his academic and school life, he became more responsible. It was like we 'plugged him in': this was for him. He went on to do a Science Fair project on how to develop a web page [...]. I had NO idea how I was going to help him with that, I didn't help him that much, except to give him the structure of how to complete the Science Fair Project ...but he did it [...and] got a gold at the Science Fair, and a couple special awards. I submitted it to this special technology award from the BC Superintendent, and he won! He was the best in BC, and he ended up with this $5000 computer and all this video stuff, it so great! And then he mentored the grade 6 student who was going to fill his boots the next year. It's pretty cool...

Another thing Karen does is join forces with the librarian at her school to support students' assignments and research projects with high quality Internet resources. The librarian locates relevant material and makes it available to students on a website created for that purpose. Karen values this support a great deal, because it saves her and her students time and trouble, and can support at-home parental involvement, too. And while she agrees that it is valuable for students to learn Internet search skills, it's not always the time; sometimes, they just need appropriate information and the librarian is there to help. Creating a website like this is something Karen doesn't have the skills to do herself, but she sees the value in having it, and simply finds a way to make it happen because she has a pedagogical purpose in mind. Unsurprisingly, Karen describes herself as a "general contractor" when it comes to

working with technology: she's not necessarily the one who "does" technology, but the one who coordinates others to "do technology":

> Like a general contractor, I make sure I call in the best experts – it's about picking the right people and coordinating them, and coordinating them in such a way that students are ready to hear it, and will benefit from it…it needs to be timely and timed right. Like anything, it has to be relevant.

This general contractor role implies a hands-off approach and a heavy reliance on support. And, the emphasis here is on pedagogical purposes; it's not about the technology. In spite of describing her computer skills as low, Karen is nonetheless planning and designing learning opportunities with technology, drawing in others when needed to make up for her lack of skills (with hardware and creating web sites, in the examples above). We can hear the teacher, or "designer" in her words: technology must be used in such a way that it is relevant, well timed, and beneficial to students' learning.

The fact that teachers like Karen do find meaningful ways to include technology without being highly skilled or highly efficacious users suggests that computer skill and computer self-efficacy may not be essential to meaningful technology integration, as some of the research in this area would suggest (e.g., see meta analysis by Larner & Timberlake 1995). Furthermore, for faculty associates using FirstClass in the PDP context, the skills they have and are confident in having (email and Internet) are the skills they need. So in a sense, computer skill and computer self-efficacy for FirstClass are constant across participants, and we must look further still to see what may have inspired differences among their choices and decisions.

Assertion: Faculty associates' attitudes toward technology don't seem related to their tendency to use technology and/or to use it in pedagogically meaningful ways in the PDP; the ability to see technology as a tool with pedagogical potential is more important.

All participants expressed fairly positive attitudes toward technology as a tool for productivity and classroom use, and two were particularly enthusiastic. Half of the participants reported slightly higher attitudes toward technology as a tool for productivity than classroom use, and there are important caveats for the latter which arose in interviews. In addition, there were some interesting differences between attitudes expressed on paper and those expressed elsewhere: in most cases, faculty
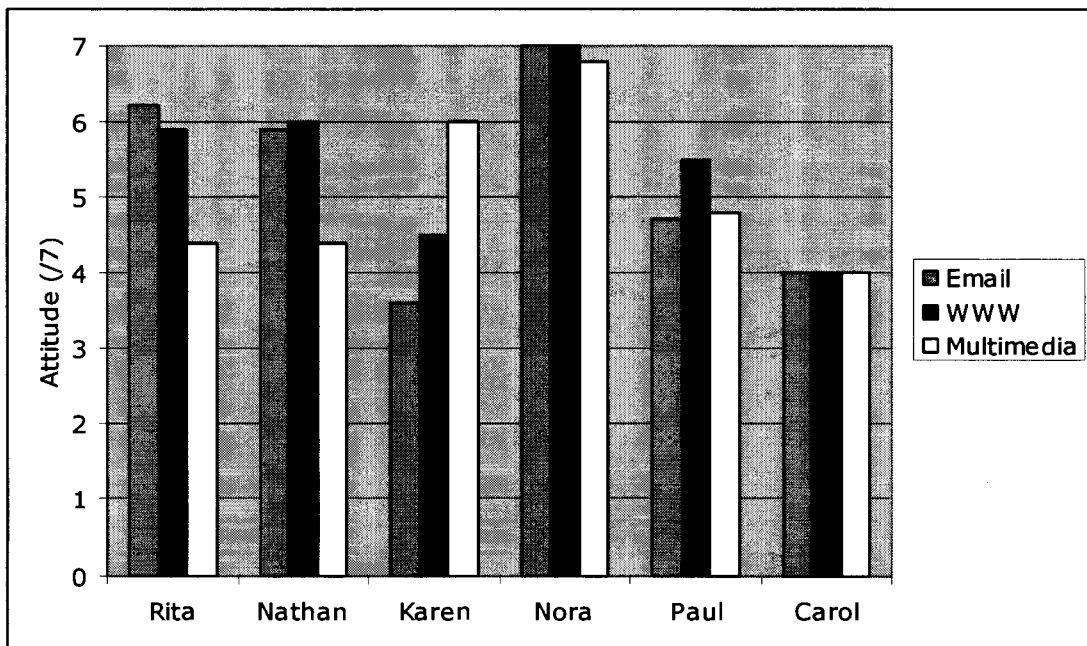
associates report higher computer attitudes on surveys than they do in discussions or in the actions and choices they make.

Figure 11:   Attitudes Toward Technology: Using Computers
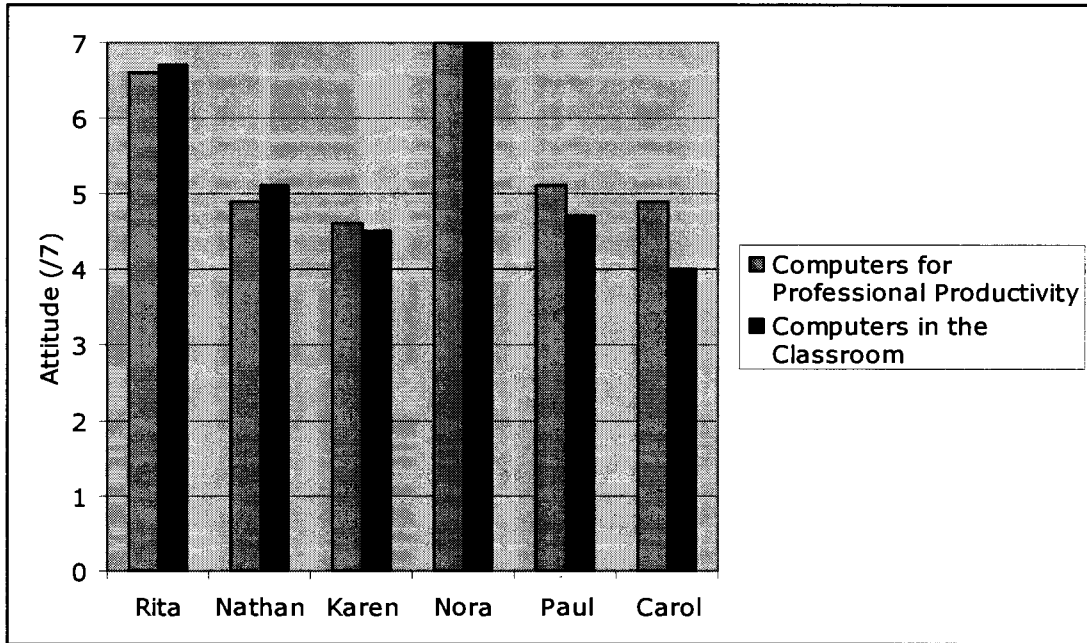
Figure 12:   Attitudes Toward Technology: Three Common Types

With respect to using technology in the classroom, it is interesting to find lower scores on subscales involving "interest" and "engagement" in using technology. For example, the most and lowest scores appeared on the fascinating/mundane and interesting/boring subscales for using technology in the classroom and using technology for productivity. This suggests that faculty associates may not find using technology particularly exciting or engaging, which was hinted at earlier in comments about only learning what was needed to function, but no more. This lack of personal interest in technology makes pedagogical relevance that much more essential for faculty associates:

> [...] relevance and purposefulness is big for me. This is a medium and it's the process and content that matters. [...] it's what you're saying, not how you're saying it [...,] learning how this can become more relevant and more purposeful is important, and I haven't seen it in application yet. What I've seen is a very unsophisticated use of email in the classroom that sort of undermines their purpose; they become games, reward-based opportunities...
> (Paul)

When discussing classroom use of technology, the four of six participants who expressed positive attitudes qualified these in terms of grade levels, saying that it is less appropriate to use technology in elementary grades than middle school or high school. Similarly, all faculty associates seemed more comfortable with the idea of using technology in the PDP, and saw this as quite different than using technology in their own K-12 classrooms:

> ...I have to say as an FA working with [preservice teachers], I see a lot more application and I am more excited about using technology or learning how to use it **with** student teachers. [I have] way more commitment to that and excitement about it than I have been about being a teacher using technology with my Grade 6's or Grade 5's. I really wrestle with, 'why I would use it with my students and what is its place?' I'm not convinced. I see neat things and neat programs, cool stuff, and research opportunities on the web – that kind of thing, but I'm not convinced of its place in an environment where I see my focus as getting kids ready to research, read, and write independently of artificial mechanisms to aid them. So I'm always wrestling with that[...] I'm not saying there isn't a place for this, but I'm not convinced it's the elementary school... (Carol)

◆◆◆

[...] when I think about relevance in the classroom it needs to be related and purposeful, so when I think about email and using computers in the elementary classroom...they almost have no reason unless you generate one in my opinion...(Paul)

For some faculty associates, there seems to be a gap between how they think about using technology in their (K-12) classroom and what goes on in the PDP. They all seem to like the idea of technology in the PDP, but only Karen and Nora seem to feel this way about using technology in their K-12 teaching. But faculty associates are chosen to mentor preservice teachers specifically because of their K-12 teaching expertise and experience. But for many, their teaching expertise and experience don't include using technology:

...you don't know what you don't know. To think about applications of technology in my [K-12] classroom, I don't have time to be inventive! But if someone shows me stuff that sparks an interest and an application in me, then I would use it... (Paul)

Most importantly, like skill level, attitudes toward technology don't appear to be strongly related to actual use. In Cohort A, Rita and Nathan (particularly Rita) expressed quite high attitude ratings overall, and favoured using computers in the classroom more than computers for productivity, and yet their actual use was limited and far more geared toward productivity (i.e., "administrative" use, efficiency, and convenience). And in Cohort B, Karen expressed some of the lowest attitudes toward technology on all subscales and yet, she did the most with it. Furthermore, Nora expressed the most positive of all attitudes toward technology, and yet did almost nothing with it in the PDP. So here again, like computer skills, attitudes toward technology itself may not be as important as some studies would have us believe in terms of understanding how and why teachers use or avoid technology in their work with students.

Relationship between ability, attitudes and using technology

In this study, the relationships between ability, attitudes and actions around technology use vary among participants. All participants have, at most, basic computer skills, yet some manage to integrate technology in creative and meaningful ways in their K-12 teaching and in the PDP, while others don't. For some, the technology itself, and the anticipation of problems with it, lead to avoidance. For others, they find ways to make it happen with support from others. So, it seems that having high levels of

computer skill and/or positive attitudes toward computers may not be that important when it comes to making decisions about, or actually using technology in teaching. There must be other important factors at play.

Theme: Teacher Belief

The complex relationships between teachers and students become uncertain in the face of microcomputers [...] I mean only to say the obvious: Classrooms are steeped in emotions.
(Cuban, 1986)

Assertion: Beliefs about the importance of human relationships in the classroom can seem threatened by the idea of using technology in teaching. However, technology seems less threatening and more familiar when perceived in symbolic or flexible terms – as a tool, a space, or a strategy – for achieving pedagogical goals.

The role of teacher belief has long been an area of interest for researchers who try to understand why teachers do the things they do. Many researchers have made the connection between teacher belief and any number of classroom practices, including using technology (e.g., Annand, 1997; Mullen, 2001). Ertmer (2001) claims that teachers' beliefs play a key role in how they use technology, and suggests it's essential to find ways of using technology that match or support their beliefs about teaching – a good fit in this way will lead to successful practice supported by technology.

Cuban (1986) defines teacher beliefs as "working theoretical models that guide decision making regarding how to present content, how to teach skills, how to build student confidence, and a dozen other 'hows' of teaching" (p. 93). The pedagogical culture in the PDP is characterized by beliefs in student-centeredness, collaboration, constructivism, diversity and respecting individual differences, and the ever-present forces of theory and practice. For most faculty associates, the "hows" that Cuban (1986) talks about are accomplished largely through relationships and connecting with students on an individual level:

> I really come at the work I do through relationship, that is the connection that's important to me...I think it's the relationships we build that set the groundwork for success. There are a lot of things you can teach, but when you have a productive, respectful relationship, you can go a lot further than that... (Paul)

For some faculty associates, this belief in the human connection can create dissonance when trying to reconcile it with using technology. Rita, who expressed high

75

enthusiasm for the idea of using technology in the classroom in surveys, shared a very different perspective when discussing it at greater length:

> ... what's important in education is that child/teacher connection, so all that stuff [technology] is extra, and it's nice, it can enhance and enrich, but it's not the foundation, it's that personal connection that you have to make...

Carol describes a sense of risk or trade-off she may not be willing to make; she sees potential for using computers in teaching, but the cost – time away from other things – seems too great:

> There isn't enough time to develop what I think the "great things" computers and technology have to offer without taking away from other things I feel need the time.

Teacher beliefs, such as those related to the teacher-student connection, and what constitutes important curriculum goals, can present challenges for teachers when it comes to using technology in their classrooms. Beliefs, in other words, can act as barriers to meaningful technology use. And in an effort to preserve these beliefs (or leave them unchallenged), teachers who do use technology may feel it important to keep its role minimal, using it for only simple, administrative things.

Rita and Nathan from Cohort A are a good example; their use of technology was largely administrative. In discussing their teacher beliefs, both stressed the importance of relationships with students, meeting individual students' needs, treating everyone as an individual, and giving each student an equal voice. It would seem that asynchronous online communication would be a useful tool for supporting the goal of giving each student an equal voice. Both Rita and Nathan recognized that potential – everyone does have a voice in FirstClass – but the type of voice becomes important. Everyone has an equal chance to "speak" online, but as "designers" of these spaces, it's important for faculty associates to create particular kinds of invitations which lead the online dialogue in different ways. In Cohort A, invitations for sharing resources and socializing were in place. Community building was expected to occur through this type of online interaction, but invitations to dialogue or engage in deeper group discussions about issues beyond those things weren't created in the online space. According to Rita, the main problem was confidentiality. Perhaps she harboured deeper concerns about the use of technology in her teaching, or perhaps she simply doesn't see technology as being *for* that kind of learner and discussion support – in her description

above of what's important, we can see she views technology as an add-on, not part of the foundation.

Barger & Barger (1982) have suggested that "teachers are unaware of the humanizing possibilities of the computer" (p. 14). These possibilities, they argue, involve promoting autonomy (i.e., information literacy means independence from the "technical elite"), individuality (opportunities for self-paced learning), rationality (computer can support higher-order and critical thinking), affectiveness (excitement or motivation around using computers), responsiveness (communication with others), and creativity (multi-media, and time to do off-line creative things because the computer can manage the drudge work) (Barger & Barger, 1982). Granted, the Bargers wrote nearly two decades ago, and some of the early, excited promises of computing in education have been tempered with time. But on the other hand, all of their assertions – which all reflect important teacher beliefs – have found some support in research studies over the last several years. But their main point then, which remains true for faculty associates' today, is teachers may not have experienced these possibilities in their own classrooms. More to the point, I think, is that teachers haven't discovered, or been shown, how technology need not interfere with their beliefs at worst, and could, at best, even support them.

Looking at Cohort B, many of Karen and Nora's belief statements were concerned with performance, measured growth, achieving individual potential, but there were also strong statements around community building and the development of individual concepts of competency. There were more clear links forged between beliefs (which were also connected to goals and learning outcomes) and the use of the online space, which may be why Karen was motivated to learn and do more with it; she saw that it could be used in such a way that supported her teaching beliefs and goals, including fostering relationships in her cohort community.

Relationship between teacher belief and using technology

Teacher belief alone may not tell us all we need to know about how a teacher will respond to invitations to use technology in their teaching. The important thing may be whether teachers can, at least, see technology as something which doesn't interfere with deeply held beliefs about teaching. At best, they may be able to see how it might support their beliefs. Cuban (1986) discusses how teachers often view technology as synonymous with entertainment, which diminishes it in their eyes as a means of legitimate support for teaching and learning (p. 61). I also suspect that faculty

associates view technology as a tool for delivery based on their experience with certain educational software packages; it's a way to "shovel" content or information. In the current climate of constructivist and student-centred classrooms, and particularly in the PDP which is deeply concerned with these issues (and, for the most part, against "transmission" pedagogy), it may be that technology is seen to interfere with important beliefs, because of the kind of tool it's perceived to be.

Theme: Perspectives on Technology Use - Infusing, Integrating or Incorporating?

Assertion: Pedagogically meaningful uses of technology are possible when it is integrated into teaching and learning goals and practices. Incorporating, or "adding on" technology leads to simpler, more administrative use.

The Director of the PDP has raised the question of different relationships with ICT implied by the commonly used terms, "infuse", "integrate", and "incorporate" (Stephen Smith, personal communication, March 10, 2004). It's a good question worth exploring through a closer examination of the words themselves.

Infusion implies "filling", or "steeping" in something, often a liquid, to extract the content or active principles (Oxford, 1992). *Integration* suggests combining all parts into a whole, a joining or unifying of key elements into a cohesive "one" (Oxford, 1992). *Incorporate* denotes adding something "as a part or ingredient", to something else already in existence (Oxford, 1992).

In the PDP, the model for technology has been one of "infusion", an approach whereby technology and support are placed in the environment, thus creating subtle invitations for people to choose. It's "filling" or "steeping" the environment with technology possibilities. This has proven to be a useful model for elective *adoption* in this context, because in the PDP, as elsewhere, people value and enjoy the academic and personal freedom to choose how to accomplish their work:

> People are dead against having technology imposed on them by the powers-that-be. They resent the addition of technology when it comes from an outside source. It's like the programs you have to use to do marks in K-12: people hate it! Not all faculty associates are keen on technology; they don't see the potential, or the value. (Nora)

"Integration" and "incorporation" are closer cousins, and seem more related to the way technology functions in the teaching and learning context: both terms suggest

active *use*. Since integration implies combining into a whole, and incorporation implies an add-on, we ought to be chasing integration, or use that joins or *unifies* key elements of something already in existence: teaching and learning. This distinction is critical if we are to move toward pedagogically meaningful uses of technology. If we incorporate, or "add-on" technology, we might focus on skills, provide an optional email list or a teacher-controlled website with links to resources, or use PowerPoint to present lecture notes. Nora describes the way she and other faculty associates think about the role of technology in this same way – it's an "add-on" for reference:

> Integrating [technology]...what do you mean? I think you **use** it, as another resource, it's another reference. I don't think you integrate it, I think you refer to it, it's more 'here's what it has to offer if you know how to get around in it'..., so I wouldn't say integrated, I'd say [it's]...a tool for reference

Rita's definition of integration reflects a blend of what I've called "incorporation" and "infusion" – there is the "add-on" of using PowerPoint (instead of the blackboard or overheads), and there is the presence of technology in the classroom:

> [integrating is] when, you're using PowerPoint for most of your presentations, and you've got all sorts of things set up in your class, the computer is used on a regular basis, by the students at the back, there's probably one or two in the classroom

But if we integrate technology, we create structure around the use of it to advance teaching and learning goals: it's connected to learning outcomes, it supports process, and it facilitates thinking. Paul talks about how he understands integration in this same way:

> I see the integration of technology as a means to support learning. Using technology is logging in to Reader Rabbit and Kid Pix. They're using it, they're in the room and the computer is on, does it have an application or implication for learning in the classroom? Maybe, maybe not. Whereas it would be a more focused and connected use if it were integrated into what you were hoping to achieve. How are you trying to support learning? Not learning about technology, but supporting the curricular areas...

As we will see, these different perspectives on *what technology is* and *what it's for* seem to have a greater impact on how teachers use technology than their computer skills, attitudes, or even their computer efficacy. Psychologists talk about the idea of "functional fixedness" to describe a person's persistent view of the utility of an object.

For some, a hammer is for hammering nails and nothing more. For others, it could be used to prop open a window, ring a bell, or even stir soup. I would argue the greater the flexibility teachers have in the way they view the functions – or possible functions – of computers in their teaching, the further they can move away from incorporation and toward integration.

Theme: The Self-Efficacy Connection

Ertmer's (2001) Responsive Instructional Design model attends to computer self-efficacy issues by focussing on teachers' feelings (barriers, concerns, etc) and previous experiences with technology, and by providing opportunities for vicarious experiences through sharing. Computer self-efficacy is also supported by the presence of an instructional designer who acts as a go-between where capricious computers are concerned, buffering teachers from basic, but frustrating technical problems.

But the instructional designer also plays another, even more important role in self-efficacy that has not been articulated clearly in the literature: self-efficacy related to being a *technology using teacher*, one who designs instruction using technology to support pedagogical goals and knows s/he can. For participants in this study, having higher computer self-efficacy didn't necessarily lead to using technology to support teaching and learning, and indeed, why would it? It seems more important that it's perceived as a tool for such things, not just a tool they can use. Perhaps the most powerful part of Ertmer's (2001) model is it connects teachers' beliefs and goals to technology use by creating supported invitations for teachers to start acting and thinking of themselves as teachers who design instruction, activities, assessment, etc, with meaningful (connected and supportive of pedagogical goals) uses of technology. Teachers who are able to thoughtfully and purposefully plan and use technology in these meaningful ways – and *know* they can – have a different kind of efficacy that is more than computer self-efficacy. I'll call this "designer" self-efficacy.

Computer self-efficacy and designer self-efficacy were evident in participants' experiences and decisions in this study. Examples of both types will be examined next.

Computer Self-Efficacy, Empowerment & Action

Assertion: faculty associates may feel more or less efficacious as a result of technology experiences, but high computer self efficacy doesn't necessarily lead to using technology, or using it in pedagogically meaningful ways, nor does low computer self-efficacy necessarily lead to avoiding technology, or using it in simple, administrative ways.

Computer self-efficacy, or how one feels about one's ability to successfully use computers, appeared to have some impact on how faculty associates felt about computers, though their feelings and subsequent action (or inaction) was not what I expected. For example, Carol said learning new things made her feel empowered and want to learn more, but she didn't pursue this desire in the period of study. On the other hand, Karen had an experience which challenged her computer self-efficacy, and her skills (temporarily) fell apart. But, she kept going with it.

Carol describes feeling empowered after receiving additional training in FirstClass. Increasing her skills, she says, made her feel good, and motivated her to learn more:

> Last year I felt overwhelmed. But this year it's changed for me because the more I've learned about it, and more comfortable I am, I'm wanting to learn more, and when you taught me simple things, that was very empowering, and I thought, 'oh, it's not a huge mystery, you just have to know how to do it and have someone to show you'[...]. I'm way more motivated to learn more and I'm actually looking forward to sitting down and doing things, not because I have to, but because I really like the way that looks and I want to figure it out.

Receiving training, learning new things, feeling good about one's increased skills, and feeling motivated to continue is a precise description of the computer self-efficacy cycle. The assumption is that efficacious people will continue and do more on their own. However, this wasn't the case for Carol, and in fact, all faculty associates continued to ask me to do things they knew how to do, right up until the end of the study. Bandura (1994) explains that "motivation is regulated by the expectation that a given course of behaviour will produce certain outcomes and the value of those outcomes." (p. 73). In light of Carol's cautious comments about the use of technology throughout the study, it may be that in spite of feeling efficacious, she wasn't convinced of the value of doing more with technology for her teaching. Had she felt more convinced of the pedagogical value of doing more with technology, she might have done so.

Karen's experience with the conference presentation is a good example of what Bandura (1994) refers to when he says that self-efficacy can be undermined "if failures occur before a sense of efficacy is firmly established" (71). The experience at the conference wasn't a failure in the sense that technology went wrong, but it was difficult for Karen in terms of how she felt about her computer ability relative to others there. For months prior to the conference, she had been working with increasing skill,

independence and was feeling good about how technology was supporting her work with preservice teachers. In the weeks before to the presentation, she was feeling fine about her small speaking part, and even on the day she wasn't nervous. Once we arrived, she found people she knew from her work in the PDP and her school district, and enjoyed coffee and conversation with half a dozen folks. But once the presentations began, she started feeling sick:

> I felt like a fish out of water, like there was no one there I could relate to. I felt like a stranger in a different zone. Despite that, I'm glad I did it, it stretched me, but I've never been so nervous...nervous because I felt incompetent...

And the next day, she was making errors and asking for instructions on the most basic of tasks she had been doing herself for months. Had her computer self-efficacy been diminished? She's far from incompetent, but found herself in a crowd of people whom she did not view as peers. She said they were "techno wizards", and "in a different zone" than she was in terms of computer skills. Ultimately, she did not view them as teachers, like she is. At the conference, she explained:

> Elementary and secondary teachers are very exclusive to each other; they keep to themselves and their world...

I found this comment interesting; she describes a divide between teachers and technology people, and places herself with the former group. Even though she had been using technology as a tool to support her teaching, when placed in this context, it seemed to her to be more about the technology than the teaching. I suspect that her computer self-efficacy was weaker than her designer self-efficacy, which is to say she sees herself as a competent teacher, but because of her lower skills, she has developed a "general contractor" approach where technology is concerned. The conference experience may have challenged her computer self-efficacy and she temporarily "forgot" some of the things she learned.

So, while this study supports the notion that computer self-efficacy can make things more or less pleasant for users, it seems unwarranted to claim that high computer self-efficacy will always lead teachers to use technology, or to use it in pedagogically meaningful ways. In the same way that being able to use a pen doesn't guarantee you will write anything, much less beautiful poetry, being able to use

computers doesn't mean you will, much less in such a way that usefully supports teaching and learning.

Designer Self-Efficacy

Assertion: Designer self-efficacy – the belief that one is able to plan instruction with the meaningful use of technology – is the most important factor in teachers' likelihood to use technology, and to use it in pedagogically meaningful ways. High computer skills and/or positive computer attitudes aren't necessary or sufficient for designer self-efficacy.

Designer self-efficacy is related to one's perspective of what technology is and what it's for: teachers who view technology as a strategy, method, or "space" for achieving pedagogical goals tend to have higher designer self-efficacy. Those who view computers as administrative or productivity tools tend to have lower designer self-efficacy. Computer skills and attitudes aren't that important, because the focus is on teaching and learning, and technology merely represents a way to support these.

Karen appears to have the highest designer efficacy of all participants. She was also the most vocal about her commitment to drawing on established educational theories, and balancing these with practice in her teaching. It was a frequent topic in our discussions, and manifested itself clearly and consistently in the assignments and requirements for her students. Perhaps because she was so concerned with connecting theory to practice, with demonstrating this connection and requiring her students to do likewise, it was easier for her to do the same thing when connecting theory to practice when thinking about using technology. The challenging conference experience seemed to have a minor and temporary impact on her computer self-efficacy, but her designer self-efficacy seemed strong throughout the study in her words and deeds.

Karen shared a couple examples of integrating technology she felt were pedagogically meaningful. The first was an innovative use of digital photographs an email she had seen in another classroom; the second was the use of audio taping in her own classroom.

> Last year I was observing a kindergarten classroom where that teacher, I felt, really integrated technology into her classroom. [...] She was a very close observer of children, and [...] she would take digital photographs of the kids in different play centre situations, and take verbatim notes of what they were saying in those play scenarios. Then she would transcribe [her notes], take the digital photo, and send them to parents [via email], these wonderful little snapshots of what their kids were doing throughout the day!

And then she would do a little debrief to explain what it meant from her professional opinion. [...] One that really stuck in my mind was this little boy and little girl sitting on the carpet with building blocks making a castle. You could see they were really engaged with playing with each other, and the little girl was saying, 'and the castle is clean and she can't get out because it's very dark, and oh, the dark, it's going to be very dark, and she's very scared'. This is how the child was playing: she was the princess in the castle and there was this little blurb underneath about how they were going to watch a video in class and one of the kids said, 'oh don't turn out the lights, I'm scared of the dark'. So they talked about it in class and decided that out of consideration of that child's feelings they would leave some of the lights on so it wouldn't be too dark to watch the video. She said often, children will work out this sense of fear through imaginative play, so you can see how they are working through this sense of getting used to a natural fear that a kid would have of the dark through their play. So in a way, she's educating parents, giving them snapshots of what their kids were doing throughout the day, I would eat that up as a parent, I would love that if I saw pictures of my kid doing stuff and building stuff...

Karen is excited about this kind of technology use. She sees it as a way to document, to explore meaning in the classroom, and to build bridges with parents. This is the kind of idea about technology integration that could easily and usefully be passed on in the PDP. It's simple, it requires little equipment and skill, and it serves important purposes. It's also a good example of the vicarious experience Bandura talks about; I believe the exposure to this idea supports Karen's developing designer self-efficacy because, while she hasn't yet done this practice herself, it opened up one more new way for her to think about technology use in classrooms, and it is something she plans to do when she returns to her K-12 classroom.

In her K-12 classroom, she makes use of audio recorders to tape children reading. Again, it's simple, and it's done for important reasons:

...this isn't high tech or anything but when I taught grade 3, my teaching partner and I would audiotape kids reading. We'd audiotape them twice in a reporting period, just a short little thing. They had to choose a piece that was challenging but not frustrating, and we'd listen to how sophisticated and wonderful their reading had become. If you listen to the progression from September to June, it's amazing. Each kid had their own little audiotape and they LOVED it, and the parent helpers helped facilitate that, they'd go out in the hall and do their thing, and so we'd have this audio documentation, and it became like a little memento for them.

Carol also talks with some excitement about the creative process of "doing design". She describes her relationship with technology like cooking, and talks in exploratory, even playful terms; we get an image of "mucking about" with things. There is still a feeling of the unknown and the possibility of failed promises, but there is also a sense of optimism in terms of how it will turn out in the end, with practice and support:

> you get a new cookbook and you look at the picture, and you think, oh, that looks really good, but it doesn't always turn out as good as you hope. You hope it will look as good as it does in the picture, so you try different things or you try again, so for me it's like computers. I know I'm not an idiot, there's lots I can do, it's just new and I have to start at the beginning, and as I learn more about it, I get more competent and more creative and willing to explore and build on that confidence"

For Carol, the cookbook picture is an idea of what might be accomplished, and the various attempts at the recipe is the design process. In her metaphor we also see how computer self-efficacy may support designer efficacy for those who are not general contractors, but independent chefs.

Faculty associates relate to the idea of "designing" instruction and teaching/learning situations – it's what they do as teachers. But the idea of themselves doing *technology-supported instructional design* is more foreign. And it seems to be more than semantics; some describe planning and using technology in teaching as somehow separate or different than "teaching", whereas others see a link more clearly:

> I resist the idea of ['instructional design'] because it lacks the heart of teaching, which is relationships and people...it's distant from that... but it's really the 'instructional' that's the problem...I'm OK with 'designer', because it's creative, like a composer... (Karen)

<div align="center">✦✦✦</div>

> [An instructional designer is] someone who formats instruction in a way so that it achieves the outcome [...] figuring out how to get a message across: design a lesson, plan a lesson, use whatever materials and equipment, take into account the needs of the learners...it's what teachers do... (Paul)

The distinction between seeing oneself as a designer (or planner, or composer, etc.) of teaching and learning environments and one who does that with technology is important if we are to support teachers to think of themselves as capable in this way. It seems faculty associates more readily see themselves as designers in the PDP than in

<div align="center">85</div>

their K-12 teaching because of all the planning they must do in the PDP without the kinds of guidelines they receive in K-12 teaching (i.e., IRPs).

> I look at myself as more of an instructional designer here [in the PDP] than there [K-12]...here I had to start without knowing what the curriculum is...

Faculty associates are most hesitant to say they do instructional design with technology, often because they don't see themselves as "technology people", and in spite of actually doing it in the PDP by anyone's definition. Clearly, they make decisions about if and how preservice teachers use technology, and they invent ways to have technology support the work they do. And, in many cases, they even do the hands-on, online, button-pushing themselves.

Theme: Barriers to Change

Assertion: All faculty associates experience either or both first- and second-order barriers to technology integration. First-order barriers tend to lead teachers to avoid technology, or use it as an "add-on". Second-order barriers can lead to pedagogically meaningful uses of technology in teaching.

The literature has identified a number of so-called "obstacles" to the integration of technology in teaching, including problems with equipment, support, and time, teachers' beliefs and preferred instructional practices. As a way of understanding these obstacles, Ertmer (1999) draws on the work of Bickner (1995) who built upon the idea of first- and second-order change discussed by Cuban (1993) and others to "categorize these obstacles as first- and second-order *barriers* to change" (p. 54). First-order changes are those which "adjust current practice to make it more effective or efficient, leaving underlying beliefs unchallenged [, whereas] second-order changes confront beliefs about current practice and lead to new goals, structures or roles" (Ertmer et. al, 1999, p. 54). Therefore, first-order barriers are described as extrinsic to teachers: problems with access to hardware and software, lack of time and support. Second-order barriers are described as intrinsic to teachers, and include beliefs about teaching and computers, preferred ways of teaching, and receptiveness to change (Ertmer, 1999, p. 54). Both types of change and barriers emerged in this study, and, like Ertmer (1999), I found first-order barriers to be mentioned often and first: every faculty associate had stories of disappointment and frustration when attempting to use technology in their own K-12 teaching.

First- and second-order changes and barriers are useful tools for thinking about the dynamics of integrating technology into teaching, though in practice they may not be as separate as the dichotomy would suggest. But for the moment, they provide a useful distinction with which to explore how faculty associates think about technology. Both types of barriers emerged from the data in this study, and will be discussed next using the first- and second-order barrier dichotomy to organize them.

First-order barriers

First-order change involves adjusting current practices, usually to increase efficiency or productivity, and don't challenge underlying beliefs about teaching (Ertmer et al., 1999, p. 54). In terms of technology integration, first-order barriers are thought to be "extrinsic" to teachers: problems with equipment, a lack of time, or inadequate support. Before coming to the PDP, faculty associates experienced many first-order barriers which influence the way they think and make decisions about technology in the PDP context. And during their experience teaching in the PDP, other first-order barriers were reported. These will be discussed next.

1. Hardware & Software Problems

Rita and Nathan commiserate about their experience with the most commonly-cited first-order barriers: problems with hardware, software, or support:

> Nathan: I can speak firsthand about computers: when you go into a lab in an elementary school and if you're not so [technically] inclined half the time there's something wrong with them, it's often more trouble than it's worth

> Rita: I think the bottom line is, unless teachers have those resources at their fingertips in their classroom, they don't get infused, they don't get integrated. So we are limited...

> Nathan: and we are doubly limited in terms of being in elementary. Most of the elementary labs are nowhere near on par even with what's in secondary schools.

> Rita: and they're broken all the time. Something's down...

> Nathan: and there isn't the expertise to keep it going

Rita: so as a teacher, you're always have a back up plan, when your computer time is slotted because 90% of the time, there's a problem, and you may be able to use it, and you may not. That's very frustrating.

Indeed, these first-order barriers appear to be present in many K-12 classrooms – every faculty associate I spoke to related similar experiences with the same tone of frustration. In the PDP context, however, problems with access and support are rare. Particularly for an on-site cohort like Rita and Nathan's, there is an abundance of technology resources and support available: a wireless network, portable laptop carts, digital cameras, video cameras and video editing equipment and expertise, a video library, a large, well equipped teaching lab with two huge projection screens and ceiling mounted projectors, and so on.

In spite of all this, first-order barriers stay with these teachers, shaping the way they think about and approach technology in their teaching. They seem to have had so many bad experiences with technology that they've left little room for it in their K-12 teaching, and they bring that perspective with them to the PDP.

2. Lack of Time

Another problem often cited in the literature that appeared in this study is the issue of time, and it manifested itself in two ways: new faculty associates need time in their first semester to learn how to use computer conferencing, and all faculty associates lack time to "be inventive" about any technology use in the PDP.

With respect to getting started with computer conferencing, it's clear that most teacher educators go through a period of adjustment. For most, this is their first experience using computer conferencing in this way. And for many, they have only recently purchased their first personal computer, usually a laptop, because of their new job in the PDP. Experienced faculty associates told me their first year was overwhelming – they spent too many hours at the computer and found it very frustrating and tiring. But by the middle to end of their first year, they had worked out strategies for using and understanding technology use in the PDP context:

Last year was my first introduction to FirstClass and I got my [first] computer, and I found it really bogged me down last year. I think part of that was my lack of experience, I felt too available…and I didn't set boundaries for myself so I always had my computer on and every time I walked by my office at home I would be checking to see if there was a red flag…I created a scenario where I was constantly attached to [it]…then … I

realized, 'I'm not doing this', and I started to set healthier boundaries...I stopped checking every 10 minutes... [it's] hugely different this year... I still check a couple times a night, and I won't leave a reply because it's really important to me that I respond, but I don't necessarily do it the moment it comes to my computer, because I know I could be out tonight, and I need that to be ok, and [preservice teachers] need to know that's going to happen... Yes, so boundaries are very, very important... (Carol)

This lesson is passed between the experienced and the new partner. Because of Carol's experience, Paul already has his ideas about the technology clear in his mind in the first few weeks of his first year:

We talked about it with each other and with [preservice teachers] ...that we didn't want to create a dependence, to be at their beck and call and respond to everything, we agreed on it, and I intend to stick to it because there aren't enough hours in a day, there are red flags on my computer that have probably been there since August, but they'll have to stay...

The other issue – time needed to be inventive with technology – is more complex than setting personal boundaries. For many faculty associates, this represents the kind of second-order work that "confront[s] beliefs about current practice" (Ertmer et. al, 1999).

To think about applications of technology in the classroom, I don't have time to be inventive. But if someone shows me stuff that fits and sparks an interest and an application in me, then I would use it, [but not] unless I'm exposed to it ... exposure is important, you expose people and they take from it what they want... (Paul)

3. Previous experiences: Computer Labs in K-12

All participants reported negative experience with computer labs in their experiences teaching in K-12 schools. Indeed, the "lab mentality" in public schools necessarily creates school-wide competitions for time and resources. And because teachers are expected to fit their instructional time into the lab schedule (instead of vice versa), many simply don't bother trying.

the worst thing is you plan to do something and then you don't have the technology. And that happens in the schools all the time...in a school, half the stuff [computer equipment] doesn't work, so you can't rely on it, you always have to have a back-up plan...if you go down to the computer lab in an

> elementary school and you're trying to do a multimedia presentation, you know, PowerPoint or whatever you're going to try to do, and the computers are down and no one is coming to fix it for like a week...you can't do it...that kind of thing happens often in the labs (Rita)

For those who do attempt it, they are frequently met with scheduling problems, old or faulty computers and a lack of support in the labs. Another problem with labs is the typical room arrangement (everyone in rows, facing the wall) and activities (individual vs. group) don't reflect their preferred teaching style. Also, there is often an inhospitable "gatekeeper" involved with technology labs, whose job, it seems, is to make access and use of the facility difficult. In many cases, lab time is perceived as either free time or play time, or the equivalent of shipping students off for babysitting.

4. Preservice Teachers' Abilities

One of the best examples of an insurmountable first-order barrier was Rita's concern over confidentiality. Her worry that preservice teachers couldn't manage to uphold confidentiality in online discussions limited the way she thought about using technology. For her, it was a high-stakes issue (professional ethics), and, it rested on things outside her control (the discretion of 32 people). It was as too great a risk, and so many topics of significance in this cohort could not be discussed online, and the focus of the online space remained administrative: simple communication, assignment submission, and resource sharing.

Second-order barriers

Recall that second-order change involves a shift in current thinking, beliefs or practices, and second-order barriers reflect challenges to these. In terms of teaching with technology, second-order barriers are considered to be those which are "intrinsic" to teachers: beliefs about teaching, beliefs about computers, established classroom practices, and feelings about change (Ertmer et al, 1999, p. 54). In this study, two closely related second-order barriers emerged: low confidence in the pedagogical value of technology and uncertainty about the role or purpose of technology. Both have implications for how technology is used in the PDP, and will be discussed next.

1. Low Confidence in Pedagogical Value of Technology

> I can never, ever find anything on the Internet that is as good or better than what I can create myself! (Karen)

The frame of reference that many faculty associates have regarding educational software is "Drill-and-Practice" or "Instructional Game Software" (Bitter & Pierson, 1990). "Reader Rabbit" and "Kids Pix" were two pieces of software mentioned by all participants – these are found in their schools and have been tried by all participants at some time. No faculty associate I spoke to had a high opinion of these software packages. Paul told me his students seemed to enjoy working with educational software, "but in the sense that they love to fiddle" and have time in a new environment (the computer lab); he didn't think it served any pedagogical purpose. Karen complained bitterly about the cost to implement educational software when books would serve students so much better. Though she does not use this kind of software in her own teaching, she had experience with it that came very close to home:

> my greatest opposition to…[software] like SuccessMaker, or Accelerated Reader, or Reader Rabbit … [is] they become substitutes for instruction, and I think, not very good substitutes…[my child's] teacher really used Accelerated Reader, but she didn't give reading instruction – **that** was her Reading time and there's no opportunity to teach kids if they make a mistake. So [my child] would come home and have this little slip of paper that said, 'congratulations, you passed this test by 50%' and I'd say, 'you got 5 wrong, honey, what happened?', 'I don't know', 'what kind of questions were they?', 'I don't know', 'what were the questions?', 'I don't know'. There's no opportunity for correction or instruction, so it's really not helpful and really not motivating for kids, especially those who struggle in that area… As an educator, I oppose that kind of instruction because it's not done well.

It's important to remember that these sorts of attitudes, experiences, and opinions are passed on to preservice teachers. While most faculty associates admit that using technology in the classroom "sparks interest", they tend to question the pedagogical value of this kind of software, which represents so much of the technology use in their experiences in K-12 schools. It becomes easier to understand why teaching preservice teachers about technology integration may not be a priority for them in their roles as teacher educators in the PDP.

2. Perceptions of Purpose: What are computers for?

...consider the beliefs that many, but not all, teachers hold about television, radio and films as entertainment media and therefore somewhat tainted as teaching tools. Excessive use of televised lessons or films, for example, casts suspicion on the teacher as being less than professional or simply scratching for filler material. Such beliefs leave little room for gracious and warm reception of technological guests into the classroom.
(Cuban., 1986, p. 61)

Perceptions of the purpose(s) of technology are potential second-order barriers because they are beliefs or ideas internal to teachers. When perceptions of purpose are flexible and symbolic (computer as a space for dialogue, computer as extension of the classroom), the more likely teachers will engage in thinking about second-order change, and the greater the potential for creative and pedagogically meaningful uses of technology. Where perceptions of purpose are rigid and mechanistic (computer-as-megaphone, computer-as-filing-cabinet), the more likely teachers will focus on first-order change (and barriers), and the greater the potential for simple, administrative use.

Computer conferencing in the PDP is perceived – and used – in different ways, which reflects the flexibility of the tool and the thinking of the people who use it. Generally speaking, faculty associates approach computer conferencing as an administrative, communicative and community building tool. Less often, it's approached as a "pedagogical" tool, or a tool which supports specific pedagogical goals. Below are the common perceptions of technology emerging from the data in this study.

Technology as an Administrative or Productivity Tool

Computers do offer some obvious advantages in our everyday working lives; most of us use them to manage routine tasks quickly, easily, and with less paper. This type of use has been a mainstay in the PDP since FirstClass was introduced. All faculty associates agree that the ability to "take care of business" is a valuable contribution of computer conferencing to their work. For some, it's a poor substitute for the "real thing" (face-to-face contact), but it works to support a community which is perpetually time-poor and often separated:

> I would say [the use of FirstClass] is limited to receiving [preservice teachers' assignments and exams] and getting a response back and forth...there was an opportunity to be collaborative in this medium. Would it have been better in person? I'm inclined to think yes. Was there the time to

do that? No. So we were provided opportunities to maintain collaboration around their assignments and exams that we wouldn't have had because of time constraints... (Paul)

<p style="text-align:center">✦✦✦</p>

I love FirstClass, it made things very efficient [...preservice teachers] would put up a message and others would respond to it, and it didn't have to be [my partner] and I responding, which is really nice because we kept trying to get that across to them: we all have knowledge and different bits of knowledge we put it together and we figure it out. Use all your resources, so they really started doing that and they took ownership of it which was great [...] and they were putting up important websites that they found really helpful, and they coordinated their interests and information for one of the assignments – that was really good. (Rita)

Nora shares the view of technology as a resource, though she also describes it in more symbolic terms: for her, the Internet and FirstClass are like a bunch of rooms full of information. In those rooms, she's a visitor:

There are lots of rooms, lots of spaces to visit. I might stay longer in some places, lingering there if I find something interesting. But I have to be strategic in choosing where I go, what I will take away, where I spend my time. I'm a visitor here, a guest, a learner, and I'm looking for value, for information. I'm not a builder or creator here, I might contribute, but don't create because I don't have access to do so.

The idea of designer efficacy comes up again here because Nora doesn't see herself as someone who can create in that space – she visits (reads), she may contribute (send messages), but she doesn't look at her contributions as *creating* the space. Teachers who think of themselves as architects of these fora are more likely to use them to build in very specific support for learning processes.

The different ways Karen and Rita handled concerns about confidentiality in sharing classroom experiences is a good example of the ways perceptions of technology can shape its use. Karen saw technology as a potential space where important sharing and dialogue could occur, and was willing to work through the confidentiality issue. Rita expressed concerns that preservice teachers couldn't navigate the confidentiality issue, which is a first-order barrier (something outside of her control), but another way of looking at it is she simply doesn't view technology as a place to dialogue meaningfully, but rather a tool to disseminate information and resources.

Technology as a Communication & Community Building Tool

By far the most frequent use of computer conferencing in the PDP is day-to-day communication. For Cohort A, it didn't go much beyond this, which perhaps can be attributed to the way Rita seems to think about technology – it's for supporting communication and administrative tasks:

> We use [FirstClass] to build community, and handle the direct, individual questions...I see it for both things, it builds the community through that sharing of resources and general questions [....] And of course it's that communication between me and the student directly, you know the [assignment] Drop Box, or just a message they send to make me aware of something...keeping me up to date, me keeping them up to date. I see it mainly for those two things... [FirstClass] really created a sense of community when we're not physically together [...] that was really exciting – people still felt like they were together.

Some find it goes beyond the everyday, and into more personal sharing and community building:

> It's also become a lovely medium for people giving feedback to us and each other which I think has been quite positive: gestures of appreciation, gratitude, and caring... (Carol)

Technology as a Pedagogical Tool

While the utility of the communication functions of computer conferencing are a given, it's the way teachers intentionally structure the communication that can turn it into a pedagogical tool:

> When we did use technology, it was [done] very consciously for our purposes – it achieved a learning goal we had in mind, and whether or not we were fully confident about it or capable with it, we still used it to complete a purpose. That fits under the idea of a design; it's an intentional use... (Paul)

✦✦✦

> I see [FirstClass] as a tool to achieve group work, it's a strategy to foster communication, community, clarification opportunities [...] I guess I regard it more than a strategy, it's 'instruction', isn't it? Designing instruction is about using different structures and different strategies, and community, communications, opportunities for clarification are our outcomes... (Carol)

94

Paul and Carol invited preservice teachers to share their personal teaching credos with the group as a way of increasing awareness and confidence in their developing ideas in educational philosophy:

> Many struggled with [writing credos] because in their first year they weren't sure about their philosophy of education or how articulate it....We invited them to post their credos [publicly, online] and a lot of them did, and the feedback was really positive, they made a connection about how they approach something...so their awareness was not just directed to us by handing in an assignment, they were sharing them in a public area... and the more people shared, the more they were willing to share, once they realized they were closer to their developing awareness than they may have anticipated...(Paul)

In Cohort B, Karen developed several ways to invite certain kinds of purposeful sharing online that supported the learning goals of the cohort and challenged preservice teachers to grow and help each other grow as professionals. Theory and practice were equally represented in the online space, and students were constantly challenged to contribute in both ways, and to integrate the two.

In her creation of the *Voyages* space, Karen invited responsible sharing among preservice teachers and the participation of others who could mentor them and help them make meaning. The way she structured the online form for the submission of *Reflections* required preservice teachers to make and demonstrate connections between theory and practice issues, and, along with *Tasks*, they were encouraged to get into the habit of steering their professional development by having to set goals and record strategies and achievements. The *Stepping in Schools* area was a useful way to learn about school culture and prepare preservice to enter schools as proactive, contributing professionals rather than passive observers. *Strategies* gave students a bag of practical teacher tricks to dip into, but only once they had experienced and understood the strategies in class, and the *Readings & Resources* material provided its theoretical counterpart. Similarly, the *Lessons and Unit Plans* area gave teachers more material to draw on for their own teaching and planning, but the emphasis here was on preservice-teacher created material that had been assessed by faculty associates and deemed to be high quality.

Each of these definitions of technology (administrative tool, community building tool, and pedagogical tool) is a legitimate and accurate way of describing at the role computer conferencing in the PDP. It's one or more of them in varying degrees across all cohorts. Ideally, we will see more pedagogical uses of technology in the PDP, but

this seems to depend on bringing second-order barriers out into the open and into discussions.

Theme: Responsibility

Recalling the distinction between "infusing" and "integrating", where the former describes technology's presence in the physical environment, and the latter describes its application in the design and day-to-day teaching/learning activity and processes, how do "infusing" and integrating" come about? Who is responsible for "infusing" and "integrating" technology in the PDP?

It would seem that responsibility for infusion, or the gentle provision of technology in the environment, rests upon the PDP; technology is a resource like any other, to be provided to members of the community for use in completing their work. But in a community where teaching practice isn't legislated, responsibility for integration necessarily falls to those who plan and implement instruction: faculty associates. The only problem is, they don't necessarily see it that way. Some insist technology is an important issue, but someone else is responsible for it. And others suggest it's not really that important, either itself, or relative to other things they must accomplish in the PDP. The position of the Director of the PDP is they wish to hire faculty associates with technology "with-it-ness", but when that doesn't happen, the support should come from elsewhere in the Faculty of Education: courses or sessions in the computer lab. (Stephen Smith, personal communication, March 10, 2004).

The fact that faculty associates don't tend to see themselves as the ones who are or ought to be responsible for teaching preservice teachers how to effectively integrate technology into teaching says something about how they view technology and the role it plays. For those who would have the PDP take responsibility for this kind of instruction, the implication is that using technology in teaching is somehow different or separate from teaching, or at least the kind of teaching they do, so it falls outside their duties as teacher educators and onto the program itself to advance this type of practice. Faculty associates plan and deliver instruction on teaching in the content areas and classroom management, and they do these without being told how to do it, but somehow technology is different:

> I was happy following the way it was as far as computer use... people follow what's there, how it's done. So, the onus is on the PDP to have people who can guide faculty associates in useful directions. (Paul)

Some faculty associates prefer, or assume, that preservice teachers will take the responsibility for their learning in this area through Professional Development opportunities once they become practicing teachers. There are a few problematic assumptions with this view:

1. Technology-related professional development opportunities about pedagogical uses of technology will be available.

2. New teachers will choose technology from long lists of professional development topics available to them.

3. Technology-related professional development sessions are consistently of high quality in all districts. Research has shown this is not always the case (e.g., US Department of Education, 2000).

A recent visit to the Vancouver School Board website showed 13 different types of professional development opportunities for in-service teachers, including sessions on child abuse, troubled youth, ESL, Fine Arts, Literacy, Science, Special Education, Alternative Education, Autism, Dance, Presentation Skills, Leadership, and Multiculturalism, just to name some. The only session having anything to do with technology was restricted to librarians, and involved Internet research skills ("How to find what you're looking for on the Internet"). None of the sessions listed appeared to have anything to do with integrating technology into teaching in pedagogically meaningful ways. If technology integration is a priority in British Columbia schools, why are there so few professional development opportunities supporting this? The VSB explains,

> In the past we offered a lot of district technology training programs for teachers but with cuts in funding, there isn't anything district-wide being offered these days. Schools get the pro-d funds distributed to them directly and they decide how to spend the money. Some may use it for technology training but the district isn't given the specifics. (Gloria Wieland, Coordinator of Professional Development, Vancouver School Board, personal communication, February 6, 2004)

Granted, there are several levels of professional development opportunities for teachers: school-wide, district, provincial and other special-interest conferences. Still, teachers have a limited number of days to spend on such things (two to four seems to be the average), and, according to faculty associates, new teachers are more likely to attend sessions that will meet urgent classroom management and curriculum needs.

Furthermore, if using technology in teaching wasn't a priority in their PDP experience, it may continue to be a low priority once they become teachers.

Based on these types of issues, it is risky to assume that teachers will receive adequate professional development in the pedagogical uses of technology once they leave the PDP. Their opportunity to access this kind of training depends mainly on the availability of workshops (decided by the schools or districts) and the teachers' choice to attend those sessions instead of ones on other topics.

What are faculty associates teaching about technology?

If the responsibility for providing instruction and professional development around classroom applications of technology is uncertain, what is actually happening in the PDP today? With few exceptions, faculty associates are not providing preservice teachers with specific instruction on how to integrate technology into their own teaching, at least, not ICT:

> [Preservice teachers in Cohort A] learn how to use a video camera and [reel-to-reel] projector, for films, because schools still have that. They already know how to use a tape recorder and overhead, they learn how to print on chalkboards...you have to remember to make it straight. Most chalkboards don't have lines. You know, that low tech stuff is still important in our school systems. Most schools have Internet [...] I don't think a lot of teachers are using email. Some teachers are teaching students how to use Excel ...but [...] every school is different, so you just don't know...I don't think we need to prepare them for all that[....] if they can use it in their practicum, let's show them. If they can't, then let's not put the time into it. But maybe I'm limiting them... (Rita)

Rita's priorities are practical: she wants to prepare preservice teachers to be able to function in their practica with the kinds of technologies often used to deliver content. But she also acknowledges that her choices may be limiting preservice teachers' learning where technology is concerned. Nathan picks up this thread, and suggests that new teachers with technology skills will have an advantage when it comes to getting jobs:

> it's important [for preservice teachers] to be able to give some examples of using technology in teaching [...] when you're in an interview [for a teaching job], you can bring it in, you can give examples so then you're selling yourself, I know [in my district], all the preservice teachers are going to get an invitation to apply for the TOC list, so they're interviewing over 100 people,

so how do you sell yourself over someone else? I think every tool and every method that you can bring is valuable.

Beyond the practical, some faculty associates are interested in the idea of dealing with issues surrounding technology in teaching, more so than the hands-on part, and, without a great deal of personal experience, they are prepared to explore these issues with support:

> we've made some attempts to bring in the discussion [about using technology in teaching]...I think there needs to be more so they're making an informed decision, and it can't be just the information that **we** [faculty associates] provide because that's obviously value-laden...there's got to be some sense of developing that critical thoughtfulness around why and how or if, we use this... (Paul)

<div align="center">✦✦✦</div>

> I think that we need to prepare new teachers to use technology in meaningful ways, but we also need to be responsible for discussing both sides of the story...from my experience of working in classrooms with kids, the cost of setting up these facilities – labs in particular – and the cost of maintaining them don't justify the value we get from them. So I think we need to have technology, it needs to be integrated, it needs to be part of the curriculum, and there even needs to be specific instruction, learning new things about it, as well as, part of that is learning how to be a responsible user of technology... (Karen)

Support for these discussions could come from a few sources. One obvious source is faculty members whose area of expertise is educational technology. The Faculty of Education is fortunate to have a number of excellent, talented scholars in this area. Perhaps their input – either with their own cohorts, or more widely – could be increased to address these issues. Another possibility is to draw on the support of graduate students in Education (many of whom are practicing teachers) whose graduate work is focussed on educational technology. Working with faculty members, some useful discussions or workshops could take place on issues relevant to teachers today.

But the point raised is an important one: it would be useful to create space for discussions and experiences which would lead to preservice teachers making their own informed decisions. Creating the space in the cohorts' schedule is up to faculty associates, but at the moment, there is little established in the PDP for faculty

associates to create space for; more support is needed to facilitate these discussions across the cohorts.

Keeping it Optional

No faculty associates I spoke with *require* preservice teachers to demonstrate pedagogical application of technology in their own developing plans or ideas about teaching. A few expressed concern about forcing students to use technology, which they may not want to do:

> I think [what technology is used] will depend on where [preservice teachers] are at. They might use PowerPoint, some might feel they have two left hands when it comes to computers, it's hard to say because I don't know them and I'm not going to be one to try and force something on them. I will let them go what way they're going to go (Nathan)

<p style="text-align:center">✦✦✦</p>

> I think it's important for [preservice teachers] to have [technology] at their disposal and to use it if they choose to or not use it if they choose not to, but I think it's important for them to have that opportunity, and for those people who are completely not into it, I guess that's their choice, I don't see why we should impose on them. They should do what they need to do in the classroom, I just don't feel right in saying, this is what you **have** to do. (Paul)

<p style="text-align:center">✦✦✦</p>

> I think [technology use in the PDP] should be individualized, student driven...I don't think we need to take people to a certain point, where everyone can do email or do a website, I think everybody should start where they are, where their perceived needs and interests are...and I think that would be in line with the PDP philosophy. I think we start with where they're at because it can be scary, people are scared, some refuse to use it. I have colleagues who use it for marks and that's all they use it for and then they sometimes get someone to put the marks in because they hate it [....] but realizing kids these days know how to get around with it, it's their life, they were born with it, I think there has to be a certain level of awareness and a desire to get a certain level of literacy, even if it just means you can use Word, email, pick up a document. (Nora)

While she is hesitant to assign it as a requirement, Karen wants her preservice teachers to think about pursuing technology Pro-D like any other:

They've got a lot [of assignments] on their plate, and I don't want them to view the tech goal as another task -- I think we'll keep it really informal and I'll just suggest it to them as an individual choice. I think we need to keep it really individualized as they are so diverse in where they are at, it's important they seek what they need. I don't want to get into having a mandatory workshop – it seems counterproductive...I really want to promote the idea of professionalism and them seeking what they need.

Leaving the exploration of pedagogical uses of technology optional is problematic for a few reasons, the main one is it may not happen. The problems with relying on professional development have already been outlined, and to those I would add that treating technology as an option sends a message to preservice teachers' about its importance. Give any student a course syllabus with a "required" and "recommended" reading list, and ask them what they actually read by the end of the semester: optional extras usually don't get done in busy lives.

Chapter Six:
Discussion & Conclusions

Faculty associates' relationships with technology are complex and personal. And while each teacher travels his or her own journey, there are some common dimensions from which we can learn, as we have seen in cases presented in this study. Issues and implications raised in the themes emerging from the cases will be explored in this chapter as major findings and suggestions for practice. Finally, to bring this study full circle, I will reflect on the Responsive Instructional Design model in light of the original goal for this study, which was to find a useful way of working with faculty associates as they work with technology.

Major findings

1. Designer Self-Efficacy & Perceptions of Technology

Perhaps the two most important ideas to emerge from these cases are the roles played by teachers' perceptions of themselves and of technology. The notion of designer self-efficacy is different from computer self efficacy; it's not about seeing oneself as a competent technology *user*, it's about seeing oneself as a competent technology-using *teacher*. Similarly, how faculty associates answer the questions, "what is technology *for?*", or "what are computers *for?*" will greatly shape the way they are used in teaching. Teachers who see technologies as tools for productivity or efficiency tend to use them in those ways. But teachers who see technology as a strategy, or a space in which teaching and learning can occur, will use it quite differently.

When considering the relationship between designer self-efficacy and computer self-efficacy in light of experiences of participants in this study, a relationship between the two emerges which is also connected to whether technology is likely to be integrated (meaningfully embedded in the teaching/learning context) or incorporated (added on for convenience reasons). I've said elsewhere that computer self efficacy alone may not tell us what we need to know about how and why teachers use technology in pedagogically meaningful ways teaching. It seems more complex than, "have efficacy, will use". The mediating factor seems to be designer self-efficacy, or whether teachers see themselves

as capable of including technology meaningfully in their teaching plans. So where computer self-efficacy is high, teachers may use technology, but the way they do so depends on their designer self efficacy. High designer self-efficacy is more likely to lead to integration; low designer efficacy is more likely to lead to incorporation, or a more basic, administrative use. Low computer self-efficacy may inspire teachers to avoid using technology, but they can manage to incorporate it with support.

Figure 13:   Relationship Between Efficacy Beliefs and Technology Use

<table>
<tr><td rowspan="3"></td><td colspan="3" align="center">**Computer Self Efficacy**</td></tr>
<tr><td></td><td align="center">High</td><td align="center">Low</td></tr>
<tr><td rowspan="2">**Designer Self-Efficacy**</td><td>High</td><td>Integrate Independently. Technology use is meaningfully connected to learning goals.</td><td>Integrate with support. Success depends on quality and accessibility of support.</td></tr>
<tr><td>Low</td><td>Incorporate, tendency toward practical, administrative and social use.</td><td>Likely to avoid use, but may incorporate with support.</td></tr>
</table>

2. First- and Second-Order Barriers Revisited

In a study of seven K-12 teachers, Ertmer et al. (1999) set out to discuss the relationship between first and second-order barriers, and concluded that either type of barrier on its own – hardware/software/support issues or teacher beliefs about using technology – can represent a reason for non-use.

With respect to computer conferencing in the PDP context, first-order barriers are, for the most part, removed: equipment and support are available to all, and much more so than what faculty associates encounter in K-12 schools. And yet, discussions around technology use are filled with horror stories about first-order barriers from previous experiences and contexts, which shape faculty associates present thinking and use in this context. This raises the question of a relationship between the two that was not explored in Ertmer's work.

Specifically, teachers may report first-order barriers (e.g., problems with hardware), when a second-order barrier is at the heart of the matter (concern over, or inability to envision, technology supporting teaching and learning goals). Conversely, they may report a second-order barrier when a first-order barrier is at the heart of the matter. In this study, everyone expressed first-order barriers at one time or another. According to some, this is the only problem. To hear them tell it, technology would be great if computers weren't so frustrating, but, because technology presents insurmountable obstacles, there's no point in even talking about it. However, those who expressed second-order barriers were more likely to engage in "design" thinking and discussions and to attempt new ways of using technology to support their work with preservice teachers.

Rita is a good example of someone who spent a lot of time talking about first-order barriers. Hardware and support have been a source of great frustration for her, and she mentioned them often. Also, she justified not giving attention to technology issues in her PDP cohort because she was sure that her preservice teachers would experience the same difficulty, so why spend precious time on it? However, she also mentioned an important second-order barrier – a very fundamental teacher belief:

> ... what's important in education is that child/teacher connection, so all that stuff [multimedia, technology] is extra, and it's nice, it can enhance and enrich, but it's not the foundation, it's that personal connection you have to make...

It may be that problems with technology provide a way out of dealing with it, thus leaving unchallenged this very important belief about the importance of teacher-student relationships which may seem threatened by technology. Bad experiences with first-order barriers in schools are so ubiquitous, few would question a teacher's decision to avoid using technology for those reasons, and the matter can be dropped. In this way, we can see how first-order barriers are not only frustrating for teachers, but they also halt potentially useful conversations about using technology in teaching before they even begin.

Figure 14: Discussing First and Second-order Barriers
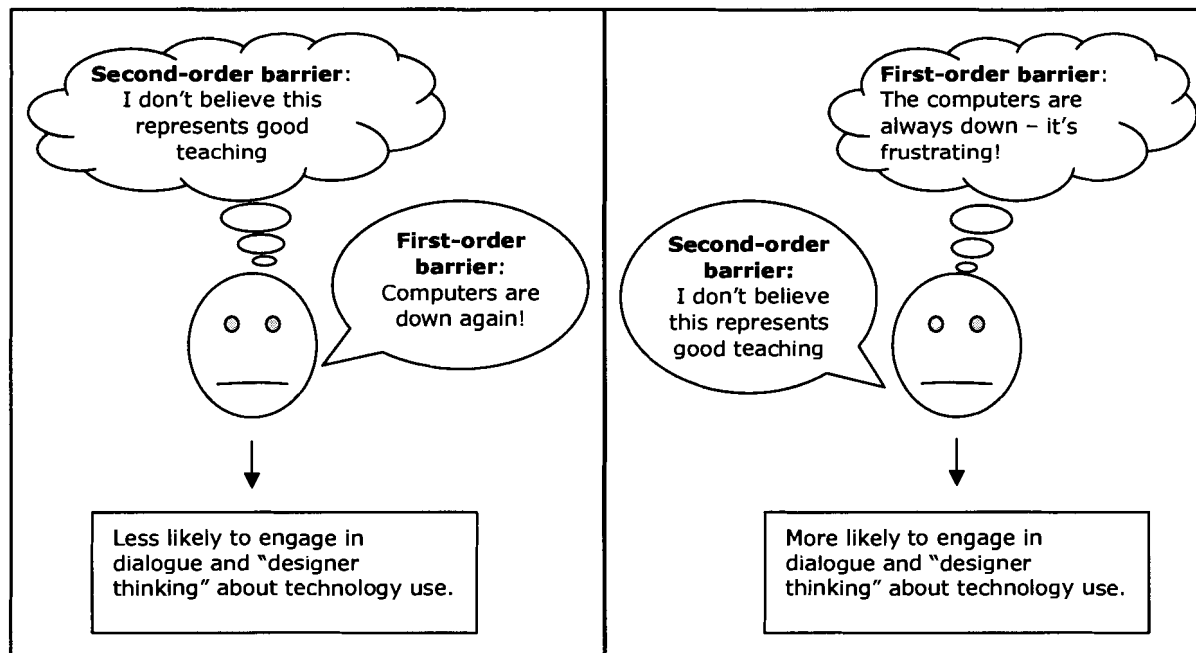
First-order barriers seem related to computer self-efficacy: when things are difficult because of computers, people experience frustration, a lack of success, and perhaps a lack of confidence in their abilities. Second-order barriers are related to what I'm calling designer self-efficacy: confidence in one's ability to design instruction supported by technology. This involves perceiving it as a tool for such things. It also involves perceiving oneself as capable of designing instruction with such a tool, which is related to perceptions of purpose: if technology is perceived as an administrative tool, that's how it's used. If it's perceived in more symbolic ways – as a space, as a strategy, as a means to facilitate dialogue – the possibilities for use become quite different.

First-order barriers are powerful for shutting down "designer" thinking. When these are expressed as the predominant concern, it can be difficult to move past them because they are perceived to be beyond the control of the teacher (hardware, software, support). Rita's case is a good example of this.

Second-order barriers, on the other hand, are powerful opportunities for exploring and facilitating meaningful uses of technology. Good teaching is what it's about, so if people are expressing second-order barriers, it creates a space for dialogue around pedagogical uses of technology. If second-order barriers can be discussed and worked through, we find ourselves working in the realm of design, which is within the teacher's control and area of expertise. Teachers are already experts in designing

instruction, but they don't always connect this to having expertise in designing instruction *with technology*. This is one reason specialized support is so important. For teachers who don't often use technology for whatever reason, they need opportunities to see technology – and themselves – in a different way.

I am suggesting that if first-order change (and barriers) are the focus of teachers' technology efforts, their use of technology is likely to be limited to the types of simple or "administrative" uses seen when faculty associates began using FirstClass. Attempting first-order change and overcoming first-order barriers are likely to support one's computer self efficacy and promote using technology in these first-order ways. On the other hand, if second-order change (and barriers) is the focus of teachers' technology efforts, their use of technology is likely to be more pedagogically meaningful (relevant, connected to goals and learning processes). Attempting second-order change and overcoming second-order barriers are likely to increase one's designer self-efficacy and promote using technology in these second-order ways (see Figure 15).

Figure 15:   Change, Barriers, Efficacy, & Technology Use

106
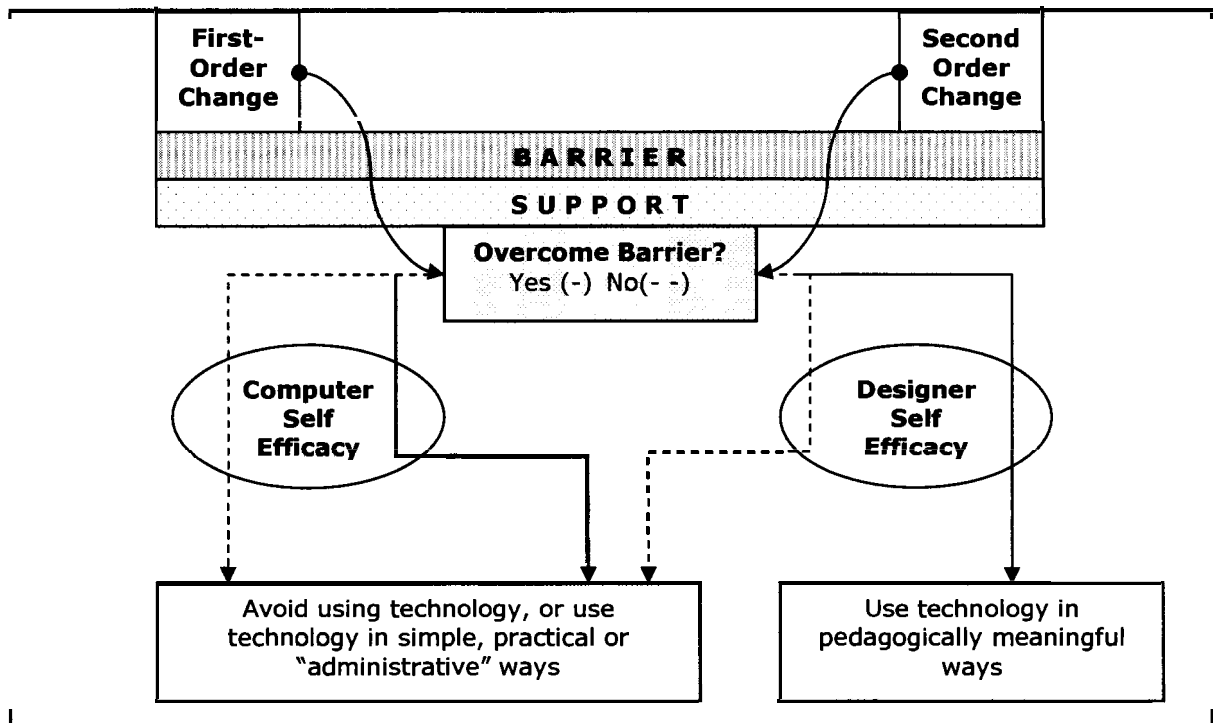
3. The Importance of Support

*The major challenge to supporting school learning
with technology lies not with the technology
but with the professional development of educators
(Fisher, Dwyer, and Yocam, 1996)*

In the PDP as elsewhere, people using technology need support. To ward off first-order barriers, a talented technical team must be on hand to ensure equipment and network integrity and availability. These "techies" are the oft under-appreciated backbone of many organizations, and their swift, skilful interventions help keep people working and minimize their frustration. We might call this "first-order support", and recognize its importance in Karen's description of her experience with it in the PDP:

> I think the biggest obstacle that I face is my own lack of ability in technology but I suppose the most wonderful thing about working in a place like SFU is that there's amazing technical support here. You sometimes have to seek it out and you sometimes have to use good people skills in order to benefit the most from those opportunities and those great tech support people, but they're definitely there to compensate for what I lack. And in the process I'm learning so much more[...] your support gave me the perseverance to stick with it because if I hadn't had your support and the support of Laura and Linda[2], I would have given up, I would have let it go.

But in a teacher education context where exploring issues and practices around the pedagogical application of technology is part of the community's work, what we might call "second-order support" becomes as important. In particular, support must be stable, pedagogically sensitive and personable.

Particularly in a place like the PDP, where the high turnover of faculty associates is part of the design of the program, stable support is critical. As we have seen, supported technologies are used by the PDP cohorts, and unsupported ones are not[3]. So, FirstClass, the Internet, video, and video editing are used. At one time websites were supported, but in the last few years this has not been the case, and so the websites that once existed were abandoned as soon as the faculty associate who maintained them left the PDP. For preservice teachers, this means that, aside from

---

[2] Laura Buker is a former faculty associate who currently provides iMovie training and support to the PDP cohorts. Linda Hof is a video ethnographer, and support person for video in the PDP.
[3] One exception is digital cameras, which are increasingly used by preservice teachers and faculty associates who own them personally, and use them to take photos and share them online.

what is specifically supported, there may be no other technology experiences in their PDP year. In a sense, this is evidence that the "Infusing Technology" initiative is alive and well in the PDP; technology is there for people, and they can choose to take it or leave it. In many cases, they leave it, but where they take it is where the support is. Hence, we can expect that other supported technologies, or approaches to technology use, would also be adopted and used. For example, if there were permanent people associated with the meaningful pedagogical applications of technology, or if the people currently connected to specific technologies had the time and resources to focus on those issues in addition to the "first-order" issues, we would likely see "better" use of technology in the PDP.

To advance our understanding of the possible roles technology can play in teaching, it is important that people who support teacher educators are aware of *educational* uses of technology. Throughout this study, it is apparent that in general, faculty associates don't have the experience or expertise with pedagogical uses of technology needed to guide preservice teachers, but they are expert teachers, and are willing to learn. What's needed, as Ertmer (2001) says, is help with translating their goals and practices into such a way that technology can play a useful role (p. 35). This calls for instructional design support from others who knows something about education and technology, an idea widely recognized in technology implementation programs in teacher education (e.g., Dudt, K., Yost, N., & Brzycki, D., 2001). Carol tells the familiar tale of poor access to technology in her K-12 teaching, but goes on to say how her supported experiences in the PDP have rekindled her interest in using technology in teaching.

> For myself [...] knowing the limitations of the technological resources at my [K-12] school, I don't have the excitement, and I have a lot more wrapped up in my cynicism, because every time I book the lab to do something with the Internet, I've gone in and five of them don't work and it just becomes an exercise in frustration, so I don't do it anymore. But when Laura did the iMovies last year with our student teachers, it was incredible and I'm sitting there thinking, "Yeah, we could do this!" I've had kids use videotapes and create commercials [...] in the classroom and it's been really great, but did I actually teach them techniques about using video? No. I left that to the wind. If they have a video at home, Mom and Dad are probably going to teach them how to use it, they figure out how to do it, but up here, I'm learning how to myself, but I also know there are [preservice teachers] who are going into similar situations that I came from, but without the same kind of baggage, perhaps, so fresh outlooks, fresh perspectives, and see lots of opportunities for integrating these things. If you're going to do it – there

are lots of awesome, awesome things – but if you're going to do it, know why. What purpose does it serve? What is the intentionality? Don't do it because it's gimmicky and it's fun. Don't do it because it looks good to have an iMovies to show at a parent-teacher thing. What is the intentionality?

Her comments demonstrate how powerful a partnership between master teachers and great support can be. With her commitment to "intentionality", or purposeful use of technology, and the *educational* technology expertise of skilled support staff, significant advances in the pedagogical uses of technology could be made in the PDP.

The personable or "human" face of support is as important in the PDP as technical competence. In a recent report, Grimmett (2004) points out the importance of attending to the "human factors" of technology. By this I think he means the way people come to use and feel comfortable using technology well. As I argued above, it's not enough for support people to be technically skilled, they must also have a sense of educational uses of technology, and to this, I would further add, they must be personable. This sounds simple and perhaps trite, but part of the problem that faculty associates have experienced in the past involve unhelpful "gatekeepers" in their school labs who control access to technology, and either facilitate or block their efforts by giving or withholding assistance. We must remember Paul's experience of feeling frustrated and embarrassed by his lack of skill, and recognize that technical support staff can, at times, be impatient with those whose skills are yet developing. According to faculty associates, there is a tendency to talk in "techno" terms unfamiliar to the novice, and to do the minimum to get a technical problem resolved. To be fair, resolving these first-order support issues is usually where the responsibility of technical support staff starts and ends. But faculty associates in the PDP need more than this. They need support that attends to their developing skills in a patient and respectful way that encourages their attempts to work with technology. They need support that acknowledges and respects their teaching expertise and finds ways to invite them to bring their talents into online spaces.

Suggestions for Practice

The following suggestions for future practice come either directly from participants, or emerged from our shared work and dialogue. Some suggestions address first-order issues, like the need for different kinds of training. Others speak to

second-order issues, like the need for more dialogue around technology issues in the PDP.

1. Training: Earlier & Different

Computer conferencing, like all technologies in the PDP, was introduced to the community as an option. As the number of cohorts online continued to grow, so did expectations about everyone being online and accessible in the same online space. Today, new faculty associates don't have the opportunity to choose in the same way early adopters did, because now when they enter the community, their partner, PDP colleagues, and students are already online.

This has implications for training. The issue is no longer whether new faculty associates want to use FirstClass, but how. Carol makes a good case for earlier FirstClass training:

> I think a lot of us felt that there's this stretch in August when you're told, 'oh don't worry, you don't need to do that now, you can do it later', but then it's all at ONCE later and if there's something you can do sooner, it would alleviate some of those things you can't do until later. So I wonder about FirstClass basics in August and then if you want to learn some more things, again in October program. It allows people to choose to get what they need to know, spend time with it, and not get it with everything else they need to know – that is what causes stress for a lot of people

This also makes sense when considering that all participants in this study described their technology learning on a "need-to-know" basis. I'm pleased to report that, at the time of writing, (summer 2004), steps have been taken in this direction and training is currently underway for at least some of the new faculty associates who will begin in September 2004.

In addition to earlier training, we should consider different training. It's important to go beyond "how-to" training so faculty associates have opportunities to make choices and plans for technology use in the PDP that better reflect their teaching and learning goals. Ideally there would be more and earlier opportunities for faculty associates to meet with support staff; three meetings would be optimal. The first would provide FirstClass training and an orientation to the online community and resources. By the end of the first session, faculty associates should have seen and done enough in FirstClass to be able to think about how they want their own online space set up, and start actually doing it themselves. The second session would provide an introduction to

other technologies available in the PDP and include a showcase of examples that faculty associates can consider and discuss with their partner before the third meeting. Finally, the third meeting would be devoted to making concrete plans for using technology to provide pedagogical support for the work of the cohort. This kind of support would be possible with an earlier start. Additionally, if faculty associates had the opportunity to meet again with support staff when a new partner joined the cohort, it would give experienced faculty associates a chance to revisit their ideas, and could help give new faculty associates a stronger role in the technology plans that we have seen thus far.

2. *Finding a Legitimate Place for Technology in the PDP*

The ebb and flow of the PDP community membership is a wellspring of its vitality. New teaching partnerships, new students, new ideas, and new approaches keep things fresh and innovative. Every new faculty associate influences the program and its students by doing things according to his or her experiences and expertise. This is the point, as Karen says, "to bring fifty educational leaders together". So, there is constant rebirth.

The flip side of this is it may feel there is little to hang on to. For new faculty associates, they receive precious little in the way of "a program" to implement. Their entry into the community is characterized by warm social interactions, off-campus retreats, and community-building exercises with colleagues, not reams of documents or curriculum they must set about implementing.

The fact that there is little written down is one of the exciting things for new faculty associates ("we can *create* everything ourselves!"), as well as one of the challenges ("we must create everything *ourselves*?!"). What little that is written down is clung to like a torn treasure map. One benefit of this scarcity of resources is that faculty associates take what's written down quite seriously and use it in their teaching, in their own ways. One example of such a document the "Profiles of Teaching Competency", created by Selma Wassermann and Wallace Eggert in 1973, and most recently revised in 1986. All faculty associates I spoke to have great respect for this document and use it to guide their planning and assessment. This document is split into three sections, entitled: "Teacher as Person", The Teacher and the Kids: Interactions, and "The Teacher, The Kids and the 'Stuff': Classroom Life". I believe technology competency comes under the last heading, "The Teacher, The Kids, and The

Stuff: Classroom Life, and in particular, the subheading, "The teaching materials are varied, imaginative and relevant", which reads:

> At the highest level you will find student teachers who use a wide variety of resources as teaching materials. In an elementary classroom, you will find a good supply of arts and crafts materials, library books, paperbacks, magazines, photographs, science equipment, concrete mathematical materials, newspapers. In a secondary classroom, many different kinds of materials are available that are relevant to the subject matter of the class. These student teachers may use field trips, film strips, films and recordings as part of the curriculum...(Wasserman, S, & Eggert, W, 1973).

I propose that this document be updated to include ICT in the "stuff" that preservice teachers today need to consider among their resources. Consistent with the rest of the document, it should be brief and include principles and indicators of the range of performance excellence (e.g., ISTE NETS guidelines – see Appendix F). As with the rest of the document, faculty associates can fill in the blanks and implement as they see fit. We can begin by making greater efforts to raise awareness, so the issue gets dealt with, rather than being left to chance or relegated to things "optional". Carol discusses the importance of raising this awareness:

> I have felt in my life outside the university community that there is a momentum to tow the party line about computers and technology in the classroom, and that is usually driven at the district level or the parent level or at some community level, and so for these students to come here and at least have the question raised, as [...] something they need to decide as practitioners is good, that's valuable, and maybe raising the question and letting them know where to find some of the answers that will influence their decision, that's great, and it's what we've done in other areas, whether it's teaching PE, or using computers, so it's just raising awareness isn't it? (Carol)

Mullen (2001) raises some sensible concerns about the full scale adoption of the ISTE NETS guidelines because they may not address important issues, such as the limiting nature of a checklist method of assessment, and the problem of assessing students' technology work in a consistent and informed way (p. 461). Clearly, guidelines that reflect the position and priorities of the Faculty of Education are needed, and the best way to achieve this is through discussions by informed stakeholders who have the appropriate "background and experience with computer technologies, and a shared understanding of what is acceptable work" (Mullen, 2001, p. 461).

3. Avoiding Templates for Technology Use

Templates are tempting, particularly to efficiency-minded, or busy people who don't wish to constantly reinvent the wheel, or those who lack confidence in their ability to create something. Proponents of templates (see, for example, http://www.thiagi.com/article-rid.html) promise faster, better, more streamlined design. But they're formulaic. And the main problem with this is that the course design process, like the learning it seeks to inspire, is often creative and messy. But fans of templates would have you believe otherwise: all you need is the right formula. This might work in some places, but it doesn't fit with the PDP philosophy, where process, reflection and re-creation are mainstays of the community. In all other areas of curriculum development in the PDP, templates have been avoided. This isn't to say people don't share ideas or give advice, or do similar things; they do, and there are customs and practices (e.g., retreats, "Program") set up to facilitate this. But each faculty associate pair goes through a unique process of designing their cohort's work each semester, and it makes sense that if technology is a part of that unique process, it needs to be designed, too.

With Cohort B, letting go of the template and taking a process approach toward a unique design proved useful for online practice; new things emerged that were tailored to Karen and Nora's goals and beliefs because we approached the task of planning the online space in a creative way, and with their goals and beliefs in mind. For the three cohorts in the pilot study, and in Cohort A for this study, keeping the template, which was built upon "doing" questions, not "belief" or "goal" questions, we ended up with an online space that is centred on simple communication and resource sharing, rather than supporting learning processes and goals.

4. Build on existing and emerging practices

There is much reason for optimism for change and growth in the PDP; it's a community built on those notions, and has many mechanisms already in place to facilitate them. In spite of all the variety and change, there are a few enduring topic themes and activities in the PDP (e.g., Critical Thinking, Inquiry/Action Research, Reflections) that seem to find life and support in the form of workshops, committees/focus groups and preservice teacher assignments in each generation. To advance our online practice, it would be advantageous if technology could become one of the themes on this list.

Sharing Sessions on Pedagogical Uses of Technology

Self-efficacy theory holds that one way to increase efficacy beliefs is through vicarious experience (Bandura, 1994). When we get together and "show and tell" about pedagogical uses of technology, existing practices are challenged and adopted and new practices take root. To promote and elevate the use of technology throughout the cohorts, there should be more technology-related sharing events among faculty associates in the PDP in order to create invitations for the kind of dialogue that will lead to better practice, and to provide faculty associates with more ideas and choices for their use. In this study, faculty associates reported a lack of time, experience, or creativity with these issues, and so providing the support for them in the program leads to providing it also for preservice teachers:

> I think there needs to be some exposure. For me part of the preparation in the PDP is that these people could be in classrooms next September and they're going to have to make some informed decisions about educational technology where they're going to be expected or encouraged to use technology in certain ways, everything from using district templates on reporting, developing IEPs, and I think to have been exposed [...,] so they're a little more prepared [...] if only to make informed decisions rather than reactionary decisions. (Paul)

Multimedia

The potential for pedagogically meaningful uses of multimedia is largely untapped in the PDP. Faculty associates express positive attitudes – but low skills – with respect to multimedia (see Figure 15). There is interest here, but a lack of available or proactive support, which means faculty associates don't use it much in their work with preservice teachers.

Faculty associates describe their understanding of multimedia as its name might suggest: many media, usually together and including images, video, and sound. And in discussing teaching beliefs, all faculty associates make reference to different learning styles, honouring and attending to individual differences, and making efforts to present materials in different ways and allow students different ways of representing their learning for assessment purposes. Multimedia, then, seems like a technology that faculty associates would gravitate toward.

And they do, sort of. In attitude surveys, faculty associates give high ratings to multimedia, in some cases even the same or higher than email and the Internet – things they use often and know how to do well. However, all rated their ability with

multimedia (e.g., creating a website, PowerPoint presentation, or iMovie) the lowest, and compared to other technologies (email, computer conferencing, Internet, word processing), they use it very little in their practice. When interpreting these findings, it's tempting to wonder if we simply lose appreciation for something once we master it, or we admire things we cannot do. But in reality, I think faculty associates see the potential for multimedia use because this is something they already do in their classrooms, though it's not necessarily multimedia with a plug attached to it:

> I think that as a teacher I'm always using a wide variety of media in my lessons and giving them options to represent their learning using a variety of media, I think there are lots of media that I don't incorporate, like a lot of computers, I think that's what we teach teachers too: don't just use one tool to illustrate your point or a concept, come at it from a variety of ways allow the students to digest that learning and represent it in a variety of ways, whether it's a paper mache project or a skit or a poster or a video commercial...(Carol)

Figure 16:   Multimedia Attitudes and Ability
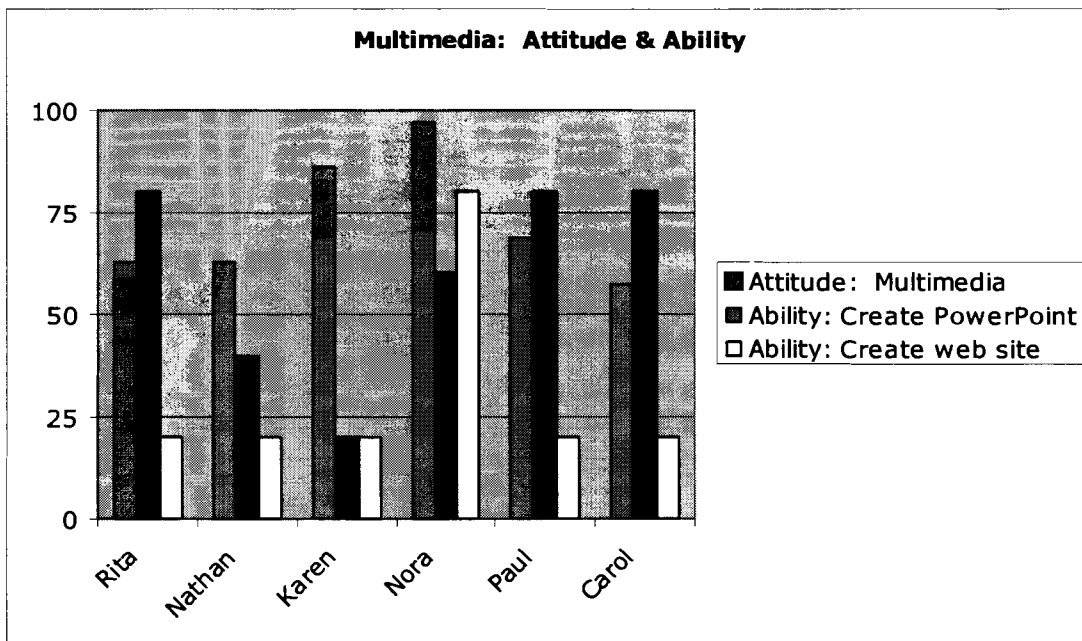
Digital Cameras

Digital cameras "aren't part of the standard toolkit promoted by the PDP, but they're used more than ever, usually by the students themselves" (Laura Buker, personal communication, April 7, 2004). I have also noticed a significant increase in

the number of faculty associates with digital cameras in the past year. People in the PDP with digital cameras do what everyone does with them: take pictures of themselves and their friends in various settings and share them online:

> Why use digital cameras? To record important milestones, important events, to help kids remember some of the things we did, just to let them know that what we do and what they do is important enough to be recorded. (Nora)

Digital photos are a way to record and share the journey with each other. Sometimes, these photos end up in presentations, or, more rarely, in digital portfolios created by the students. It could be useful to extend this practice and challenge members in the PDP community to consider ways to use their digital cameras for specific purposes, perhaps for observations, assessment, or sharing kids' progress with them and their parents by sharing pictures over email.

Electronic Portfolios

The pedagogical value of portfolios for presenting learning and for assessment is well documented (e.g., Flood & Lapp, 1989; Lamme & Hysmith, 1991; Matthews, 1990; Tierney, Carter, & Desai, 1991; Valencia, 1990; Wolf, 1989) and most faculty associates use and support this method in their own teaching. The development of electronic portfolios in the PDP would provide a reason and way for preservice teachers to learn and use technology to demonstrate their understanding and abilities to others in rich and creative ways. Of 96 preservice teachers in three cohorts, I am aware of just two in the fall 2003 semester who attempted digital portfolios. For preservice teachers and faculty associates, it would be helpful to be presented with examples of well-crafted digital portfolios.

"Tech Tuesdays"

Recently, Laura Buker has pioneered a program called "Tech Tuesdays" in the PDP. The idea is to have children from local classrooms come to the Faculty of Education computer lab and experience different technology-supported learning activities while the preservice teachers observe and participate. The findings from this study lend tremendous support such a program, because as we've seen, many teacher educators in the PDP don't have the skills, experience, time, or desire to teach preservice teachers about ways to integrate technology into their teaching. A program like "Tech Tuesdays" provides preservice teachers with an opportunity to see technology

supported learning in action and make up their own minds. If the logistics can be worked out, I believe this kind of program would be excellent for the PDP cohorts.

From Infusion to Leadership

The Infusing Technology Initiative has spearheaded a revolution in how communication occurs throughout the PDP. There are still many opportunities for face-to-face meetings of all kinds, but the asynchronous communication offered through FirstClass keeps more people in touch more often than was the case in previous years when the telephone was the mainstay of communication. In the years since its introduction, this initiative has proven to be an excellent model for adoption and the enculturation of technology in the PDP.

However, we may have reached a point where, to advance the goals established the Faculty (e.g., Grimmett, 2003), and go beyond incorporation and into integration, it's becoming time to approach questions and issues in educational technology in the PDP in a more proactive way. Leaving things optional is only good insofar as people have the skills to pursue it on their own. Preservice teachers who wish to develop skills and/explore pedagogically meaningful uses of technology in their teaching may not know where to start, and the case studies described here illustrate that many faculty associates are not prepared to assist them. At the time of writing, there is word of a new "Technology Cohort". This is exciting in the sense that these issues will be certainly explored there, but what about the other fifteen cohorts? If educational technology is an important issue for teaching today, it needs to find a legitimate home in all cohorts.

Evaluating the Responsive Instructional Design Process

My first research question had to do with how to support faculty associates in developing strategies for the use of computer conferencing in the PDP. My hope was that Ertmer's model would provide a useful and agreeable framework for this, and I believe it did. Faculty associates gave me positive feedback about our time together, and for those with whom I had worked before, I doubt they detected a great difference in the way we worked together now. As before, I was there to support their work and follow their lead. However, this semester we had two things we never had before: extended conversations about their teaching beliefs and goals for the cohort, and focussed effort around forging connections between these and their online practice.

This made an important difference, particularly for Cohort B, and is a direct result of using Ertmer's model.

Throughout the study, I felt this process was a good one for the PDP because of its gentle, consultative nature that focuses on teacher educators and what they need. Their workload is huge, the demands on their time are great, and they need support to get it all done. I believe this process offered a way for this support to occur while advancing our practice and bolstering their confidence. As a designer, my goals for working with teacher educators became more focussed – we were working together to go somewhere new with our approach to computer conferencing, as opposed to starting with what had been done before. The focus on their beliefs, needs, and goals raised new kinds of questions, sparked new kinds of discussions, and as a result, we did a few measurably different things online that had not been done before in the PDP.

Ertmer (2001) describes this process as being useful for those "who don't want training or aren't prepared to learn from it" (p. 33). I have never known faculty associates to be negative about training in this way, but their challenges in the PDP are many. I would argue that greatest challenge with respect to working with technology is simply a lack of experience in thinking about technology in this way, as a way to support their pedagogical goals and teaching and learning activities. This presents a challenge for them doing their own work with preservice teachers in this environment, as well as how they handle the topic with preservice teachers who are developing their own philosophies and practices for teaching.

There are aspects of this process I would use again in just about any instructional design situation. In addition, there were steps I would avoid in future work, in an effort to save time, and because they added little. First, the focus on teacher beliefs and goals was the most valuable part of this process. Approaching planning discussions with these in mind opened up new kinds of conversations I had never had with faculty associates before, and led to better uses of technology in Cohort B. The focus of our discussions was not the technology, but on the learning goals it might facilitate: these, more than technology, are things faculty associates more readily think *in terms of.* Often it's just a matter of language; when they aren't fluent in "talking tech", the momentum of a planning discussion sags when figuring out whether they mean "conference" or "icon". It doesn't matter, and avoiding that kind of distraction helps them to engage more in "designer thinking"

Another aspect of Ertmer's model that was very successful in this context was the sharing aspect. Not only did we "seed" the community with ideas and opportunity

for general and specific discussion about CMC use, but it put faculty associates in the position of being experts and talking about their design ideas, their choices, their reasons for doing things a particular way.

I found Ertmer's suggestion to discuss teachers' own learning style didn't contribute to the process, and I would avoid that in future use to save time and stay focused on designer thinking. Mostly, I found the responses predictable; after all, these are all people with graduate degrees and many years teaching experience, so they can do "traditional" learning, collaborative learning, and individual/self-directed learning because they've had to. Everyone prefers projects and collaboration over lectures and memorization. And these responses wouldn't have changed how I approached our time together – it was a collaborative process, and I can't imagine it being any other way.

Limitations of the Study & Future Research

The main limitation of this study is its sample size. Not only was it conducted in a very specific context, but also it works with only a handful of people from that context. Therefore, care should be taken in extrapolating findings to other teacher education programs at other institutions, or to other K-12 teachers working with technology.

While this study intentionally focussed on faculty associates and their experiences and perceptions of technology use in the PDP, it would have been interesting to include preservice teachers in the data collection and analysis. In particular, there were no data from preservice teachers showing their response to the different approaches used by Cohort A and Cohort B. Did the preservice teachers in Karen's cohort learn more or better or differently? Did they benefit from her innovative uses of FirstClass? Do they go on to use technology in their own teaching? These questions are outside of the scope of this study, but would be useful types of questions to pursue in future research set in the PDP.

Another interesting and useful avenue for future research in the PDP is if and how the important goals established by the Faculty of Education for ICT (Grimmett, 2003) are being met. For example, how are the "human factors" being attended to, and how are these experienced by participants? Are the uses of ICT "compelling, meaningful, and effective"? How are we improving conditions for learning through the use of ICT? Theoretical and practical explorations of these questions would certainly be of great interest and use to advance understanding and practice in education.

Conclusion

Rogers (1995) says that "when an invention is designed with the concept of re-invention in mind, a certain degree of re-invention often occurs as the innovation diffuses" (p. 175). This has been the case with FirstClass in the PDP: through the work of faculty associates, cohorts have customized the use of FirstClass to suit their purposes. In the first year, the structure and use of the online spaces across cohorts were essentially identical. Any differences were largely cosmetic, which is to say the FirstClass interface may have looked a bit different across cohorts, but its use was the same (i.e., group and individual communication, information dissemination, assignment submission). Now, in year three, there is much more diversity in both the look and use of FirstClass across cohorts. Our online practice has advanced.

The small but observable changes to online practice that came about in the course of this study should be looked upon with optimism. I view them as evidence that faculty associates are willing to take risks and explore questions about good teaching and learning with technology, but they need invitations and support to do so. I also view these changes as an affirmation of the value of Ertmer's model as a tool design and development of teaching and learning with technology. I think it's a fair assessment to say they are great teachers working with a very good model. We were not expecting a revolution in four months, nor should we. In his seminal book, *Teachers and Machines*, Cuban (1986) notes:

> With regard to time, too few educational researchers study phenomena for very long. In research designs, experimental groups may receive treatments ranging from an hour to a week, perhaps a month – seldom longer. Longitudinal studies of a decade or more are rare. The research literature displays abundant instances where investigator pronounced that an innovation, a program, or direction undertaken by a school district had failed. The conclusions come after studying the planned change for six months, a year, or perhaps two. No doubt there are excellent reasons for this impatience, including research costs and pressures to produce publications. But to historians, palaeontologists, anthropologists, and other scientists, such impatience, while understandable, erodes the credibility of educational researchers' findings. Scientists who study humans and animals, for example, understand that decades, centuries and even millennia may need to pass before some changes to become noticeable (p. 106).

Faculty associates are now entering their fourth year of using computer conferencing. I hope the steady refinement and improvement of online practice and research interest in this practice continues, for the PDP is a community with

exponential impact on the theory and practice of teaching and learning in our time. The students of today are the teachers of tomorrow and wherever they go – locally, nationally, internationally – their practice and influence is shaped by their PDP experience.

Appendices

Appendix A: Ethics Approval

SIMON FRASER UNIVERSITY

OFFICE OF RESEARCH ETHICS

BURNABY, BRITISH COLUMBIA
CANADA V5A 1S6
Telephone: 604-291-3447
FAX: 604-268-6785

June 20, 2003

Ms. Tracy Roberts
Graduate Student
Faculty of Education
Simon Fraser University

Dear Ms. Roberts:

Re: Responsive instructional design in technology-supported teacher education

The above-titled ethics application has been granted approval by the Simon Fraser Research Ethics Board, at its meeting on June 16, 2003 in accordance with Policy R 20.01, "Ethics Review of Research Involving Human Subjects".

Sincerely,

Dr. Hal Weinberg, Director
Office of Research Ethics

Appendix B: Technology Proficiency Self-Assessment

Do you have a computer at home? No / Yes
Do you have access to the World Wide Web at home? No / Yes

Instructions: Select one level of agreement for each statement to indicate how you feel.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

I feel confident that I could...	SD	D	U	A	SA
1. send e-mail to a friend.					
2. subscribe to a discussion list.					
3. create a "nickname" or an "alias" to send e-mail to several people at once.					
4. send a document as an attachment to an e-mail message.					
5. keep copies of outgoing messages that I send to others.					
6. use an Internet search engine (e.g., Yahoo or Alta Vista) to find web pages related to my subject matter interests.					
7. search for and find the Smithsonian Institution Web site.					
8. create my own web site and publish it on the SFU server.					
9. keep track (in a browser) of web sites that I have visited so that I can return to them later.					
10. find primary sources of information on the Internet that I can use in my teaching.					
11. use a spreadsheet to create a pie chart of the proportions of the different colors of M&Ms in a bag.					
12. create a newsletter with graphics and text in 3 columns.					
13. save documents in formats so that others can read them if they have different word processing programs or computer platforms.					
14. use the computer to create a slideshow presentation.					
15. create a database of information about important authors in a subject matter field.					

I feel confident that I could...	SD	D	U	A	SA
16. write an essay describing how I would use technology in my classroom.					
17. create a lesson or unit that incorporates subject matter software as an integral part.					
18. use technology to collaborate with other teachers or students who are distant from my classroom.					
19. describe 5 software programs that I would use in my teaching.					
20. Find a way to send computer files between my home and SFU that are too large for the SFU email system to handle.					
21. write a plan with a budget to buy technology for my classroom.					

Appendix C: Teachers' Attitudes Toward Information Technology

(TAT2.0, shortened version. From *Knezek, & Christensen, 1997*)

This questionnaire is designed to assess your perceptions of the use of information technology for your own productivity as well as in the classroom. Results will remain strictly confidential.

Instructions: Choose one location between each adjective pair to indicate how you feel about the object. Usually it is best to respond with your first impression, without giving it much thought.

To me, **electronic mail** is:

1	important	O	O	O	O	O	O	O	unimportant
2	boring	O	O	O	O	O	O	O	interesting
3	relevant	O	O	O	O	O	O	O	irrelevant
4	exciting	O	O	O	O	O	O	O	unexciting
5	means nothing	O	O	O	O	O	O	O	means a lot
6	appealing	O	O	O	O	O	O	O	unappealing
7	fascinating	O	O	O	O	O	O	O	mundane
8	worthless	O	O	O	O	O	O	O	valuable
9	involving	O	O	O	O	O	O	O	uninvolving
10	not needed	O	O	O	O	O	O	O	needed

To me, **using the World Wide Web** is:

1	important	O	O	O	O	O	O	O	unimportant
2	boring	O	O	O	O	O	O	O	interesting
3	relevant	O	O	O	O	O	O	O	irrelevant
4	exciting	O	O	O	O	O	O	O	unexciting
5	means nothing	O	O	O	O	O	O	O	means a lot
6	appealing	O	O	O	O	O	O	O	unappealing
7	fascinating	O	O	O	O	O	O	O	mundane
8	worthless	O	O	O	O	O	O	O	valuable
9	involving	O	O	O	O	O	O	O	uninvolving
10	not needed	O	O	O	O	O	O	O	needed

To me, **multimedia** (HyperStudio, iMovie) is:

1	important	O	O	O	O	O	O	O	unimportant
2	boring	O	O	O	O	O	O	O	interesting
3	relevant	O	O	O	O	O	O	O	irrelevant
4	exciting	O	O	O	O	O	O	O	unexciting
5	means nothing	O	O	O	O	O	O	O	means a lot
6	appealing	O	O	O	O	O	O	O	unappealing
7	fascinating	O	O	O	O	O	O	O	mundane
8	worthless	O	O	O	O	O	O	O	valuable
9	involving	O	O	O	O	O	O	O	uninvolving
10	not needed	O	O	O	O	O	O	O	needed

To me, **using computers for my professional productivity** is:

1	important	O	O	O	O	O	O	O	unimportant
2	boring	O	O	O	O	O	O	O	interesting
3	relevant	O	O	O	O	O	O	O	irrelevant
4	exciting	O	O	O	O	O	O	O	unexciting
5	means nothing	O	O	O	O	O	O	O	means a lot
6	appealing	O	O	O	O	O	O	O	unappealing
7	fascinating	O	O	O	O	O	O	O	mundane
8	worthless	O	O	O	O	O	O	O	valuable
9	involving	O	O	O	O	O	O	O	uninvolving
10	not needed	O	O	O	O	O	O	O	needed

To me, **using computers in the classroom** is:

1	important	O	O	O	O	O	O	O	unimportant
2	boring	O	O	O	O	O	O	O	interesting
3	relevant	O	O	O	O	O	O	O	irrelevant
4	exciting	O	O	O	O	O	O	O	unexciting
5	means nothing	O	O	O	O	O	O	O	means a lot
6	appealing	O	O	O	O	O	O	O	unappealing
7	fascinating	O	O	O	O	O	O	O	mundane
8	worthless	O	O	O	O	O	O	O	valuable
9	involving	O	O	O	O	O	O	O	uninvolving
10	not needed	O	O	O	O	O	O	O	needed

Appendix D: Teaching Perspectives Inventory

(TPI v1.0, Pratt & Collins, 2001)

This inventory will help you identify your perspectives on teaching. As you consider the following statements, think of specific content and learners.

NOTE: Because these statements represent contrasting views of teaching and learning, you will agree with some, but not all, of the statements below. Try to discriminate between statements that do and do not represent your views.

Different Educational BELIEFS: What do you believe about instructing or teaching?

For each statement, select the response that best represents your Agreement or Disagreement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	SD	D	N	A	SA
1. Learning is enhanced by having predetermined objectives.					
2. To be an effective teacher, one must be an effective practitioner.					
3. Most of all, learning depends on what one already knows.					
4. It's important that I acknowledge learners' emotional reactions.					
5. My teaching focuses on societal change, not the individual learner.					
6. Teachers should be virtuoso performers of their subject matter					
7. The best learning comes from working alongside good practitioners.					
8. Teaching should focus on developing qualitative changes in thinking.					
9. In my teaching, building self-confidence in learners is a priority.					
10. Individual learning without social change is not enough.					
11. Effective teachers must first be experts in their own subject areas.					
12. Knowledge and its application cannot be separated.					
13. Teaching should build upon what people already know.					
14. In learning, people's effort should be rewarded as much as achievement.					
15. For me, teaching is a moral act as much as an intellectual activity.					

Different Educational INTENTIONS: *What do you try to accomplish in your instruction or teaching?*

For each statement, select the response that best represents how OFTEN it represents your educational intention.

	Never | Rarely | Sometimes | Usually | Always				
	N	**R**	**S**	**U**	**A**
16. My intent is to prepare people for examinations.					
17. My intent is to demonstrate how to perform or work in real situations					
18. My intent is to help people develop more complex ways of reasoning.					
19. My intent is to build people's self-confidence and self-esteem as learners.					
20. My intent is to challenge people to seriously reconsider their values.					
21. I expect people to master a lot of information related to the subject					
22. I expect people to know how to apply the subject matter in real settings.					
23. I expect people to develop new ways of reasoning about the subject matter					
24. I expect people to enhance their self-esteem through my teaching.					
25. I expect people to be committed to changing our society.					
26. I want people to score well on examinations as a result of my teaching.					
27. I want people to understand the realities of working in the real world.					
28. I want people to see how complex and inter-related things really are.					
29. I want to provide a balance between caring and challenging as I teach.					
30. I want to make apparent what people take for granted about society.					

Different Educational ACTIONS:
What do you do when instructing or teaching?

For each statement, select the response that best represents how OFTEN you do that action.

	Never	Rarely	Sometimes	Usually	Always
	N	**R**	**S**	**U**	**A**
31. I cover the required content accurately and in the allotted time.					
32. I link the subject matter with real settings of practice or application					
33. I ask a lot of questions while teaching.					
34. I find something to compliment in everyone's work or contribution					
35. I use the subject matter as a way to teach about higher ideals.					
36. My teaching is governed by the course objectives.					
37. I model the skills and methods of good practice.					
38. I challenge familiar ways of understanding the subject matter					
39. I encourage expressions of feeling and emotion.					
40. I emphasize values more than knowledge in my teaching.					
41. I make it very clear to people what they are to learn.					
42. I see to it that novices learn from more experienced people					
43. I encourage people to challenge each others' thinking.					
44. I share my own feelings and expect my learners to do the same.					
45. I link instructional goals to necessary changes in society.					

Appendix E: Twelve PDP Goals

1. The development of a clear, coherent and justified view of education that enables one to: understand the place of education in an open, pluralistic and caring society; determine the content, methods and institutional arrangements that are relevant, worthwhile and appropriate for the education of children; have a personal vision of what one can achieve as an educator; understand how schooling and other institutions influence students.

2. The development of a clear commitment to: respect students as persons with varied interests, backgrounds, points of view, plans, goals and aspirations; care about students and their individual development, uphold standards of excellence inherent in various forms of inquiry; uphold the principles that ought to govern a civilized, democratic and pluralistic community; establish and maintain ethical working relationships with all members of the educational community.

3. The development of clear commitment to lifelong learning manifest in: openness to alternatives and possibilities; reflective practice; engagement in dialogue and collaboration with colleagues, students, parents and others in the educational community; ability to form and reform ideas, methods, techniques; setting an example to students; stimulating students to be continuous learners.

4. The development of ability to create opportunities for learning that are: engaging and imaginative; significant and relevant to pupils' educational development; intellectually challenging; sensitive to issues of social equity and cultural diversity; appropriate to building habits of sound thinking; responsive to students' individual learning needs; reflective of growing understanding of what goes on in the classroom; consonant with learning goals.

5. The development of ability to put educationally sound curriculum ideas into practice in well-organized ways.

6. The development of knowledge about: teaching subjects; how individuals and groups of students learn; evaluation practices.

7. The development of ability to be a thoughtful and sensitive observer of what goes on in the classroom.

8. The development of ability to use evaluation and assessment practices that: use evaluative data as a means of furthering student learning; appreciate the subjectivity of evaluation; make use of varied practices that are congruent with learning goals; respect the dignity of each learner; show understanding of the moral implications of evaluation and assessment practices; promote self assessment.

9. The development of ability to use classroom interactions that: show caring and respect for every student; encourage learners to clarify and examine their ideas; are authentic, unpretentious and honest; communicate openness, a tolerance for uncertainty, and appreciation of the spirit of inquiry.

10. The development of appreciation for and skill in organizing harmonious working groups, and interpersonally sound working relationships among students.

11. The development of ability to observe, understand and respond respectfully to students with different learning styles and learning difficulties.

12. The development of appreciation for and ability to be flexible about curriculum — recreating, re-inventing, re-constituting, and discarding practices that have been observed, upon reflection, to be inappropriate to individual and group learning needs.

Appendix F: NETS Profiles for Technology-Literate Teachers

Upon completion of the culminating student teaching or internship experience, and at the point of initial licensure, teachers:

1.   apply troubleshooting strategies for solving routine hardware and software problems that occur in the classroom. (I)

2.   identify, evaluate, and select specific technology resources available at the school site and district level to support a coherent lesson sequence. (II, III)

3.   design, manage, and facilitate learning experiences using technology that affirm diversity and provide equitable access to resources. (II, VI)

4.   create and implement a well-organized plan to manage available technology resources, provide equitable access for all students, and enhance learning outcomes. (II, III)

5.   design and facilitate learning experiences that use assistive technologies to meet the special physical needs of students. (II, III)

6.   design and teach a coherent sequence of learning activities that integrates appropriate use of technology resources to enhance student academic achievement and technology proficiency by connecting district, state, and national curriculum standards with student technology standards (as defined in the ISTE National Educational Technology Standards for Students). (II, III)

7.   design, implement, and assess learner-centred lessons that are based on the current best practices on teaching and learning with technology and that engage, motivate, and encourage self-directed student learning. (II, III, IV, V)

8.   guide collaborative learning activities in which students use technology resources to solve authentic problems in the subject area(s). (III)

9.   develop and use criteria for ongoing assessment of technology-based student products and the processes used to create those products. (IV)

10.   design an evaluation plan that applies multiple measures and flexible assessment strategies to determine students' technology proficiency and content area learning. (IV)

11.   use multiple measures to analyze instructional practices that employ technology to improve planning, instruction, and management. (II, III, IV)

12.	apply technology productivity tools and resources to collect, analyze, and interpret data and to report results to parents and students. (III, IV)

13.	select and apply suitable productivity tools to complete educational and professional tasks. (II, III, V)

14.	model safe and responsible use of technology and develop classroom procedures to implement school and district technology acceptable use policies and data security plans. (V, VI)

15.	participate in online professional collaboration with peers and experts as part of a personally designed plan, based on self-assessment, for professional growth in technology. (V)

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Technology operations and concepts

2. Planning and Designing Learning Environments and Experiences

3. Teaching, Learning, and the curriculum

4. Assessment and Evaluation

5. Productivity and Professional Practice

6. Social, Ethical, Legal, and Human Issues

Reference List

Anderson, T., Varnhagen, S., & Campbell, K. (1998). Faculty Adoption of Teaching and Learning Technologies: Contrasting Earlier Adopters and Mainstream Faculty. *Journal of Higher Education, 28* (2,3), 71-98.

Admiraal, W.F., Lockhorst, D., Wubbels, T., Korthagen, F.A.J., Veen, W. (1998). Computer-Mediated Communication Environments in Teacher Education: Computer Conferencing and the Supervision of Student Teachers. *Learning Environments Research 1*(1), 59-74.

Anderson, S. E. (1997). Understanding Teacher Change: Revisiting the Concerns Based Adoption Model. *Curriculum Inquiry, 27*(3), 331-367.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopaedia of Human Behaviour,* (4), 71-81. Retrieved January 3, 2004 from: http://www.emory.edu/education/mfp/BanEncy.html

Barger, R. N., & Barger, J. C. (1982). Why Educational Computers Are Here to Stay. *Eastern Education Journal,* 15(2), 11-14. Retrieved March 10, 2004 from: http://www.nd.edu/~rbarger/humanize-computer.html

Beynon, J., Grout, J., & Wideen, M. (2004). From *Teacher to Teacher Educator: Collaboration Within a Community of Practice.* Vancouver: Pacific Educational Press.

Bitter, G.G. & Pierson, M.E. (1999). *Using Technology in the Classroom.* Boston: Allyn and Bacon.

Bonk, C. J., & Cunningham, D. J. (1998). "Searching for learner-centred, constructivist, and sociocultural components of collaborative educational learning tools". In C. J. Bonk, & K. S. King (Eds.), *Electronic collaborators: Learner-centred technologies for literacy, apprenticeship, and discourse.* Mahwah, NJ: Erlbaum. Retrieved December 10, 2003 from: http://php.indiana.edu/~cjbonk/article.html

Brownlee, J., Purdie, N., Boulton-Lewis, G. (2001). Changing Epistemological Beliefs in Pre-service Teacher Education Students. *Teaching in Higher Education (6)2,* 169-177.

Carr, J. (1998). *Information Literacy and Teacher Education.* ERIC Clearinghouse on Teaching and Teacher Education, Washington, DC. Retrieved February 15, 2004 from: http://www.ericfacility.net/databases/ERIC_Digests/ed424231.html

Clouse, R. W. & Alexander, E. (1997). Classrooms of the 21st Century: Teacher Competence, Confidence and Collaboration. *Journal of Educational Technology Systems 26*(7), 97-111.

Chatel, R.G. (2001). Technology and Teacher Preparation: A Case Study. In Burkett, R.S., Macy, M., White, J. A., Feyten, C. M (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference, Orlando, Florida, 12,* 56-61.

Clark, R. E. (1983). Reconsidering Research on Learning from Media. *Review of Educational Research, 53(4),* 445-459.

Cradler, J., McNabb, M., Freeman, M., & Burchett, R. (2002). How Does Technology Influence Student Learning? *Learning & Leading with Technology, 29(8),* 46-56.

DeTure, L. R. & Gregory, E. (2001). Infusing Technology into the Teacher Education Program. In Burkett, R. S., Macy, M., White, J. A., Feyten, C. M (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference, Orlando, Florida,* 12, 136-7.

Dudt, K., Yost, N., & Brzycki, D., (2001). Preparing Teachers for the Digital Age: Implementing a Dynamic Model of Pedagogical Change. In Burkett, R. S., Macy, M., White, J. A., Feyten, C.M. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference, Orlando, Florida,* 12, 160-165.

Duran, M. (2001). Technology Integration into Preservice Teacher Preparation: Recommendations for Practice. In Burkett, R. S., Macy, M., White, J. A., Feyten, C.M. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference, Orlando, Florida,* 12, 103-104.

Egbert, J. & Thomas, M. (2001). The New Frontier: A Case Study in Applying Instructional Design for Distance Teacher Education. *Journal of Technology & Teacher Education, 9(3),* 391-405.

Ertmer, P. A. (2001). Responsive Instructional Design: Scaffolding the Adoption and Change Process. *Educational Technology,* Nov-Dec, 33-38.

Ertmer, P. (2001). VisionQuest © : Teacher Development Model for Scaffolding Technology Integration. *Society for Information Technology and Teacher Education International Conference 2001*(1), 833-839. Retrieved October 3, 2003 from: http://dl.aace.org/3635

Ertmer, P. A. (1999). Addressing First- and Second-Order Barriers to Change: Strategies for Technology Integration. *Educational Technology Research and Development 47*(4), 47-61.

Ertmer, P. A., Addison, P., Lane, M., Ross, E., Woods, D. (1999). Examining Teachers' Beliefs About the Role of Technology in the Elementary School Classroom. *Journal of Research on Computing in Education, 32*(1), 54-71.

Fisher, C., Dwyer, D.C., & Yocam, K. (Eds). (1996). Education *and technology: Reflections on computer in classrooms.* San Francisco, Jossey-Bass.

Fuller, Hester L. (2000). First Teach Their Teachers: Technology Support and Computer Use in Academic Subjects. *Journal of Research on Computing in Education, 32(4).*

García-Barbosa, T. J. & Mascazine, J. R. (2002). *Guidelines for College Science Teaching Assistants.* Retrieved May 14, 2003, from http://www.ericse.org/digests/dse98-11.html

Gordon, J. (1996). Tracks for learning: Metacognition and learning technologies. *Australian Journal of Educational Technology, 12*(1), 46-55.

Grandgenett, N., Ziebarth, R, Koneck, J., Farnham, M. L., McQuillan, J., Larson, B. (1992). An Investigation of the Anticipated Use of Multimedia by Pre-Service Teachers. *Journal of Educational Multimedia and Hypermedia 1,* 91-101.

Grimmett, P. (2004). *Faculty of Education: Three Year Plan.* Burnaby, B.C.

Hargrave, C. P. & Hsu, Y. S (2000). Survey of Instructional Technology Courses for Preservice Teachers. *Journal of Technology and Teacher Education 8(4)*, 303-314.

Hidalgo, J., Lu, M., & Miller, M. T. (2000). Confronting Difficulties Associated with Pre-Service Teacher Preparation Technology Apprehension: A Case Study. In *Proceedings of the Annual Association of Teacher Education,* Barcelona, 25.

Holloway, R. E. (1996). Diffusion and Adoption of Educational Technology: A Critique of Research Design. In *Handbook of Research for Educational Communications Technology*. Ed. Jonassen, H. D. New York: Simon & Schuster Macmillan. 1107-1133.

Jonassen, D. H., Carr, C., Yueh, H. (1998). Computers as Mindtools for Engaging Learners in Critical Thinking. *TechTrends*, 43(2), 24-32.

Keating, T. & Evans, E. (2001). Three Computers in the Back of the Classroom: Preservice Teachers' Conceptions of Technology Integration. In Burkett, R. S., Macy, M., White, J. A., Feyten, C.M. (Eds.). *Proceedings of Society for Information Technology & Teacher Education International Conference*, Orlando, Florida, 12, 160-165.

Knezek, G., & Christensen, R. (1998). Internal Consistency Reliability for the Teachers' Attitudes Toward Information Technology (TAT) Questionnaire. *Proceedings of the Society for Information Technology & Teacher Education, 2,* 832-833.

Larner, D.K. & Timberlake, L.M. (1995). Teachers with Limited Computer Knowledge: Variables Affecting Use and Hits to Increase Use. Teacher Education. Retrieved October 1, 2002, from: http://80-web10.epnet.com.proxy.lib.sfu.ca.

Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic Inquiry*. London: Sage Publications.

Mayer-Smith, J., Pedretti, E, Woodrow, J. (1998). An Examination of How Science Teachers' Experiences in a Culture of Collaboration Inform Technology Implementation. *Journal of Science Education and Technology 7(2)*, 127-134.

McCabe, M.F. (1998). Lessons from the Field: computer conferencing in higher education. *Journal of Information Technology for Teacher Education, 7(1)*, 71-87.

Merriam, S. B. (2001). *Qualitative Research and Case Study Applications in Education*. San Francisco: John Wiley & Sons.

Miles, M. & Huberman, A. (1994). *Qualitative Data Analysis* (2nd Ed.). Thousand Oaks: Sage Publications.

Mullen, L (2001). Beyond Infusion: Preservice Students' Understandings About Educational Technologies for Teaching and Learning. *Journal of Technology and Teacher Education*, 9(3), 447-466.

National Education Technology Standards. Profiles for Technology-Literate Teachers. Student Teaching/ Internship Performance Profiles (n.d.). Retrieved July 14, 2004 from: http://cnets.iste.org/teachers/t_profile-stu.html

Newman, J. M. (1987). *Learning to Teach by Uncovering Our Assumptions*. Language Arts, 64(7), 727-737.

Palmer, P. (1998). *The Courage to Teach*. San Francisco: Jossey-Bass.

Porter et al (2000). Does Professional Development Change Teaching Practice? Results from a Three-Year Study. U.S. Department of Education. Retrieved November 12, 2003 from: http://www.ed.gov/rschstat/eval/teaching/epdp/report.doc

Postman, N. (1992). *Technopoloy: The Surrender of Culture to Technology.* New York: Random House.

Ragan, P. E., Lacey, A., & Korithoski, T. (2001). Teacher Preparation and Online Learning: Is It Working? In Burkett, R. S., Macy, M., White, J. A., Feyten, C.M. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference, Orlando, Florida,* 12, 205-210.

Richey, R. C. & Nelson, W. A. (1996). "Developmental Research". In *Handbook of Research for Educational Communications Technology.* Ed. Jonassen, H. D. New York: Simon & Schuster Macmillan, 1213-1243.

Robinson, L. M. (2003). *Millennium II Project Website.* Retrieved February 10, 2004 from: http://www.iittl.unt.edu/pt3II/_Toc498406788

Rogers, E. M. (1995). *Diffusion of Innovations.* 4th Ed. New York: Free Press.

Ropp, M. M. (1997). Exploring individual characteristics associated with learning to use computers and their use as pedagogical tools in preservice teacher preparation. Doctoral dissertation. Michigan State University.

Selwyn, N. (1998). What's in the Box? Exploring Learners' Rejection of Educational Computing. *Educational Research and Evaluation,* 4(3), 193-212.

Smith, S J., Robinson, S. (2003). Technology Integration Through Collaborative Cohorts. *Remedial & Special Education,* May/Jun2003, 24 (3), 154-161.

Stake, Robert. (1995). *The Art of Case Study Research.* London: Sage Publications.

Wasserman, S, & Eggert, W. (1973). *Profiles of Teaching Competency: Form A: Pre-service Professional Development.* Unpublished report, Simon Fraser University.

Statistics Canada. (2003). Education indicators in Canada: Report of the Pan-Canadian Education Indicators Program, 2003(1), (No. 81-582-XIE). Ottawa, Ontario. Retrieved June 10, 2004 from: http://www.statcan.ca/english/freepub/81-582-XIE/2003001/highlights.htm#C

Statistics Canada. (2003). Internet Use in Canada, 2003 (No. 56F0003XIE). Retrieved June 13, 2004 from: http://www.statcan.ca/english/freepub/56F0003XIE/index.htm

Statistics Canada. (2003). Connectivity and ICT integration in Canadian elementary and secondary schools: first results from the Information and Communications Technologies in Schools Survey, 2003-2004 (No. 81-595-MIE2004017). Retrieved June 10, 2004 from: http://www.statcan.ca:8096/bsolc/english/bsolc?catno=81-595-M2004017

Statistics Canada. (2003). Household Internet Use Survey 2003 (No. 56F0003XIE). Ottawa, Ontario. Retrieved July 6, 2004 from: http://www.statcan.ca/english/Pgdb/arts50a.htm

Woodrow, Janice E. J. (1991). Teachers' Perceptions of Computer Needs. *Journal of Research on Computing in Education,* Jun 01, 1991, 23(4). 475 – 496.

Zandvliet, D. B., Buker, L., Ballard, P. & Parvanova, T (2002). *Infusing Technology into Teacher Education: A Development and Research Project Funded by the British Columbia Ministry of Education.* Unpublished Report, Simon Fraser University.