University of Alberta

Authentic Teacher Professional Development: A consequence of participation in K-12 Collaborative Online Projects.

By

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Chapter 1

Teacher Technology Professional Development

Background

The use of technology in education has a long history, progressing in earnest in the 20th century from teaching machines, film, and instructional radio through to television and eventually the personal computer. The personal computer rapidly increased in computational power over the last 20 years of the century, and one aspect of the PC made its impact on the future inevitable – PCs could be connected together to form networks and information could quickly be sent anywhere around the world. Over the past five years the profound impacts of this new technology on education are coming into focus. With the infusion of the Internet into the modern day culture, the World Wide Web has become a source of extreme possibilities; the best and the worst facets of humanity can be found on the WWW. Nevertheless, the underlying theme of universal access to information, and the ability to share information makes the Internet's impact on education potentially huge.

Today's classroom teachers are being expected to take on ever-increasing roles (Dilworth & Imig, 1995) with the incorporation of meaningful technology activities into daily lessons being one of these new roles. Experts agree that there will be little if any difference in student learning unless teachers know how to effectively use technology, and professional development is one method to achieve that goal (Dilworth and Imig, 1995; Mackenzie 2000, 2001; Trotter, 1999). As Mackenzie (2001, ¶ 5) aptly phrases it, the "focus of professional development should be on teaching and learning strategies that make a difference in daily practice -- on activities that translate into stronger student performance" but research varies on how

to bring about effective technology Teacher Professional Development (TPD). Add to this uncertainty the fact that a majority of the teacher pool did not grow up with computer literacy opportunities afforded to Generation Xers (Cockrell, Cockrell & Harris, 1998), considerable training is needed to educate the teacher pool on the incorporation of computer technology into classroom activities. ICT incorporation into the curriculum creates several challenges for all teachers in a time where the teacher's role in the classroom continues to change. Jonassen states that "teachers must adopt a new model of teaching (1996, p. 261) and that "schools should function as apprenticeships in learning how to learn, and that teachers should model, coach and scaffold learners to help them articulate their knowledge...." (1996, p. 262) An extension of this argument is then that teachers too need new ways in which to expand their teaching skills and participation in professional development.

It is within this context of "needing to educate the teacher pool" that several unique professional development initiatives that focus on technology education have sprung up over the past several years. Since the mid-1990's Canadian educators have been online in more and more meaningful ways – from the first "sharing" of the classroom experience on the WWW to complex collaborations of students, teachers, and mentors which result in the publication of books and CD-ROMS (Kissel, Ostashewski & Ostashewski, 2001). Several institutions, such as Canada's SchoolNet GrassRoots Program initiative (Government of Canada, 2002), have provided funding support and encouragement for worthwhile student activities that have a technology component. According to the SchoolNet's GrassRoots Program, "these [classroom technology] projects, which are initiated, designed and implemented by the teacher and students,

are curriculum relevant, focus on learning activities carried out using the Internet and result in the creation of a website" (Government of Canada, 2002, p. 1). In fact, some provincial governments and teacher organizations in Canada have recognized that in order for emerging "information and communication technologies" (ICT) to be integrated into the curriculum, the need for teacher technology education would be significant.

In Alberta, Canada, this realization became a reality with the development of several unique initiatives that addressed the challenge of teacher technology professional development. One of the first initiatives in Alberta was the development of a foundation that included five members – The Alberta Teacher's Association, The College of School Superintendents, Alberta Learning, Alberta School Boards Association and a corporate foundation – TELUS. Since early 1996, the Telus Learning Connection (TLC) initiative (available at http://www.2learn.ca/) has provided technology inservice opportunities for thousands of Alberta teachers, and more importantly for this study, provided support for the delivery of collaborative online projects for students with the Alberta curriculum as the focus. On the strength of teacher requests for technology education, the TLC initiative was followed by the development of other technology training initiatives for Alberta teachers like the Teachers Learning Technology (TLT) project (available at http://www.tlt.ab.ca/). As well school divisions within the province developed their own technology inservice programs that were delivered in a variety of ways. Teacher technology professional development in Alberta over the past 7 years has been delivered in a variety of ways, and the focus of the current study will be within this context. A Leader in ICT

integration into the classroom, Dr. Judi Harris, author of *Way of the Ferret* and *Virtual Architecture*, has commented that "the approach to teacher technology professional development in Alberta is unique across at least North America, and possibly in the world," (J. Harris, personal communication, November 16, 2001) and as such the focus of this study will be on a component of that teacher professional development (TPD).

Context of the Study

Interest in TPD has expanded in recent years, and with the continued evolution of information and communication technologies in the educational context, technology TPD has considerable importance. Whether it is the Generation X teacher with the challenge of "adapting to new terrain" (Cockrell et al, 1998, p. 113) because technology is changing every day, or the Boomer teacher that requires considerable time investment to develop computer literacy skills, technology TPD is a key concern for educational administrators and school jurisdictions.

There has been a renewed call for redesigning teacher professional development in recent years (Colgan, Higginson and Sinclair, 1999; Dilworth and Imig, 1995; Lieberman, Anderson, Gonzales, Laguarda, Leighton, Walking-Eagle and Weiner, 1996; Willis, 2002), specifically in regard to ensuring that PD experiences are meaningful to teachers. The call for a different kind of technology professional development both at the teacher skill level and classroom ICT incorporation level (Colgan et al, 1999; Lundeberg, Coballes-Vega, Standiford, Langer and Dibble, 1997; Macmillan, Liu and Timmons, 1997) suggests new kinds of approaches are required for effective technology TPD. Colgan, Higginson and Sinclair (1999) state:

> Research on teacher professional development (TPD) suggests that teachers need more opportunities (a) to access and discuss exemplary reform-based materials, (b) to co-construct and publish resources for new teaching practices, and (c) to collaborate on the creation of locally relevant solutions by participating in a professional community of practice. (p. 316)

Research on TPD also indicates that in order to be effective, it needs to be relevant to a teacher's immediate teaching situation. Teacher technology learning continues to be delivered primarily through traditional inservice or "just-in-case" seminars, which although effective for technology skill development, do not seem to be effective for helping teachers incorporate technology into the classroom (Trotter, 1999; Willis, 2002). Colgan, Higginson, and Sinclair (1999) found that the predominant forms of teacher professional development (the *workshop* model and the *train-the-trainer* model) are not sustainable, nor especially effective at changing teacher practices because they lack collaborative or generative components. Furthermore, Loucks-Horsley, Love, Stiles, Mundry, and Hewson (2003) identify a key characteristic of effective professional development as the opportunity for teachers to collaborate with colleagues and other experts in the construction of content and pedagogical content knowledge. Thus, the challenge to deliver effective and relevant technology TPD that leads to ICT incorporation into classroom activities is considerable.

With the ever-increasing number of computers and networks and increasing costs to operate and maintain them, school boards are looking for signs that the expenditure is not wasted and that teachers are incorporating ICT. Although several studies show that teachers are still not comfortable with ICT integration, other studies

are finding that technology TPD may not always come in the form that would be expected. McGee (1998) indicates that technology TPD may be occurring in unique ways – as a result of teacher participation in collaborative online projects. McGee's study suggests "teacher learning may be facilitated through contextually-situated experiences that allow knowledge construction with peers, either electronically or in face-to-face settings" (p. 9). Harris and Grandgenett (2002) describe K-12 teachers and their learning experiences during participation in online projects. The findings of this quantitative study "show that teachers participating in curriculum-based online activities created for and with their students report authentic professional development to a considerable degree" (p. 54). Teachers also report that they have made changes to their teaching/learning and assessment practices due to their learning as a participant in the online projects. As a result students are being engaged in learning activities where technology plays a significant role, and teachers are collaborating with students to accomplish ICT tasks. A third study, Abbott (2000), states "teachers all described their involvement with the telecomputing projects as resulting in a variety of different kinds and degrees of naturally occurring, job-related growth in their understanding of their teaching practice" or what Abbott refers to as "authentic professional development" (p. 29). These three studies form a framework for understanding the *authentic teacher professional development* (ATPD) phenomenon in that teachers, while engaging their students in activities that incorporate ICT outcomes, are learning ICT tasks alongside their students.

It seems then that one activity that may fulfill the requirements of effective technology TPD is participation in collaborative curriculum-based online projects.

However, participation in online projects, and especially ones that are personally relevant to individual teachers, could not be effectively mandated. Abbot (2000) warns that "top-down mandates for educational change, such as state or district-wide initiatives that require teachers to demonstrate proficiency in using technology, may not correspond with teachers' beliefs about how they think they should conduct their classrooms and when or how they should change their classroom practice" (p. 26). Is there a way then to encourage teacher participation with their students in these online collaborative projects? If indeed we could point out *with confidence* to teachers that online collaborative project participation leads to authentic learning experiences for teachers and students, some of which will be technology-based, we would be contributing to the goal of efficacious technology TPD while engaging students in ICT curricula.

Purpose of the Study

The purpose of this research is to describe and evaluate the nature of the authentic teacher professional development occurring as a consequence of participation in K-12 curriculum-based online projects. What relationships exist between authentic teacher professional development and teacher participation in curriculum based online projects?

This study addressed the following six questions:

1. What profession-centered technology learning is reported by teachers who participate in collaborative online projects?

2. How does the profession-centered technology learning reported by teachers participating in collaborative online projects compare to traditional technology learning?
3. What factors of the online collaborative project experience motivate teachers to participate for the first and successive times?
4. How do teachers perceive their incorporation of collaborative online projects into curriculum activities affects student attitudes?
5. Is teacher-centered learning that occurs during collaborative online projects more effective than other types of technology PD for teachers.
6. What do teachers identify as the professional value of the collaborative project experience for themselves and their students.

Significance of the Study

There continues to be a considerable amount of time and resources expended by various levels of government and school boards on technology TPD; however, methods to maximize incorporation of technology into classroom practice require improvement. The intent here was to determine the factors that prompt and encourage teacher participation in collaborative projects resulting in teacher confidence and competence in the integration of technology into classroom activities. The quantitative portion of this study was undertaken to examine and compare the relationship of profession-related technology learning occurring among teachers who participate in collaborative online projects with those who do not. The qualitative component of this study provided information that describes the characteristics of the authentic teacher technology professional development.

The Harris and Grandgenett (2002) study looked into describing the authentic teacher learning phenomenon in a global educational context. This study replicated and extended their study within the Alberta context, making the results directly applicable to current Alberta realities. Leading edge research into "teacher learning" as a result of online project participation benefits from replication, and will contribute to future planning in the area of technology TPD initiatives. Gall, Borg, and Gall (1996) observe:

> The need for replication is even more critical in education and other social science disciplines because the instruments usually have considerable measurement error, since it is more difficult to control for extraneous factors that may confound a study's findings. (p. 52)

In order to support the findings of the Harris and Grandgenett study, as well as to identify some comparative statistics with regards to other technology TPD, this study collected and analyzed online survey data from Alberta teachers.

The significance of this study comes to light with a review of pressures that continue to be imposed on the teaching profession. Increasingly teachers are being called upon to be educators, social workers, councilors, and coaches, and to keep current with the ever-evolving profession of teaching. In addition, teachers are expected to keep abreast of computer technology, and how it can be incorporated into the classroom – a task so challenging that many teachers do not explore the true potential of computer technology in the classroom. However, if educational professional developers were to be able to say to teachers "participation in a collaborative online project will provide you technology PD, while you are teaching

your students in the classroom and fulfilling ICT requirements," teachers may be more willing to try. The significance of this research is simple – provide evidence of efficacious technology TPD that is "*worth it*" for teachers!

Definition of Terms

A number of technical terms are used in this study. The common ones are defined below.

Authentic teacher professional development (ATPD)

Teacher-centered learning that occurs while teachers are engaged in activities with their students as a regular part of the curriculum instruction. Technology ATPD is one consequence of participation in curriculum-based online projects. This learning is different from traditional type of technology learning that teachers do in that it occurs in the classroom, with the students, and in direct support of technology related curriculum incorporation initiated by the teacher.

Collaborative projects

Collaborative projects, as the term is used in this study, refers to online projects where two or more teachers, along with their students, work together to create and publish online the results, materials, or products of their curriculum-based explorations. As these projects have online components, there is an information and communication technology (ICT) aspect to them that teachers would facilitate as a part of their instruction. Collaborative refers to the teacher-student, student-student, and teacher-teacher collaboration that occurs as part of the project participation.

Summary

This chapter has introduced the idea that technology TPD is occurring as a consequence of teacher participation in online collaborative projects with their students. It has also made the point that for technology TPD to be effective in changing teacher classroom practices, new approaches to professional development need to be considered, one of these being the collaborative online environment that teachers choose to be part of. It was concluded that ultimately the choice to integrate ICT into meaningful experiences for students rests with teachers who have demands on their time for professional development, technology being only one of many. Therefore, more information is required regarding the characteristics of the collaborative online project experience.

The next chapter summarizes the current research with respect to these ideas. A review of literature explores the field of technology professional development from several different perspectives. New approaches to professional development, specifically technology TPD, collaboration in the classroom, and student attitudes towards technology in the classroom form the basis of the review. Collaborative technology projects and the phenomenon of ATPD are explored in the current literature and are the foundation of this study.

Chapter three presents the research methodology for describing and comparing the TPD from the teacher perspective. Included is a description of the target groups of the study and of the online instrument used to collect data.

Chapters four and five present the results of the data collection, analysis procedures, and discussions of the results. Findings and conclusions about the

practical implications of the results are offered for teachers and those planning technology TPD.

Chapter 2

Literature Review

Introduction

This review of the literature examines the emerging field of technology professional development for teachers as it relates to the research. The purposes of this review are to describe the nature of the authentic teacher professional development occurring as a consequence of participation in K-12 curriculum-based online projects and to compare it to traditional technology training. The phenomenon being studied, ATPD, differs from traditional TPD activities in that it occurs while the teacher is engaged in the teaching process. The intent here is to be able to provide some analysis of the technology ATPD experience in order for professional development providers to be able to determine how best to support technology TPD.

The literature that composes this review originates from a series of searches focusing on the topic of "workplace learning" and "teacher professional development." The literature search was initially conducted through online sources; ERIC Digests, Adobe PDF online repository, University of Alberta Education Library (abstracts, periodicals, journals), Educational Research Abstracts Online database, and on Web-base search engines (Google, AltaVista). Searches were generated using keyword phrases such as: teacher workplace learning, teacher centered professional development, collaborative projects, online professional development for teachers, teacher professional development, teacher collaboration, and ATPD. Where appropriate, searches were narrowed to only include information regarding literature published over the past 10 years. Several of the online articles contained hyperlinked

reference lists as well and these links led to the discovery of other articles related to the topic. Personal email communication with three authors involved in similar educational technology research (Judi Harris, Lynda Abbott, Marion Rex) yielded further lists of articles as well as information regarding dissertations on the topic. McGee (1998) and Abbott (2003), two dissertations, provided background information for this study

The articles that compose this review of the literature represent both quantitative and qualitative methodologies, and several of the articles are based on primary data sources that include a mixed-methodology. The methodology in several of the articles is of high quality (McGee, 1998; Forman, 1997; Lundegerg et al, 1997; Colgan et al, 1999) with significant considerations being given to ensure internal and external validity and sound data collection and analysis practices. Other articles reflect poor methods (Rakes, Flowers, Casey, and Santana, 1999) but contribute critical organizational and defining characteristics to this study.

The literature forming this review falls into six distinct categories:

1. the changing face of teacher professional development,
2. a new approach to technology professional development,
3. collaboration as a part of teacher professional development,
4. integration of computers into the classroom,
5. student attitudes about teachers and technology,
6. collaborative technology projects and authentic teacher PD.

This review provides a critical analysis of over 25 articles that define and support the purpose, methods, and general understanding of current research in technology TPD.

The changing face of teacher professional development

In a review of research on teacher professional development, Dilworth and Imig (1995) make it clear that caring and competent teachers are vital to the success of each new educational initiative. Equally clear is that preservice and inservice teacher professional development must change to equip teachers to meet new technology challenges. One important aspect is that TPD needs to be restructured in a variety of ways.

> From learning separately to learning together, in which practicing teachers are jointly responsible for their work in classrooms, and their wisdom and experiences are perceived as professional resources. Smylie and Conyers (1991) note that this conception has important implications for how schools are organized, in other words, as places for teachers to learn as well as to teach. This paradigm shift addresses one of the most pervasive conditions of classroom--*teachers isolation,* [italics added] or the inability to learn and to communicate with colleagues in the place where it counts most--the school. (Dilworth & Imig, 1995, ¶ 7)

The theme of re-organizing the type and manner in which TPD is delivered continues to be of considerable interest in educational circles. Willis's (2002) interview with James Stigler, a professor of psychology at the University of California-Los Angeles and the founder of LessonLab, sheds light on the fact that the call for redesigning how TPD is delivered is coming from many corners of educational practice.

> Today, people believe that professional development should be targeted and directly related to teachers' practice. It should be site-based and long-term. It should be ongoing part of a teacher's workweek, not something that's tacked on. And it should be curriculum-based, to the extent possible, so that it helps teachers help their students master the curriculum at a higher level. (Willis, 2002 p. 6)

Stigler's expertise in the field of educational psychology is demonstrated in his renowned video production of the Third International Mathematics and Science Study (TIMSS), and his 1999 book *The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom* that explores the implications of TIMSS findings. In Stigler's opinion, one of the key challenges to improving professional development for teachers is, "we need to create contexts in which collaborative work can be sustained. Some people think of it as a matter of "finding time"—but it's also a matter of having a program that teachers consider valuable and being able to integrate that program into the daily routines of school life over the long term" (Willis, 2002, ¶ 16). Elaborating on current professional development activities, Stigler states that they have "been largely divorced from practice, often taking place outside of schools.... It's been haphazard, with many small service providers delivering idiosyncratic kinds of professional development" (Willis, 2002, ¶ 5). The view that current teacher professional development models lack many of these characteristics is a common PD topic.

In today's society, where teachers are being pressed to fill a variety of roles in the classroom and demands on budgets, time, and resources are being pushed, finding

efficacious TPD is a goal of teachers and administrators alike. Bereiter (2002) points out that innovation in education "tends to be sporadic and discontinuous, with the result that innovative practices rarely win out over those with a long evolutionary history" (p. 321). In Bereiter's (2002) research review he states that innovation always exists, but the challenge is to create models of practice in the educational community that support sustained innovation, which allows for the realization of the full potential of an innovation. Bereiter states that educational research, in both quantitative and qualitative traditions, lack key design features that allow them to support innovative practices and thus improve the education system. He describes design research as having real potential for education in that this kind of research "produces innovations and sustains their development" (p. 325), and that this kind of research is defined by it's purpose: sustained innovative development. What makes this kind of research applicable to this study are the factors required for sustaining innovative practices in education: "design research is constituted within communities of practice that have certain characteristics of innovativeness, responsiveness to evidence, connectivity to basic science, and dedication to continual improvement" (p. 325). Bereiter points out that obviously design researchers need to work closely with practitioners developing and sustaining "a research community driven by potentiality" (p. 327). This describes an emerging type of professional development: collaborative groups of teachers innovating and trying out new ICT integration practices in search of meaningful ways to advance their skills.

These two articles summarize opinions in the education field that current professional development methods lack in significant ways – the search for more

meaningful PD is very relevant in times of expansive and continually evolving educational challenges such as technology PD.

A new approach to technology professional development

Trotter (1999) argues that there is much yet to be accomplished with regard to technology and teacher PD. In this article Trotter, a technology and media staff writer for *Education Week*, examines the findings of an *Education Week* funded 1999 National Survey of Teachers' Use of Digital Content "Technology Counts 99," conducted by Education Market Research, a New York educational research firm. This random online survey of 15,000 teachers across the U.S. resulted in 1420 responses (9.5%). Both the methodology and actual survey questions are relevant to this study. According to the Education Week survey, "four out of every 10 teachers who don't use software for instruction say they don't have enough time to try out software, and almost as many say they don't have enough training on instructional software" (Trotter, 1999, No Replacement For Teachers section, ¶ 1). Trotter further points out that professional development for teachers is the "key to whether technology is used appropriately and effectively, and technology increases conversation, sharing, and learning among students and between students and teachers." (Trotter, 1999, No Replacement For Teachers section, ¶ 9)

Trotter states that the reason school districts often bear the brunt of teacher training in technology is that they aren't getting much help from teacher education programs. In a time where there are many new and evolving changes to education, university and college programs simply don't have time to provide much technology education. Cockrell et al. (1998) supports Trotter's view on this indicating that even

the Generation Xers are finding that the task of staying current with constantly evolving computer technologies is a daunting task. Trotter points out that some school districts are having success making technology a priority by jumping forward to meet the challenge.

> One district that has taken that counsel to heart is Ladue, Mo., an affluent suburb of St. Louis. The district's use of technology is directed by the overall instructional goal that "you look at the individual child, look at his or her learning style, and teach to it," says Harriet Arkin, the district's technology coordinator. Ladue also emphasizes "inquiry based" learning, adds Marian Rosen, the technology coordinator at Conway Elementary School, "From the very beginning, we said the computer was to be used as a tool for thinking," Rosen says. "The software has changed, but that concept hasn't." (Trotter, 1999, The District's Role section, ¶ 6)

Teachers, schools, and districts see the many opportunities that technology has to offer education, but the goal of meaningful incorporation is a task that requires a different type of professional development. Trotter suggests "teachers [need to] take on one new technology-related project a year, as long as they do it with understanding" (Trotter, 1999, Advancing The Profession section, ¶ 12). Other findings of the Education Week National survey that are applicable to the current study relate to the type of technology professional development activities that teachers report as meaningful. Trotter (1999) indicates that training on integrating technology into the curriculum seems to have a greater impact on teachers than basic technology skills training, especially when it comes to whether they use software and

how much they rely on it. These findings suggest that rather than providing teachers with professional development on technology skills, the focus should be on teaching integration of technology skills to teachers:

> 25 percent of teachers who had only basic-skills training within the past year say they rely on digital content to a "moderate" or "very great" extent for instruction, the same percentage as among teachers who had no training at all. In contrast, 37 percent of teachers who had only curriculum-integration training rely on digital content to that extent. (Trotter, 1999, Survey Highlights: Method: Training Matters Section, ¶ 3)

Trotter's article provides one review of a quantitative survey, similar in methodology to this study, which identifies a new direction for technology TPD.

The Technology Counts 99 survey (Resnick, 1999) identifies several key areas that indicate teachers report that they are not well prepared to use new technologies. This survey of 1420 teachers found that "Teachers with more technology training are much more likely to feel "better prepared" to integrate technology into their classroom lessons than teachers with less training or no training (Resnick, 1999, Survey Highlights: Key Results Section, ¶ 10). Resnick reports that curriculum integration training, in contrast to basic skills only training, is important in developing teacher's ability to feel effective integrating technology into the classroom. "Training on "integrating technology into the curriculum" seems to have a greater impact on teachers than "basic technology skills" training when it comes to whether they use software and how much they rely on it" (Resnick, 1999, Survey Highlights: Training Matters Section, ¶ 2).

McKenzie (2000) is a third online article that continues this theme of new kinds of technology TPD. Mackenzie notes that "after spending millions of dollars to connect their schools and their students to the Internet, many districts are asking why so many of their newly installed computers are sitting unused" (McKenzie , 2000, ¶ 1). McKenzie, a former superintendent and author of the 1999 book "How Teachers Learn Technology Best" publishes many articles on the topic of integration of technology in the classroom. This article, a review of the research, includes action strategies based on McKenzie's practical experiences during a career of implementing technology networking and integration. The methodology of the article is literature based, a secondary source article, and as such relies heavily on the experience of the author. References to primary source studies make this article valuable and in this case one of the studies referenced (Rakes et al, 1999) provides further clarification on the topic in question.

In this article McKenzie provides a series of strategies that foster increased use of technology in the schools and is based on two underlying principles: the primacy of literacy, and the urgency of professional development. McKenzie's argument is that in order to have technology used in the classroom in meaningful and powerful ways, "we must devote far more attention to curriculum opportunities and teaching strategies" (McKenzie , 2000, ¶ 10) as opposed to simply providing technology literacy opportunities. The article makes two important conclusions from research regarding the types of teacher learning that may influence technology integration into the classroom. The first point is that teachers are spread across a continuum between traditionalist and constructivist. McKenzie refers to a 1998

national study of 2,250 teachers "Internet Use by Teachers," by Henry Jay Becker, which identified that constructivist teachers tended to allow student use of technology 3 times as much as the traditionalists. The second point comes from a study by Rakes et al (1999) who report a strong relationship between teacher style and technology in the classroom. The Rakes et al (1999) study associates several activities that fit well with technology integration in the classroom such as: problem-oriented learning activities, environments that access a variety of learning resources, encouraging creativity in problem solving and decision making, and encouraging collaboration and cooperative group work. McKenzie (2000) goes on to present 10 strategies to increase the effectiveness of districts in providing technology integrated student learning – that are *worth doing* because they emphasize the classroom teacher's bottom line: student performance. Looking at McKenzie's (2000) list of suggested strategies, teacher-centered learning and support thereof is an evident theme. The article's relevance to this current study is evident by the suggestion of a new description of the type of meaningful technology PD needed for teachers – one that follows the 'constructivist' nature in which technology is being incorporated successfully into classroom.

McKenzie (2001) takes the description of strategies for technology TPD a step further. This article, a research review, presents practical applications of findings and is intended to provide education administrators with some direction on how to deliver effective technology TPD. Even though the article cites current thoughts on staff PD from Bruce Joyce, Anne Lieberman, and Michael Fullan, it is not based on direct research. The suggestions are based on experience, and a detailed study of the factors

of effective technology TPD may in fact find the suggestions to be valid. The article is nonetheless significant in that it demonstrates the need for research in this area, and generates interest in the topic. McKenzie (2001) highlights a relevant finding of the Becker (1999) US National Survey:

> Frequent informal interactions among teachers may help teachers to learn enough about the Internet to apply it in their teaching in a variety of ways. The Internet thus becomes a potentially important tool in the creation of a collaborative professional culture among the teachers of a school. (Becker, 1999, p. 33)

McKenzie states that "the focus of professional development should be on teaching and learning strategies that make a difference in daily practice -- on activities that translate into stronger student performance" (McKenzie , 2001, ¶ 5). "We must also convince them of the value of engaging students in problem-based or project-based learning with these new tools,"(2001, ¶ 10) argues McKenzie. This article identifies key characteristics that compose effective technology TPD. "Informal support systems, partnerships, teams, and collaborative structures might be the most effective elements in a broad-based change effort" (McKenzie , 2001, ¶ 16) are the kinds of TPD activities that seem to have a direct effect on technology incorporation. In conclusion, although McKenzie's articles are not supported with specific research, they do bring the topic of this study into the light and begin dialogue on the topic.

Another article that falls into the category "a new approach to technology professional development" is the Norris, Soloway, Knezek, Topp, Young, and Box

(2000) article. This article takes a different approach to technology TPD research, and therefore has implications for this study. Norris et al (2000) argue that as technology is moving so quickly, a costly in-depth study of the effectiveness of technology TPD or the quick survey methodology of media organizations (like CNN) may not be reliable sources of information about technology TPD. Therefore they have attempted to find a middle ground methodology that has resulted in "snapshot surveys" which are not random surveys and cannot be generalized to all teachers, but still would provide a picture of what is going on in technology TPD. They further argue that the "representative teacher is actually a myth" (Norris et al, 2000, ¶ 7) and rather that the characteristics that differentiate teachers are what is important to understand. The study looked at three issues for educators - activities using technology, beliefs about technology, and needs in order to use technology. This article includes a link to the "Snapshot survey" (Norris et al, 2000) website and the authors state that they believe it is a useful tool for assisting in providing direction for the technology integration efforts of TPD. The website has a unique approach in that it allows schools and districts to set up their own set of questions which are added to some standard questions to produce an online survey. This seems a little too "canned" for directed educational research, as the development of a survey doesn't require any understanding of the process. However, it is an attempt to provide a tool that may be useful in a specific context, and in fact the simplicity may make it useful. The findings would be highly suspect however if a researcher tried to generalize them beyond the specific context – even the authors state this limitation of the approach.

Having considered the limitations of this survey, there is one area of the Norris et al (2000) article that directly applies to the current research with regards to the sampling method. One of the key findings of this survey was that "technology savvy varies greatly among teachers" (Norris et al, 2000, The Survey section, ¶ 8) and as a group teachers activities, beliefs about, and needs for technology are considerably diverse. Of consideration here is the methodology used for this portion of the study that compared 70 technology grant winners with 140 technology inservice workshop attendees. This part of the study found that the technology-mature teachers tended to use the Internet in their teaching and used email at home, as compared to those less experienced with technology. "When asked their highest need in technology, a majority of the grant winners said they needed more time to change the curriculum; the rural teachers responded that they needed more time to learn to use technology" (Norris et al, 2000, Teacher's knowledge and needs differ section, ¶ 3). The authors conclude that "if we can address the different needs of teachers, we should see increased use of the technology in the classroom," (Norris et al, 2000, The Future of the snapshot survey section, ¶ 1) and this further supports the idea that a change in technology professional development delivery can develop effective technology TPD for all teachers.

Another article that falls into the "new approach to technology professional development category" is Scardamalia and Bereiter's (2003) description of "knowledge building." This review of research article identifies innovation and the need for education and knowledge creation in a knowledge age.

> Keeping abreast of advancing knowledge is now recognized as essential for members of a knowledge society. Knowledge building goes beyond this to recognize the importance of creating new knowledge. The key distinction is between learning – the process through which the rapidly growing cultural capital of a society is distributed – and knowledge building – the deliberate effort to increase the cultural capital of society. (Scardamalia & Bereiter, 2003, p. 1371)

According to Scardamalia and Bereiter, a knowledge society presents considerable new challenges, specifically, "how to develop citizens who not only possess up-to-date knowledge but are able to participate in the creation of new knowledge as a normal part of their work lives" (2003, p. 1370). In this new type of knowledge environment, teachers work together with students building authentic knowledge that is shared and useful to themselves and others. This collaborative workspace where students and teachers are creating new knowledge describes a learning environment that fosters ATPD, as an integral part of the process.

The knowledge building environment CSILE (Computer Supported Intentional Learning Environments) is described by Scardamalia (in press) and identifies some possibilities for a new type of professional development direction for teachers. CSILE is a multimedia community knowledge space where participants contribute information and ideas to a shared space, and then work creating notes and displays of the same information in multiple graphical representations.

> This network also supports virtual workshops, practica, seminars, and other events surrounding a knowledge base. Some of the most successful instances

> of collaborative knowledge building have involved school students, teachers, researchers, graduate students, curriculum and subject-matter experts coming together to tackle a problem of understanding. (Scardamalia, in press)

What makes the knowledge building discussion important to the current research is the focus of collaboration with others outside the classroom as an integral part of teacher-centered learning and innovation – a new type of TPD that is made possible through the use of new multimedia technologies.

Collaboration as a part of teacher professional development

The call for refining professional development for teachers continues in the newsletter article by Lieberman et al. (1996). The newsletter article is a secondary source article that well-known authors on educational reform have contributed to from their own body of writings. In this case the authors cite research to support their suggestions on how and in what direction the reform of TPD might proceed. Of relevance to this study is the direction in which TPD is being prodded – towards the collaboration of teachers within and outside the school. This is a key component of the focus of this research in that "collaboration" between teachers and students, and teachers and other teachers, during classroom activities are what generate the phenomenon of ATPD.

> Engaging in an array of learning experiences with school colleagues builds community and reduces isolation. Outside learning groups support individual initiative; their members share interests and support innovation. (Lieberman et al, 1996, ¶ 3)

The call for reforms in professional development opportunities also includes a shift that identifies the need for teachers to be connected with other teachers outside the school. These outside groups may include "teacher-researcher groups, peer review groups, teacher networks and organizational partnerships, and programs that involve teachers in national, state, and local school and curriculum reform activities" (Lieberman et al, 1996, ¶ 4).

The influence of collaborations between teachers or teachers and their students is the point that distinguishes the value of the "authentic" PD experience. The concept of teacher collaboration directly supporting classroom activities continues as a theme in this article and the authors state that this means that teachers must take on new roles in the school. As teacher leaders, peer advisors, and teacher researchers, the roles of the classroom teacher expand to work with colleagues in order to create and further promising instructional strategies. Although this article doesn't apply itself directly to technology TPD, it has relevance as this shift in approaches is being mirrored in all facets of TPD. The concept of teacher collaboration does require however communication among teachers from outside the school, and curriculum-based online projects are one example of this type of collaboration.

> Researchers Ann Lieberman and Milbrey McLaughlin (1995) found that successful teacher networks unite members who share interests and concerns around a common goal that the participants themselves believe to be important. Strong networks also provide participants with an opportunity to interact in a non-threatening environment where both teaching and learning

occur simultaneously. (Lieberman et al, 1996, Networks and partnerships section, ¶ 5)

Despite the fact that this article is a newsletter, rather than a primary source research article, it still is based on significant authors' own research fields. In describing the global picture with respect to teacher professional development, this article provides an excellent reference point.

Collaboration, and more specifically electronic collaboration within technology TPD delivery is the focus of an ongoing empirical study with a group of Elementary Mathematics teachers in Ontario, Canada. The Colgan, Higginson, and Sinclair (1999) study discusses TPD and the authors' beliefs that there is a lack of established literature describing TPD and electronic learning communities. In this qualitative study of 60 teachers, the authors report that teachers need more opportunities to access reform-based materials, co-construct and publish materials that support new teaching practices, and develop collaboratively created solutions within their professional environment. These professional collaborations need to be meaningful to teachers' daily activities and these new professional communities "must offer teachers convenient access to quality experiences and resources, and teachers must derive personal value, reward, and efficiencies from the participation in the community" (Colgan et al, 1999, p. 316). These findings corroborate other research that describes teacher-centered learning communities formed for the purpose of a curriculum-based online project as a kind of teacher collaboration.

We can further examine the topic of electronic teacher collaboration by a consideration of the tools required to support collaboration. A paper presented at

AERA in 1996 by Edelson and Lento (1996) describes one such tool that facilitates teacher-student and teacher-teacher collaborations within a project-based environment. The paper is a qualitative review of exemplary use of a collaborative CMC tool that allows teachers and students to explore common understandings. The Collaboratory Notebook is a shared hypermedia database whose significant features are shared workspaces and asynchronous collaboration. The authors note that an important aspect of the effectiveness of the technology used is the teacher-teacher collaboration that becomes possible as continued support of the student-centered learning activities. Edelson and Lento state that "[teachers] need not exist in the isolation of their classroom...they become members of an active professional community.... Participants assume a support role for one another, professional, and emotionally" (1996, p. 5).

This article again points to the importance of collaboration as a part of TPD and concludes that teachers and students are all "engaged in the pursuit of knowledge" (Edelson and Lento, 1996, p. 25). The qualitative case study looks at three cases as exemplars with the expressed intent of demonstrating possible roles that the software can play in a classroom – limitations of the research are noted in the paper. The case study approach allows the researchers to provide specific information regarding the uses of the software, including some of the challenges facing the moderators of the teacher-teacher collaborations. With new types of tools come the challenges of using those tools effectively in the classroom, and the next category of this literature review explores that topic.

Glazer, Abbott, and Harris (2004) describe another type of teacher collaboration for the purpose of TPD. This action research article describes the efforts of the researchers and 5 teachers who worked together over three years to develop a model for collaborative reflection. According to Glazer et al (2004) "one particularly authentic and valuable part of TPD is reflection" (p. 31) and "teachers gain varied perspectives when they are permitted and encouraged to reflect collaboratively with colleagues" (p. 31). The outcomes described from participation in the reflective process model described in Glazer et al. article provide further corroboration of the collaboration as crucial theme.

> By being part of a supportive and sympathetic group of colleagues helping identify and address professional practice-related issues and challenges, teachers may feel more energized and therefore can be more effective in their classroom practice. (Glazer et al, 2004, p. 35)

Although the collaborative reflection model described by this article has only been tested with one other teacher group, the researchers stated that the participating teachers identified the process as valuable and beneficial to any teacher. Certainly the model described by the article needs refinement, but it highlights again the intrinsic nature of collaboration in efficacious TPD.

Abbott's 2003 dissertation provides an interpretivist study that explored teacher-centered learning in novice teachers. The data in Abbott's (2003) study were qualitative in nature and data analysis was done using a constant comparison method yielding themes that are relevant to this study. The focus for the dissertation was on what kinds of learning about teaching novice teachers were doing in their online

discussions with their veteran – teacher mentors. Although this is not a collaborative project environment with students, the telementoring was occurring *about students and the educational system.* Abbott (2003) highlights some of the reasons that teachers need to collaborate on teaching strategies:

> Because their jobs are so attention-demanding, teachers have difficulty during the school day finding time to meet and discuss professional issues with colleagues. (Abbott, 2003 p. 74)

Collaboration between teachers is identified time and again in this dissertation as the keystone of the novice-teachers' development as a successful educator. The concept that this research brings to light is that many of the novice-veteran teacher relationships formed grew into collaboratively reflective professional development exchanges.

> Some professional development specialists have suggested that teachers' telecommunications with other professionals – such as other teachers, subject matter experts from a variety of content fields relevant to teachers' instructional curriculum, and higher education personnel – constitutes a form of professional development that is well suited to individual teacher's needs. (Abbott, 2003 p. 86)

The theme of teacher collaboration as a major component of efficacious TPD models continues to be brought to the forefront of research in the field. The current study describes collaborative TPD occurring during teachers' participation in collaborative online projects with their students – a concept identified as effective PD by this category in the literature review

Integration of computers into the classroom

According to Macmillan, Liu & Timmons (1997), two key elements which lead to the successful integration of computers into education, are sufficient technical support, and effective TPD. Macmillan et al (1997) identify several problem areas of computer integration and the Internet, most notably the concern of effective teacher PD. The article comments "although most new teachers have been exposed to a computer technology component in their preservice programs (Pina & Harris, 1993), experienced teachers often require training in the technology" (Macmillan et al, 1997, p. 223). This study was an in-depth case study that explored how secondary teachers reacted to a new computer lab in their school. Using a mixed method approach, the study is based on lab observations, interviews and quantitative survey data (hardware and software difficulties). The findings were further corroborated with other research dealing with the introduction of technology in schools and the resulting conclusions are very well supported by the case study findings and analysis. This article provides a good example of the mixed-mode type of methodology that the current research used.

One notable conclusion made by Macmillan et al. (1997) is that teachers had concerns about PD and the majority believed that the traditional one-day inservice did not provide sufficient, nor appropriate types of computer integration TPD. Long-term support models of TPD, that recognized the new type of instructional strategies needed to deliver technology integrated lessons, were perceived by the teachers to have much more potential impact. The results of this study indicated that teachers understand the need for additional professional development for technology

integration. Teachers interviewed believed that a new "type of professional development [is] needed to reexamine and possibly to reconceptualize their practice to allow for computer integration [and that] requires ongoing, interactive support, not a series of one-day inservice sessions" (Macmillan et al, 1997, p. 233). The relevance of these conclusions to the current research is that it clearly identifies what *teachers* believe will be of value to them with regards to effective TPD. For TPD to be characterized as authentic, then it must include teacher choices, and it must allow teachers to identify "meaningful activities" with regards to technology TPD opportunities.

According to Milton, "expecting teachers to learn workplace skills in non-workplace settings" (2003, p. 6) is one of several paradoxes confronting successful ICT integration in Canadian K-12 schools. In Milton's (2003) review of current research prepared for Schoolnet, one example of successful integration is "teachers and students work in collaboration creating professional as well as learner communities. Learning communities extend relationships beyond the classroom, engaging parents, community members, and experts" (Milton, 2003, p. 3). In this article Milton identifies three areas that identify current requirements for continued support of ICT integration in the classroom: connectivity, capacity, and content. The issue of capacity building for successful ICT integration, according to Milton, is to "encourage and support of new teaching practices" (Milton, 2003, p. 5). Key in this article is a list that identifies best practices for technology TPD:

> It must be scalable and sustainable, allow for on-site work in schools in classrooms, include appropriate incentives in a facilitating environment, be

> activity based and allow for 'play' and discovery, be flexible and offer ongoing support. The support needed is in curriculum and pedagogy as well as technical services. (Milton, 2003, p. 5)

Milton concludes in the article that there are several paradoxes confronting efforts to successfully integrate ICT into K-12 schools and providing meaningful technology TPD and support is identified as one dilemma that needs to be resolved.

A final article in this category of integration of computers into the classroom observes the concept of capacity building "around a few existing innovations in education: the networked computer, knowledge building, and collaborative project-based learning" (Breuleux, Laferriere, & Lamon, 2002, ¶ 2). In this review of research Breuleux et al (2002) conducted "a documentary case study (Yin, 1994) with a very purposive sampling of grey literature" (p. 4) identifying twelve research and development initiatives involving fourteen countries as source material. Breuleux et al. state that:

> Access to networked computers predicts teachers' use, which then leads to school learners' use during class time. But access without proper support for the teacher who is willing to have students use ICTs, and without pedagogical guidance for the school learner is unlikely to lead to effective use. (Breuleux et al, 2002, p. 1)

Specifically with respect to technology TPD, the authors identify that teachers need technical, administrative, and collegial support and even reflective practice rather than formal professional development activities in order to effectively practice ICT integration. At the personal level, "collaborative learning among teachers is

frequently observed, but authentic or informal teacher professional development is not an activity officially recognized" (Breuleux et al, 2002, p. 14), while at the same time there are more demands on the teacher integrating ICTs: "more dialogue, more visible work, more risks" (Breuleux et al, 2002, p. 14). At the school level, Breuleux et al. identify a key need for the successful integration of ICTs in the classroom:

> A learned teacher in the use of ICTs needs resources (e.g., access for classroom students to use networked computers and relevant software), and support (technical, administrative, collegial). (Breuleux et al, 2002, p. 14)

The Canadian education system, according to Breuleux et al., needs to continue to build teacher capacity for innovation through the support of new classroom practices involving ICTs in order to further the current momentum of ICT integration.

Student attitudes about teachers and technology

The relationship of this category in the literature review may seem less than obvious, until one considers McKenzie's statement that "professional development should be on teaching and learning strategies that make a difference in daily practice" (2001, ¶ 5). If teachers find value in the professional development opportunities, then that means that classroom practice is being affected, which is in fact the goal of TPD. The question is then: what might be some of the teacher motivations to participate in projects that incorporate technology? Is it really worth it, for the *teacher and the students*? One article suggests that there may be changes in student attitudes towards teachers when teachers make use of technology in the classroom.

Forman (1997) examines two questions that a university professor had regarding his teaching: how effective was his teaching, and was the use of technology

in the course really worth it? This research has a solid quantitative method, with sufficient participants to generate statistically reliable findings, and has the benefit of being proven over time. The question remains how transferable the findings are to kindergarten – 4 grades, but at least in the middle and high school grades, it seems likely the findings may apply. Forman's study is relevant here in that positive student attitudes towards teachers and technology use in classroom practices do play a role in teacher motivations for collaborative project participation. The methodology used in this study included a survey based on the Tuckman Teacher Feedback Form to provide information regarding the teacher's perceived "personality" traits.

Surveying successive groups of students in his course, Forman found that after several years there was a sudden significant jump in one of the scores of the survey. Students had suddenly significantly identified the teacher as more original, creative, experimenting, and iconoclastic than in the past. Forman attributed changes in student attitudes to technological innovations he had introduced into the course at a particular time. In fact Forman mentions that it took him a considerable amount of time to technologically enhance his course because of the amount of effort required to learn and implement his new skills. Upon reflection Forman found that his organization focus had changed from "having organized and up-to-date class notes, to having organized, graphically interesting, and easy-to-follow presentations" (Forman, 1997, p. 58) and that the technology had allowed him to do things he couldn't have done in the past. The researcher also noted that "although the learning curve was quite steep [for learning how to use the technology].... in the long run it has been time well spent." (Forman, 1997, p. 58) Finally Forman notes that students in his

class expressed interest in the technology and how they may make use of it themselves in the future. The findings can be summarized as "using technology can help teachers significantly improve how students perceive their originality and creativity in the classroom" (Forman, 1997, p. 59), and this appears not to affect the student perceptions of the teacher as being warm and caring.

A second article that describes student attitudes towards technology states, "positive attitudes towards technologies allow for their productive use throughout life" (Ungerleider & Burns, 2002, p. 3). Ungerleider and Burns (2002) research review addresses the impact of ICT on teaching over the past 10 years. Accessing peer-reviewed articles, Eric, EBSCO online, and web searches these authors focused on two major areas: the efficacy of ICTs and the role of ICTs in instruction. According to Ungerleider and Burns only one conclusion in the research on student attitudes is clear: "children who are exposed to computers have a more positive attitude towards computers than those who are not" (Ungerleider & Burns, 2002, p. 3).

Collaborative technology projects and authentic teacher PD

Lundeberg, Coballes-Vega, Standiford, Langer and Dibble (1997) provide case study research of a school with a "national reputation for innovative use of technology and its personalized school setting" (Lundeberg, 1997, p. 61). The study follows two teachers in the school over an extended period of several months collecting detailed data in the form of videotaped classes, interviews, surveys of student beliefs, and examples of student work. The purpose of the study was to explore how the beliefs, practices and reflections of the two teachers changed during

a period of time when new computer hypermedia technologies were introduced. One male and one female teacher were selected, one new to the school, and the other an established staff member. The researchers were looking for evidence to corroborate other findings with regards to technology and constructivist and/or project-based environments. "As teachers become more immersed in using technology effectively to promote thinking, they become less didactic, and more constructivist..." (Lundeberg, 1997, p.60).

This case study has a strong methodology in that all five authors participated in data analysis of the videotapes; and a detailed content analysis of the open-ended student surveys was administered at the end of the course. Teacher and student interviews were conducted that focused on background and beliefs about what was learned in the course. Although the study provides a detailed description of how the students and teachers carried out their day-to-day activities, it applies directly to this research in that the study found "teachers viewed the course as teaching (and learning) *with* technology, whereas students viewed it as learning *about* technology" (Lundeberg, 1997, p. 59). In a project-based technology rich environment, the role of the teachers changed.

> The teachers also functioned as learners of technology skills. Both teachers promoted the goal of learning through discovery, inquiry, and shared expertise. Thus, they too became learners, sharing in the learning from other students. While many technology-related difficulties were handled by the lead teacher, students also were able to resolve problems and provide additional expertise. As a result, the teachers seized opportunities to highlight

students' knowledge about HyperCard and to use this knowledge in working with other students as well as demonstrating new techniques and procedures to be used with projects. (Lundeberg, 1997, p.75)

This study also points out "using technology well begins with helping teachers ask key questions about the instructional tasks and the context in which they will take place" (Lundeberg, 1997, p. 78). This article is pivotal to the current research in that it describes in detail a case study environment where teachers, alongside their students in the classroom, were learning about technology – ATPD – a phenomenon that has been identified as a unique kind of teacher-centered learning as early as 1997.

Rakes et al (1999) provide more direction for the current study, working from the assumption that something is happening differently when technology use is introduced into the classroom. According to Rakes et al. (1999), a long-term study following seven Apple Classroom of Tomorrow classrooms by Dwyer reported that the use of technology:

- encourages fundamentally different forms of interactions among students and between students and teachers;
- engages students systematically in higher-order cognitive tasks;
- prompts teachers to question old assumptions about instruction and learning (School reform, constructivism, and technology section, ¶ 7).

Rakes and her colleagues identified these activities as being "constructivist" in nature and preceded to answer the question "Does the use of instructional technology tools have an effect on teachers' use of constructivist teaching strategies?" (Rakes et al., 1999, The present study section, ¶ 1) Using an e-survey methodology of K-12

teachers this study had teachers recall their classroom experiences and rate their technology activities on a scale of constructivism. Limitations of the survey were the random/non-random sampling used, and the online delivery of the survey, and the reader is cautioned about generalizing the results. The first part of the qualitative survey instrument used explored "how teachers perceived their own use of constructivist behaviors in their classrooms" (Rakes et al., 1999, Methods section, ¶ 3) and resulted in the production of the teacher's constructivist score. Part two of the survey asked teachers to "describe how their school/classroom is connected to the Internet and asked them to report on the availability of computer hardware - the student to computer ratio in their classroom and school computer lab(s)" (Rakes et al., 1999, Methods section, ¶ 4) and resulted in a categorization of the teacher's technology level as either low, medium, or high.

The findings of this survey were that teachers who report constructivist styles of teaching also tend to be at higher levels of technology use. As well the constructivist teachers tended to use technology at a higher "invention" level (teachers who described their use as "I use technology as a tool to craft new curriculum and new teaching and learning techniques" (Rakes et al., 1999, Results section, ¶ 10)) than their less constructivist colleagues. The results also indicate that teachers with less than 15 yrs of experience, and those teaching in the lower grades tended to have more constructivist styles. One interesting conclusion is that a close examination of the classroom practices of lower grade teachers may be beneficial in designing training, especially technology training, for all teachers.

This article provides an extremely rich resource that could be paralleled for a detailed look at the ATPD phenomenon. The survey methodology, analysis, and treatment of the beliefs of teachers about their use of technology from a reflective point of view make this article important to the current research. The current study followed a very similar pattern in that the data collection of teachers' beliefs, about what they learned while participating in collaborative projects, was also conducted in a reflective survey format.

The third study to be considered in this section of the literature review is a doctoral dissertation on the topic that is defined as "authentic" technology TPD. McGee (1998) is one of the most descriptive works on the topic. As part of the Grassroots Initiative, funded by Industry Canada (Government of Canada, 2002), teachers across Canada are participating in collaborative online projects that engage students in meaningful activities. McGee's 1998 research, based on a naturalistic case study, focused directly on this phenomenon, although unlike the Grassroots Initiative the professional development experienced by teachers was unintended. McGee's study (1998) found that teachers who participated with their students in an online telementoring project experienced activities that allowed them to learn new educational information and processes. Teacher-centered learning was found to appear in various forms among the teachers; learning about others, content learning, learning about practices, organizational learning, and discovery learning. As a whole the teachers studied in McGee's research participated in the collaborative online projects "without intending to learn, and yet most teachers perceived that they learned as much as or more than their students" (1998, p. 9). One of the teacher participants

comments that "learning is supported by working on tasks related to classroom experiences" (McGee, 1998, p.178), and describes the type of learning while involved in a collaborative project as authentic.

> Without the authentic task of maximizing the talents of each of us, we wouldn't have discovered, refined and tested our evolving collaborative model. We wouldn't have done it as an intellectual exercise, and that is often what staff development amounts to. (McGee, 1998, p.179)

Another teacher in the study commented that all his previous technology training has been ineffective and yet another commented "organized staff development, one-size-fits-all, was usually either irrelevant or repetitious...more productive were workshops or conferences I choose for myself...self-directed learning through books, articles, manuals, trial and error" (McGee, 1998, p.179). McGee documented that teachers consider peer experience as encouragement, and teachers who are engaged in self-directed and self-motivated learning are more likely to alter classroom practices. McGee's study has considerable implications for meaningful TPD with regards to technology, as well as other areas. One conclusion drawn by McGee is that "findings suggest that teacher learning may be facilitated through contextually-situated experiences that allow knowledge construction with the support of peers, either electronically or in face-to-face settings" (1998, p. 9). These findings further support the literature previously reviewed that points out the value of collaboration between teachers during effective professional development activities, but in this case with technology playing a central role in the equation. McGee quotes Fullan's 1990 study which "notes that successful teacher learning requires the

acquisition of technical skills, collaboration, reflection and active inquiry, not a part of teachers' usual experience of staff development" (McGee, 1998, p.179). With respect to the qualitative component of the current study, McGee's study is the initiator – the questions asked in this study explore the nature of the "authentic" professional development activities.

Abbott's (2000) qualitative study explored eight teachers' beliefs about their on-the-job, profession-related learning that occurred during their participation in established online collaborative projects. Teacher motivations and a definitive description of the term "ATPD" as it relates to collaborative online projects are conceptualizations important to the current research.

> All the teachers interviewed for this study indicated that a primary motivation for becoming involved with the online project they selected was their interest in providing what they suspected would be a valuable learning experience for their students. (Abbott, 2000, p. 23)

The nature of the unintended teacher-centered learning identified by Abbott (2000) further corroborates the findings of McGee's (1998) research and extends it to allow for a clear indication about what is "authentic" about the phenomenon. Abbott defines ATPD as:

> [T]he learning which occurs when teachers extend their practice and try new ideas with their classes, such as curriculum-based online projects,... this naturally occurring, on-the-job learning -- in which teachers engage in new practices primarily because they believe it motivates students and increases the quality of their learning -- represents the essence of what professional

> development as educators, in terms of improvement as professional practitioners, should be about. (Abbott, 2000, p. 24)

Abbott describes the characteristics of the case study group as early adopters who were mainly self-taught in terms of technology skills, who continue to help other teachers learn how to use technology tools in the classroom. Abbott concluded that teachers felt the online projects had three main effects on their teaching: they connected with other teachers, professionals, administrators in other schools, they connected with their community, and they became aware of a community of learners that they had access to. Teachers also reported that their students benefited in significant ways due to collaborative project participation: students were more motivated; felt empowered, and developed confidence with technology. Teachers too reported that their motivation increased as a result of collaborative project participation. Abbott summarizes the findings in the following statement:

> Although engaging in telecomputing projects does not, by itself, change teachers' basic beliefs about their roles as teachers, taking part in these kinds of activities offers an opportunity for teachers to do kinds of job-related professional learning that are not readily provided by any other means. (Abbott, 2000, p. 31)

Due to rate of change of technology in North American society, technology TPD is difficult to deliver in a meaningful way that meets teachers' needs. According to Abbott, the collaborative online project experience may just be one effective way to provide meaningful technology TPD.

Harris and Grandgenett's (2002) study provides the framework for the current research, and permission to use the Harris and Grandgenett instrument for this study was granted in the fall of 2002. Harris and Grandgenett (2002) describe the phenomenon of authentic professional development as "relevant and interesting" for teachers, and their research attempts to identify characteristics of ATPD:

> Authentic professional development has been described in the literature as occurring "when we actively learn – and reflect on that learning, both individually and collaboratively – as we teach." (Harris and Grandgenett, p. 54)

This study included 336 K-12 teacher volunteers from 30 different countries (primarily from the US and Canada) who participated in an online survey that included a standardized measure of innovativeness. The findings of the survey indicate that teachers are engaging in many different types of learning as a result of online collaborative project participation. The resultant sample was skewed toward innovators and early adopters of online tools and resources; teachers who use online tools and resources were characterized as:

> [E]xperienced, innovative, student-centered, flexible, collaborative, reflective, and active professional learners who are willing to share their knowledge with both peers and protégés. (Harris and Grandgenett, p. 58)

The study points out those teachers using the Internet and online tools in their classroom report that this instructional innovation affects their professional learning in meaningful ways. Harris and Grandgenett further indicate that the need for continued exploration and documentation of ATPD is imperative, as demands on

teachers' time and efforts continues to increase. This researcher had the opportunity to participate in sessions directed by Judy Harris on several occasions as part of the Alberta TLC initiative, and found the potential for considerable benefit from this kind of study for teacher's learning to be a compelling reason to follow through on the suggestions for further research mentioned in this article.

Summary

Important research that describes professional development as a whole, as well as specifically technology TPD, has be critically discussed with the aim of describing the direction of the research in this current study. Research that describes survey methodology and questions has been considered, as well as literature that describes current trends in professional development and effectiveness. Other articles that compose this review lend themselves to providing corroborating findings, and the final three pivotal articles provide the justification of topic, method, and need for further inquiry. The following chapters describe the specific methodology, instrument and resulting sample, analyze and report the results, and provide a description of the phenomenon being studied – technology ATPD.

Chapter 3: Methods

Introduction

Emerging educational research supports the idea that TPD in technology integration requires new approaches. Teacher participation in collaborative online projects seems to be one way in which these needs can be met effectively. Harris and Grandgenett (2002) state that it is imperative "to explore and document authentic professional development" (p.58) given increasing demands on K-12 teachers to be lifelong learners. In order to understand the nature of the authentic teacher professional development (ATPD) occurring as a consequence of participation in K-12 curriculum-based online projects, six research questions were identified:

1. What profession-centered technology learning is reported by teachers who participate in collaborative online projects?
2. How does the profession-centered technology learning reported by teachers participating in collaborative online projects compare to traditional technology learning?
3. What factors of the online collaborative project experience motivate teachers to participate for the first and successive times?
4. How do teachers perceive their incorporation of collaborative online projects into curriculum activities affects student attitudes?
5. Is teacher-centered learning that occurs during collaborative online projects more effective than other types of technology PD for teachers?
6. What do teachers identify as the professional value of the collaborative project experience for themselves and their students?

This study includes a replication of recent research (Harris and Grandgenett, 2002) within the framework of the Alberta provincial setting, as well as a more detailed exploration of the ATPD phenomenon. By definition this study intends to lend more validity to the description of the ATPD phenomenon described by Harris and Grandgenett (2002) "in the sense of inspiring confidence that they [the results - inserted] represent true differences, relationships or effects in the population." (Gall et al, 1996, p. 192)

Context

The target population studied in this research was Alberta teachers *who use technology*, as this population could provide meaningful responses, compared to the entire population of Alberta teachers. The survey instrument was delivered online to a random sample of teachers accessed from two sources – the Telus Learning Connection (TLC) (available at http://www.@learn.ab.ca) and the Alberta Teachers Association Computer Council (ATACC) (available at http://www.atacc.ab.ca).

Measures

The measures for the preceding research questions are based on a collection of survey data from teachers. A mixed-mode method of survey research was utilized to collect data on the variables identified. According to Gall et al (1996), surveys:

> collect data from participants in a sample about their characteristics, experiences, and opinions in order to generalize the findings to a population that the sample is intended to represent. (p. 289)

Although acceptable for quantitative studies, "generalizations" are not characteristic of qualitative research. In order to better understand and represent the data from the

target population, and effectively answer the questions posed in this study, a quantitative component was required.

Instrument

With permission of the authors, a replication of the Harris and Grandgenett survey, including additional open-ended survey questions was employed as the data collection instrument (Appendix F: Online Survey Instrument). The instrument had 5 separate components:

1. teacher profile,
2. teacher attitudes about online learning tools,
3. teacher attitudes and perceptions about their online project participation,
4. standardized "Measurement of Innovativeness Scale," and
5. open-ended questions about their online educational project experiences.

The first component of the survey, the teacher profile, is a demographic section that collected teacher characteristics, access to computers in the classroom and at home, and a short list of educational Internet uses. The second and third components collect attitude-based data, hence the Likert-type scale questions that "typically ask for the extent of agreement with an attitude item (...from strongly agree to strongly disagree)" (Gall et al, p. 297) were used directly from the Harris and Grandgenett (2002) study. The "Measurement of Innovativeness Scale" provided data regarding the normalcy of the respondent group.

The final component of the survey provided the respondents with five open-ended questions that asked the teachers to describe what they have learned through their participation in online projects. Teachers were asked for their advice to other

teachers who may be considering participating in online projects in questions eighty-two and eighty-three. A fourth question about making online project participation a positive experience read: "What would you say are the required components for making the online project a positive experience for teachers and their students?" The final question of the instrument was designed specifically for the teachers who had not yet participated in online projects. Since participation in online collaborative projects is voluntary for teachers, the concluding survey question read: "We're interested in understanding how teachers become interested in beginning their participation in online educational projects. In your own words, please describe what kinds and levels of support, and necessary factors would need to be present to interest you in future participation in online educational projects with your students." Each of these five open-ended questions followed with a text box space that would accept over 300 lines of text for the responses.

This study extended the Harris and Grandgenett study to include teachers who have not yet participated in collaborative online projects, and therefore several additions were made to the original Harris and Grandgenett survey to separate the respondent groups questions. Additional questions regarding demographics (rural/urban) and type of collaborative project participation were also added. Types of teacher participation identifiers are included in the survey instrument to allow further analysis with respect to differences in "project development & delivery" and "class participation."

Data Collection Procedures

The online survey instrument was linked to a database that was created a month prior to online delivery. Testing in several browser environments led to changes in the online delivery and links to the database; with the final instrument being ready a week before the call for participation was announced. Access to the survey was through the domain name website www.teachertechpd.com (Appendix D: Teacher Technology PD website) owned and maintained by the author. The online survey resided on a University of Alberta server and was accessed by respondents using a login and password provided to them. Teachers were asked to respond to the series of survey questions "in confidence" in order for the author to contact them at a future date regarding completion of the survey. Shortly after the survey began several respondents from one school division replied that they were unable to access the survey pages. It was determined that their school division had firewall blocking software (blocking port 81) and these respondents were provided with a paper version of the instrument as a solution.

Sample

The literature presents several general approaches to collecting representative samples from populations. For this mixed-mode study, a sampling of the population that included both random and volunteer samples was conducted. According to Gall et al, random samples "yield research data that can be generalized to a larger population within margins of error that can be determined by statistical formula" (1996, p. 223).

In this study the two groups of interest were – technology interested Alberta teachers *who have participated* in collaborative online projects and *those who have not yet participated.* Participation, for the purposes of this study, refers to project development, delivery, or classroom participation in an online collaborative project. Throughout the remainder of this document, the first group will be referred to as the collaborative project group" and the second group as the "non-collaborative project group."

Contact with potential survey participants, ones who have been involved in collaborative online projects, was facilitated by the Telus Learning Connection initiative. The Telus Learning Connection made available an email list of 1530 teachers who had participated in collaborative online projects in Alberta up to January 2003. From this list emails were selected according to a random numbers chart using only the Alberta school divisions who had provided permission to contact teachers for this study (Appendix A: Permission Letter to School Superintendents).

Between the dates of April 16, 2003 and April 18, 2003, two hundred and thirty three emails were sent out to teachers requesting participation in the survey (Appendix B: Collaborative Project Participant Request for Participation). By April 18, 37 messages were returned as "undeliverable" and an additional 37 emails were sent out to other teachers in the same school divisions. Two weeks later, a reminder message was sent out to the selected teacher emails and the online survey remained live until the June 12, 2003. As a final strategy to increase the response rate, a personalized email reiterating previous requests to participate was sent to teachers who knew the author and had participated in collaborative projects with him.

The second group of the sample included computer-interested teachers who had not yet participated in online collaborative projects. The Alberta Teachers Association Computer Council was contacted but could not provide an email contact list. Rather ATACC provided access to the ATACC May 2003 conference newsletter (Appendix C: ATACC Article – Specialist Council Newsletter) and listserv in order for a call for participation to be delivered to that membership. The request for participation (Appendix D: ATACC Request for Participation) was posted in the ATACC listserv on May 22, 2003. Teachers willing to participate in the survey (a volunteer sample) were asked to email a reply and receive login and password information in order to complete the online survey.

Research Design

Researchers have reported online research response rates of 9.5% (Trotter, 1999), and several factors were employed in an attempt to increase the response rate for the online survey. In 2003 more teachers are familiar with the Internet than in the past and all Alberta schools have been connected to the Internet as of 2000. According to a Statistics Canada Survey (2001), almost 59% of households in Alberta access the Internet from any location (about one in five households had someone who regularly used the Internet at school. Most importantly the study delimited the sample to computer-interested teachers.

Considerable care was taken to maximize the sample within the parameters important to the study, allowing the assumption that a small sample size was sufficient to draw meaningful inferences:

> The advantage of drawing a small sample from a large target population is that it saves the time and expense of studying the entire population. If sampling is done properly, you can make inferences from the sample to an entire target population that are likely to be correct within a small margin of error. (Gall et al, 1996, p. 220)

Data Analysis Procedures

This mixed-mode study *described and evaluated* the nature of the ATPD and *compared* two groups of computer-interested teachers. Both descriptive and comparative statistical methods of data analysis were applied to results obtained from the online survey. "Descriptive statistics are mathematical techniques for organizing and summarizing a set of numerical data" (Gall et al, 1996, p. 175) and were the focus of the data analysis. Frequency, percentages, and t-test and chi-square test analyses were reported to describe collaborative project participation and identify significant differences between the two groups. Several open-ended questions provide qualitative data and the "constant comparison method" (Gall et al, 1996, p. 566) of interpretational analysis was used. Themes emerged from the responses collected, through the process of coding and categorizing consistent with the principles of grounded theory research.

Delimitations and Limitations

The population studied was Alberta teachers, and in order to effectively sample that population to acquire responses that contribute to the study, the study was delimited to *teachers who use technology*. In this way the population was narrowed to those teachers who could provide relevant survey information. If we had asked a

random sample of all Alberta teachers to participate, a lower response rate was expected, or those responses would not provide meaningful descriptions of collaborative project experience. A second delimitation of the study is based on the choice of access to teachers for the study, and that is the TLC and ATACC groups. Although there are many ways to contact Alberta teachers who use technology, the access choice delimitation was intended to aid in returning a higher response rate from an already diverse and widespread sample of Alberta Teachers. Both groups have in their membership urban/rural, division 1-4, male/female, and other demographic differences that can represent Alberta as a whole with respect to technology in the teaching profession. An assumption of this study is that these two delimitations positively affected the response rate, quality of responses, and thus the ability of the researcher to generalize the findings to Alberta teachers *who use technology* in teaching.

One potential limitation of the study was that responses would be returned only from teachers within a few school divisions. It is possible that divisional initiatives or focuses could influence the confidence level of the research findings. In order to ameliorate this limitation as much as possible, teachers who represented 49 school jurisdictions were included in the survey.

A limitation of the survey that seems at first contradictory is the use of the online survey format. Some teachers who might qualify to participate in the study may not have email addresses. The researcher personally knows two instances of teachers who are doing collaborative online projects with their students but do not have either personal or school division provided email addresses. Although this is

one limitation of the online contact format, this study assumed the large majority of computer-interested teachers have email addresses.

Other email contact limitations are spam blocking software and the changing nature of teachers' emails. When the initial email message was returned, resending the request for participation to alternate email addresses within the same school jurisdiction minimized both of these limitations.

Another limitation is simply the nature of the Internet community - some respondents will choose not to participate at all simply due to the online nature of the survey.

A final limitation of the survey is the time that it required to complete the survey. Some potential respondents, due to the nature of the classroom situations in Alberta, are extremely overworked and likely chose not to complete the survey. The time of the year for completion of the survey, May and June, also contributed to this limitation as teachers are preparing for year-end exams and marking. This is a serious limitation of the survey, one that the research design attempted to minimize, although not successfully, returning a lower than expected response rate.

Chapter 4: Results

Overview of Statistical Procedures

The beginning section of this chapter describes the response rates for the survey. Demographics and teaching environment statistics describing the survey respondents compose the second segment of this chapter. The third and fourth sections of this chapter present frequencies and percentage distributions used to analyze the responses of teachers in the online experience and collaborative project participation portions of the survey instrument. The fifth section of the analysis presents the standardized scale of innovativeness using numerical statistics. The final section of this chapter summarizes the themes identified in the open-ended sections of the survey. Throughout the chapter, statistical treatment of data analyses such as independent t-tests and chi-square tests, which allow for comparisons between the two groups, is presented. Additional statistical treatment data appears in Appendix G: Statistical Analysis Results.

Response Rates

Of the sixty-four school divisions and ten charter schools in Alberta contacted in March and April 2003, forty-six school divisions and three charter schools gave permission to contact their teachers. These "permissions to contact teachers" received from the school boards and charter schools represent 72 % of the school boards and 30.0% of the charter schools. Some school divisions' representatives were very accommodating in organizing participation of several of their teachers, providing names of teachers to contact, and directing a few teachers to contact the researcher by email. Other school divisions declined permission stating, "We have

received a large number of requests for these types of research studies. Also, it is very late in the school year and our teachers are tremendously busy getting ready for the final two months of the school year."

By the conclusion of the survey in the second week of June 2003, a response rate of 12.45% (29 teachers) of online collaborative participant group responded to the survey. This response rate assumes that all of 233 teachers saw the email requesting their participation.

Over a three-week period starting May 22, 2003 there were 22 teacher requests for login information from the ATACC listserv. This resulted in a response rate of 77.3% by ATACC teachers (17 teachers) who had not yet participated in collaborative online projects completing the survey. Of the ATACC group, there were 2 login requests that were unable to participate in the survey because they were school administrators, not current K-12 teachers, and three login requests that choose not to respond despite reminder emails being sent out twice.

An overall response rate of 18.04% (46 of 255) was achieved with the online survey. Survey respondents represented 48.98% (24 of 49) of the school divisions included in the survey.

Demographics and Teaching Environment

Questions two, three and four asked teachers about their current and past teaching experience. The current grades of teaching assignments reported by both groups of teachers ranged from kindergarten to grade 11. 24% of the collaborative project group and 29% of the non-collaborative group indicated they currently taught

at undergraduate, graduate, community college, and teacher inservices. Frequencies and percentages of teaching assignments of each group are presented in Table 1.

Table 1: Current teaching assignments of teacher respondents

		Group	
Current Teaching Assignment		Collab. Group	Non-collab. Group
Primary Grades	frequency	19	7
	%	65.52%	41.18%
Secondary Grades	frequency	10	10
	%	34.48%	58.82%
Total		29	17

The previous teaching assignments reported by both groups of teachers ranged from kindergarten to undergraduate, graduate, community college, and teacher

Table 2: Previous teaching assignments of teacher respondents

		Group	
Previous Assignments		Collab. Group	Non-collab.Group
Primary Grades	f	8.00	3.00
	%	27.59%	17.65%
Primary + Other*	f	4.00	1.00
	%	13.79%	5.88%
Secondary	f	1.00	5.00
	%	3.45%	29.41%
Secondary + Other*	f	0.00	1.00
	%	0.00%	5.88%
Primary + Secondary Grades	f	13.00	3.00
	%	44.83%	17.65%
Primary, Secondary, Other*	f	3.00	3.00
	%	10.34%	17.65%
Other*	f	0.00	1.00
	%	0.00%	5.88%
Total		29.00	17.00

* Other = Undergraduate, graduate, community college, teacher inservice

inservices. Frequencies and percentages of previous teaching assignments for each group are presented in Table 2.

The curricular areas of mathematics, social studies, science, language arts, health and physical education, and computer/multimedia development/television were those most reported by teachers. Teachers reported having teaching experience in all other curricular areas as well.

Question 5 asked teachers what the total number of years teaching experience they had. Means, standard deviations and t-test results for question 5 are presented in Table 3. No significant difference is noted between the groups (p=.832) with respect to years of teaching experience.

Table 3: Number of Years Teaching Experience

Group	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Collab. Group	29	17.59	9.171	.213	44	.832
Non-collab. Group	17	16.94	11.104			

Question 6 asked teachers to identify their formal preparation to become a teacher. Table 4 presents frequencies and percents. As can be seen, almost all teachers completed a degree program during their teacher preparation, and no significant difference (χ^2=4.06, p=0.398) was observed between groups.

Table 4: Type of formal preparation to become a teacher

		Group		
		Collab. Group	Non-collab.Group	Total
No response	f	1		1
	%	3.4%		2.2%
Undergraduate program	f	15	13	28
	%	51.7%	76.5%	60.9%
Graduate program	f	10	3	13
	%	34.5%	17.6%	28.3%
After-degree program	f	2		2
	%	6.9%		4.3%
Other*	f	1	1	2
	%	3.4%	5.9%	4.3%
Total	f	29	17	46
	%	100%	100%	100%

* Other = Bachelor of Music

Question 7 asked teachers to provide their sex. Frequencies and percents are presented in Table 5. As can be seen, there appears to be a significant dependency (χ^2=4.39, p=0.036) between Project group and sex of the respondent. Female teachers appear more likely than their male counterparts to participate in collaborative online projects.

Table 5: Sex of the survey respondents

		GROUP		
		Collaborative Project Teachers	Non-collaborative Project Teachers	Total
Female	f	21	7	28
	%	72.4%	41.2%	60.9%
Male	f	8	10	18
	%	27.6%	58.8%	39.1%
Total	f	29	17	46

. Question 8 asked teachers to provide their age. Means, standard deviations and t-test results for question 8 are presented in Table 6. No significant difference is noted between the groups (p=.922) with respect to age.

Table 6: Age of the survey respondents

Group	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Collab. Group	29	43.00	9.438	.099	44	.922
Non-collab. Group	17	42.71	10.312			

Question 9 asked teachers what kind of school setting they currently teach in – rural, urban, or online. Teachers were asked to only pick one response that best described that setting. Frequencies and percents are presented in Table 7. No significant dependency was found between Project group and school setting (χ^2=.790, p=0.674).

Table 7: What type of school setting do you presently teach in?

		GROUP		
		Collaborative Project Teachers	Non-collaborative Project Teachers	Total
Rural School	f	10	5	15
	%	34.5%	29.4%	32.6%
Urban School	f	18	12	30
	%	62.1%	70.6%	65.2%
Online School	f	1		1
	%	3.4%		2.2%
Total	f	29	17	46
	%	100.0%	100.0%	100.0%

Question 10 asked teachers about the kind of online networking applications they used themselves, and with their students. Frequencies and percentages for this

question are presented in Table 8 and chi-square data can be found in Appendix G: Statistical Analysis Results. No significant dependency between Project group and online networking applications is evident.

Table 8: Teachers' use of online networking applications

		GROUP			
		Collab. Group		Non-Collab.Group	
Application		Students	Self	Students	Self
Electronic mail	f	15	28	12	16
	%	51.7%	96.6%	70.6%	94.1%
Computer conferencing	f	10	15	1	7
	%	34.5%	51.7%	5.9%	41.2%
World Wide Web pages/sites that others created	f	26	25	16	16
	%	89.7%	86.2%	94.1%	94.1%
World Wide Web pages/sites that my students and/or I created	f	18	17	10	10
	%	62.1%	58.6%	58.8%	58.8%
realtime text chat (e.g., IRC, chat rooms)	f	2	8	0	1
	%	6.9%	27.6%	0.0%	5.9%
MUDs (e.g., MOOs, MUSHes)	f	0	1	0	1
	%	0.0%	3.4%	0.0%	5.9%
audio/video conferencing (e.g., CU-SeeMe)	f	0	4	1	0
	%	0.0%	13.8%	5.9%	0.0%

Question 11 asked teachers to provide information about their access to computers in their current school setting. Mean, standard deviation, and t-test results for question 11 are presented in Table 9. There appears to be no significant difference between the collaborative and non-collaborative groups on their students' access to computers.

Table 9: In all of the rooms in which you teach, how many total computers that students can use to access the Internet?

Group	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Collab. Group	29	34.03	20.729	.77	44	.443
Non-collab. Group	17	28.59	26.566			

Question 12 asked teachers about their access to the Internet at home. Frequencies and percentages are presented in Table 10, chi-square data can be found in Appendix G: Statistical Analysis Results. As can be seen, almost all the respondents did have Internet Access at home, and there was no significant dependency between Project group and Internet access at home.

Table 10: Internet access at home

		GROUP		
		Collaborative Project Group	Non-collab. Group	Total
Internet Access at home	f	28	14	42
	%	96.6%	82.4%	91.3%
No Internet at home	f	1	3	4
	%	3.4%	17.6%	8.7%
Total	f	29	17	46

Question 13 asked teachers where they do most of their work related to student online projects; respondents were asked to select only one choice that best represented their answer. Frequencies and percentages are presented in Table 11. Significantly more of the collaborative project group work at home on student online projects (χ^2=5.225, p=0.022).

Table 11: Where do you do most of your work related to student online projects?

	GROUP		
	Collaborative Project Group	Non-collaborative Project Group	Total
Work at Home	15	3	18
	51.7%	17.6%	39.1%
Work at School	14	14	28
	48.3%	82.4%	60.9%
Total	29	17	46

Use of Online Tools with Students

The second stage of the analysis focused on teachers' use of online tools in the classroom. Teachers were presented with a series of thirteen Likert-type questions that presented statements and asked teachers to rate their response. These thirteen questions were presented with the following six-point scale selections: strongly agree, agree, slightly agree, slightly disagree, disagree, and strongly disagree. Of the forty-six teachers who participated in the survey, thirty-five completed this portion of the survey, which began with a delimiting question, "Have you ever used any online tools with your students?" Of the 11 teachers (24 %) who chose "No" to this delimiting question, 4 teachers (9 %) were from the collaborative project group and 7 (15 %) were from the non-collaborative group. Significantly more of the non-collaborative project group responded that they have not used online tools with their students (χ^2=4.417, p=0.036).

Questions 15 to 27 presented a series of statements for teachers to respond to. Means, standard deviations, and independent t-tests for questions 15 to 27 are presented in Table 12.

Except for question 15, no significant differences ($p<0.050$) can be noted between the two groups of teachers for questions 16 to 27. Therefore it appears likely that the two groups of teachers are the same with respect to their responses on questions 16 to 27.

Table 12: Means, standard deviations, and independent t-tests for questions 15 to 27

Question	Group	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
15	Collab. Group	25	1.20	.408	-3.108	33	.004
	Non-collab. Group	10	1.70	.483			
16	Collab. Group	25	1.48	.653	-1.693	33	.100
	Non-collab. Group	10	2.00	1.155			
17	Collab. Group	25	3.64	1.524	.065	33	.948
	Non-collab. Group	10	3.60	1.897			
18	Collab. Group	25	2.00	1.000	-.767	33	.449
	Non-collab. Group	10	2.30	1.160			
19	Collab. Group	25	1.48	.872	-.064	33	.949
	Non-collab. Group	10	1.50	.707			
20	Collab. Group	25	2.24	1.332	-.708	33	.484
	Non-collab. Group	10	2.60	1.430			
21	Collab. Group	25	2.16	1.375	.774	33	.444
	Non-collab. Group	10	1.80	.789			
22	Collab. Group	25	2.20	1.291	.220	33	.828
	Non-collab. Group	10	2.10	.994			
23	Collab. Group	25	3.16	1.434	.304	33	.763
	Non-collab. Group	10	3.00	1.333			
24	Collab. Group	25	2.72	1.339	.039	33	.969
	Non-collab. Group	10	2.70	1.494			
25	Collab. Group	25	2.40	1.258	-.441	33	.662
	Non-collab. Group	10	2.60	1.075			
26	Collab. Group	25	3.48	1.447	-.765	33	.450
	Non-collab. Group	10	3.90	1.524			
27	Collab. Group	25	3.16	1.313	-.266	33	.792
	Non-collab. Group	10	3.30	1.636			

Question 15 states "I decided to help my students participate in online activities because I thought that these would be valuable learning experiences for them." The teachers only responded in the agree and strongly agree categories demonstrating that they believe online activities were valuable learning experiences. Figure 1 shows that collaborative project teachers (87 % strongly agree, 13 % agree) more strongly agree with the statement than their non-collaborative project colleges (42 % strongly agree, 58 % agree). An independent t-test (Table 12) shows a significant difference (p =0.004) between the two groups of teachers which indicates that members of the collaborative project group felt more strongly that online activities were valuable learning activities.

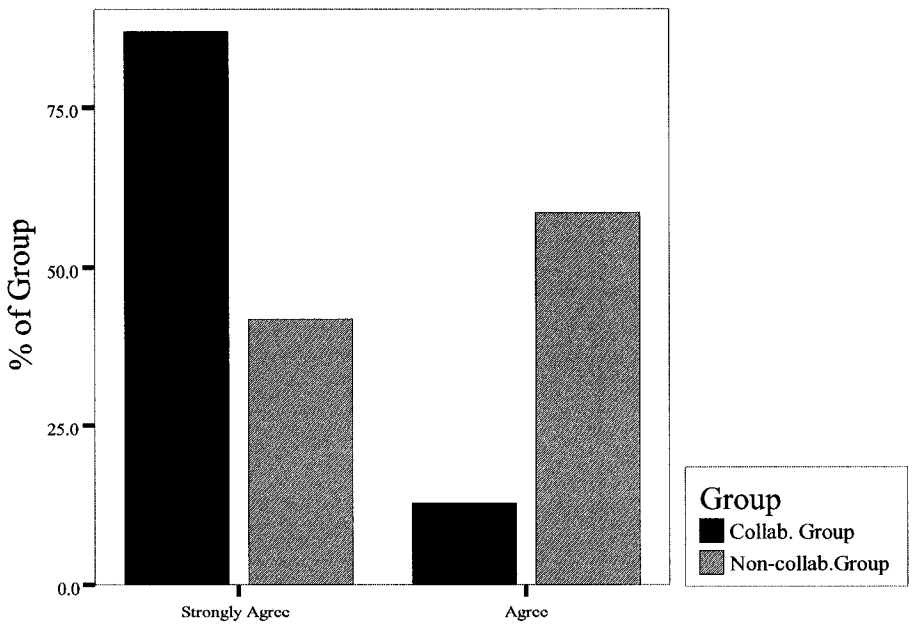

Figure 1: Percentage of responses to question 15

One of the issues in this "use of online tools with students" part of the survey is the very small (n=10) sample size of the non-collaborative group. Four of the collaborative project group teachers responded that they do not use online tools with teachers, despite their being involved in collaborative projects. I was concerned about this low response rate and conducted follow-up interviews with two collaborative project respondents regarding their response to the delimiting question at the beginning of this section. These respondents indicated that they had misunderstood the statement "use of online tools with their students" because of their understanding of the term "tools." Both of these collaborative group teachers had participated in several online collaborative projects with their students. According to these teachers, "tools" referred to some kind of online software that they were not familiar with. They did not consider the activities conducted as part of the several collaborative projects they were doing with their students as requiring online tools. This indicates a significant finding in that teachers' understanding of computer terminology, with respect to the term "online tools" needs to be carefully defined when used in teacher surveys. An alternative term that may alleviate this misunderstanding, according to these two interviewed teachers, is "online activities." As 41.2% (7 of 17) of the non-collaborative project group responded that they did not use online tools with their students, it seems likely that there was some level of misunderstanding surrounding the "online tools" terminology within this group of teachers.

Collaborative Project Participation

The third stage of the analysis focused on the group of teachers who indicated that they have participated in collaborative online projects with their students. Respondents completed a series of two numerical questions and thirty-one Likert-type questions that presented statements and asked teachers to rate their response. Questions thirty to fifty-nine were presented with the following six-point scale selections: strongly agree, agree, slightly agree, slightly disagree, disagree, and strongly disagree. Question sixty-one of the instrument presented an alternate six-point scale: extremely effective, very effective, effective, not effective, very ineffective, and extremely ineffective. All twenty-nine collaborative project teachers (100%) completed this portion of the survey, which began with a delimiting question, "Have you ever participated in any online educational projects with your students?"

Question 28 asked teachers to indicate their level of participation in online educational projects. Frequencies and percentages of responses are presented in Table 13, and as can be seen the collaborative project group has equal representation from teachers in all three types of project participation levels.

Table 13: Level of participation in online educational projects

	Frequency	Percent
Participant with your students	10	34.5
Project developer or leader	9	31.0
Other[a]	10	34.5
Total	29	100.0

a. Project facilitator, support, pd opportunity.

Question 29 asked teachers to indicate how many times they have been involved in online educational projects. Mean, standard deviation, and range of responses are included in Table 14.

Table 14: Number of times teachers involved with online projects as a:

	N	Minimum	Maximum	Mean	Std. Deviation
Participant with your	29	0	80	6.0	14.45
Project developer	28	0	10	7.1	20.45
Other	27	0	10	.41	1.92

Teachers' agreement with the statement in question 30, "I have improved my presentation skills as a result of being involved with online educational projects," was 85.7%, (21.4% strongly) as indicated in Figure 2.

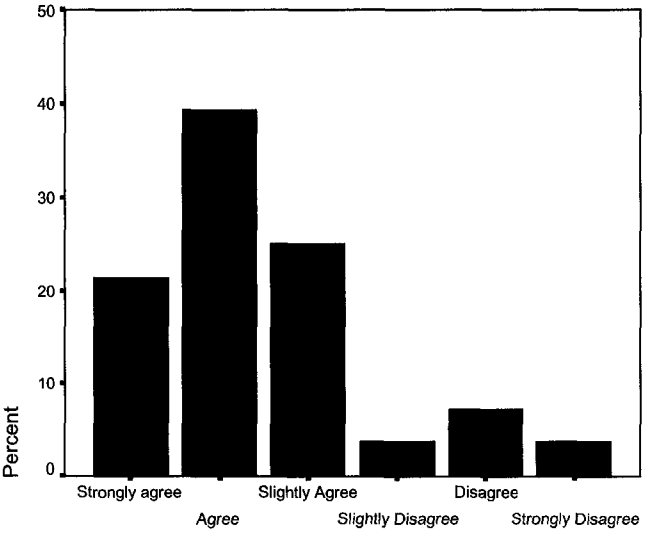

Figure 2. Percentage of teachers who responded they improved their presentation skills as a result of online educational project participation.

Teachers' agreement with question 31, "I am flexible in my classroom practice," was 100%, (48.3% strongly) as indicated in Figure 3.

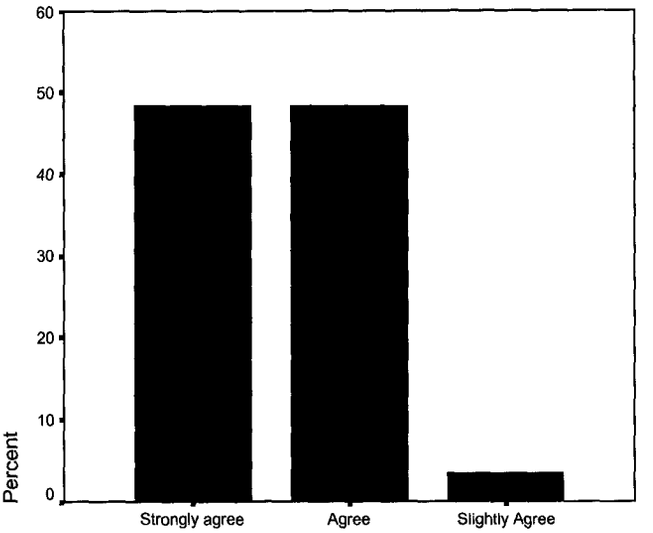

Figure 3. Percentage of teachers who responded they were flexible in their classroom practice.

Teachers' agreement with the statement in question 33, "My students seem to be motivated by participating in online projects," was 100%, (48.3% strongly) as indicated in Figure 4.

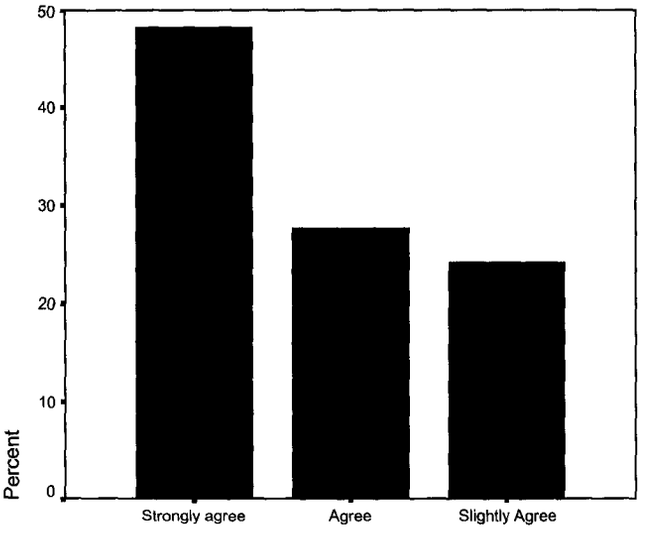

Figure 4. Percentage of teachers who responded their students were more motivated by participating in online projects.

Teachers' agreement with the statement in question 34, "I am motivated by participating in online projects with my students," was 89.7%, (34.5% strongly) as indicated in Figure 5.

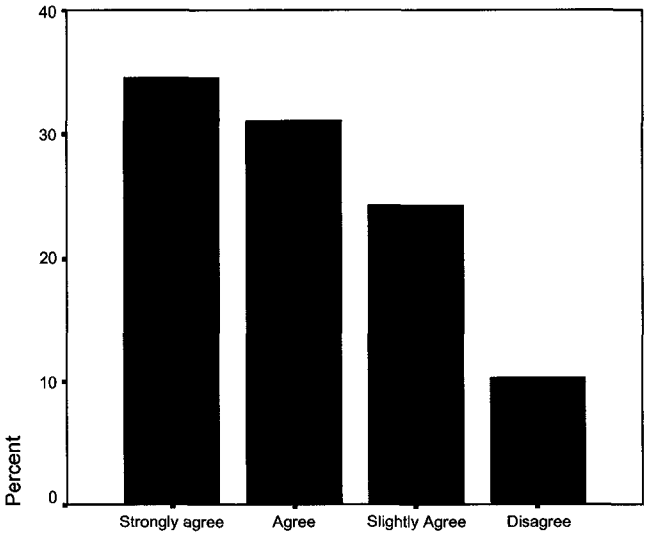

Figure 5. Percentage of teachers who responded they were motivated by participating in online projects.

Teachers' agreement with the statement in question 37, "I feel more successful as an educator as a result of helping my students to participate in online projects," was 89.7%, (24.1% strongly) as indicated in Figure 6.

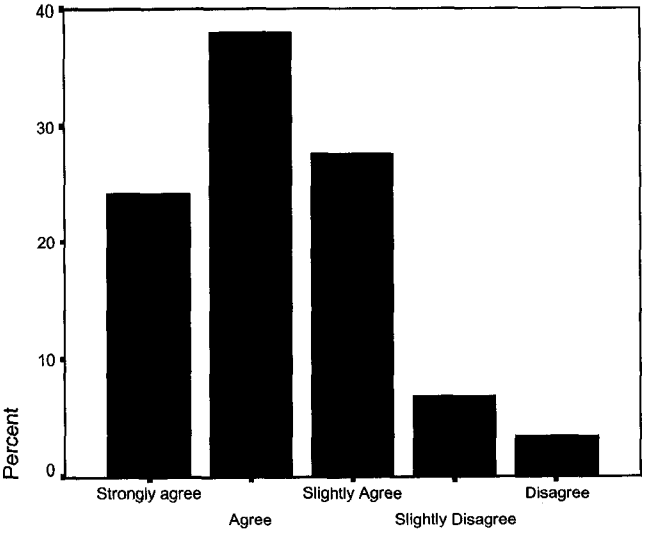

Figure 6. Percentage of teachers who responded that online project participation made them feel more successful as an educator

Teachers' agreement with the statement in question 38, "Helping my students to participate in online projects helped me to understand more about my students' learning and development," was 89.7%, (27.6% strongly) as indicated in Figure 7.

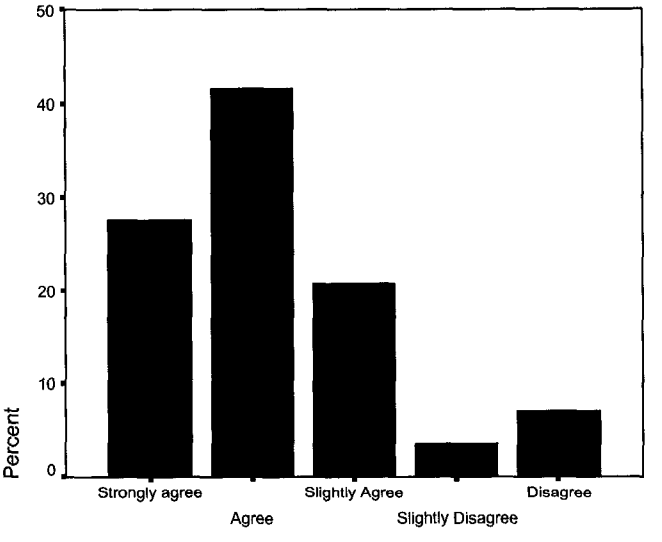

Figure 7. Percentage of teachers who responded that online project participation helped them to better understand their students' learning and development.

Teachers' agreement with the statement in question 39, "Helping my students to participate in online projects helped me to understand more about my students' learning needs and preferences," was 93.1%, (24.1% strongly) as indicated in Figure 8.

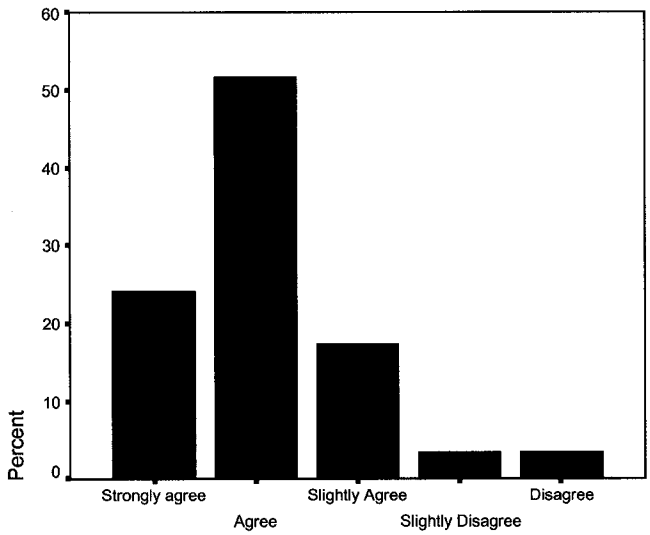

Figure 8. Percentage of teachers who responded that online project participation helped them understand more about their students' learning needs and preferences.

Teachers' agreement with the statement in question 40, "Helping my students to participate in online projects helped me to understand more about thinking in ways different than my own," was 86.2%, (17.2% strongly) as indicated in Figure 9.

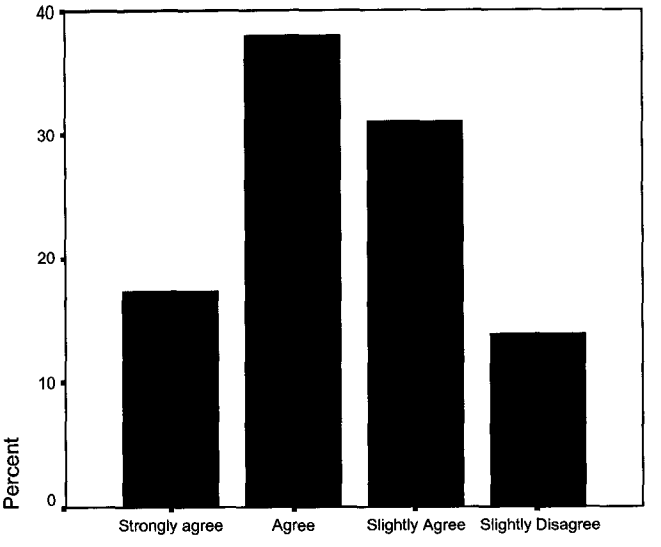

Figure 9. Percentage of teachers who responded that online project participation helped them understand more about different ways of thinking.

Teachers' agreement with the statement in question 41, "Helping my students to participate in online projects helped me to understand more about the processes for acquiring knowledge and skills," was 79.3%, (27.6% strongly) as indicated in Figure 10.

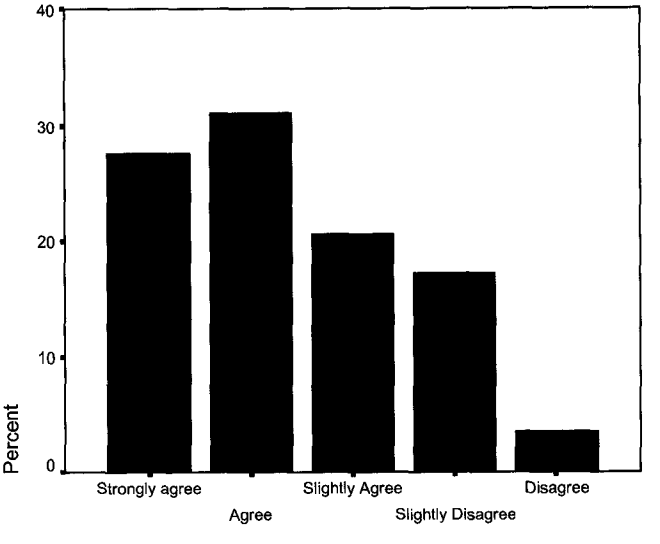

Figure 10. Percentage of teachers who responded that online project participation helped them understand more the processes for acquiring knowledge and skills.

Teachers' agreement with the statement in question 43, "I learned more about the subjects I teach from helping my students participate in online projects," was 89.7%, (27.6% strongly) as indicated in Figure 11.

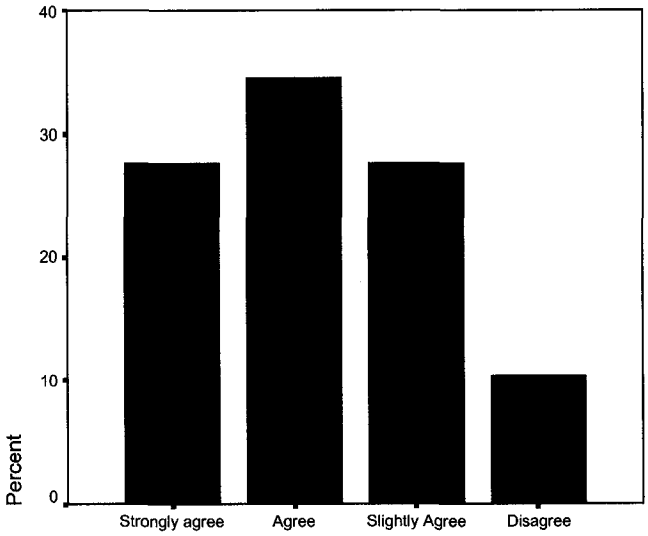

Figure 11. Percentage of teachers who responded they learned more about the subjects they teach during online project participation.

Teachers' responses to the statement in question 49, "Helping my students to participate in online projects helped me to communicate better and/or more with my students' parents," were 58.6% in the slightly disagree category, as indicated in Figure 12.

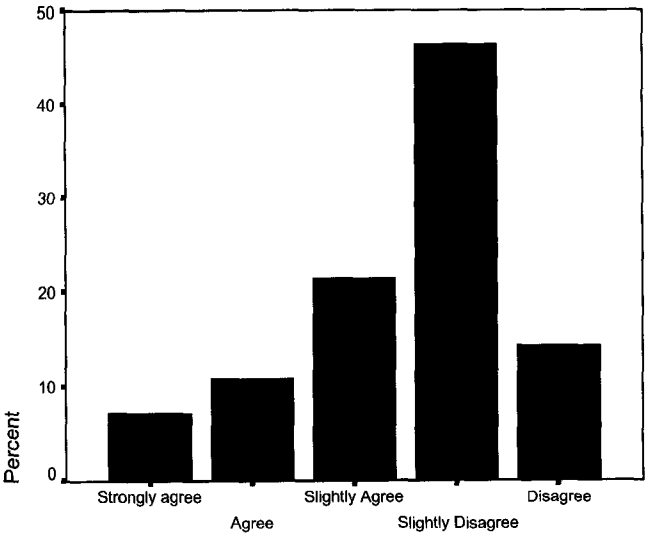

Figure 12. Percentage of teachers who responded that online project participation helped them to communicate better and/or more with my students' parents.

Teachers' agreement with the statement in question 53, "Helping my students to participate in online projects helped me to improve my online communication skills," was 93.1%, (20.7% strongly) as indicated in Figure 13.

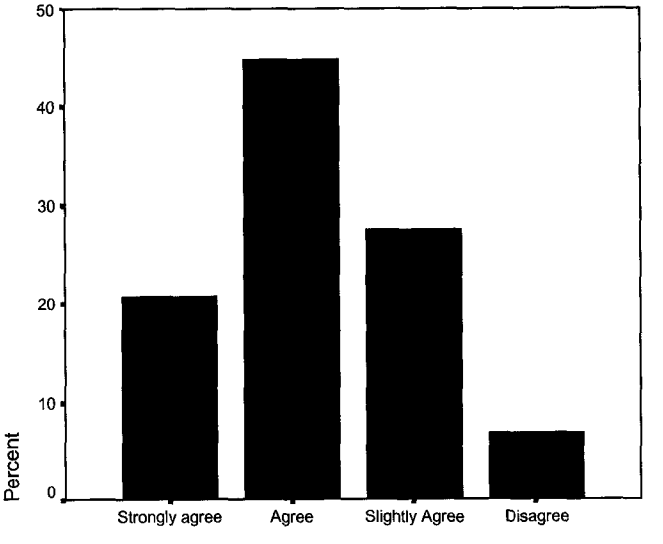

Figure 13. Percentage of teachers who responded that online project participation helped them improve their online communication skills.

Teachers' agreement with the statement in question 54, "Participating in online educational projects is the most effective way in which I learn to incorporate ICT into my teaching practices," was 82.8%, (27.6% strongly) as indicated in Figure 14.

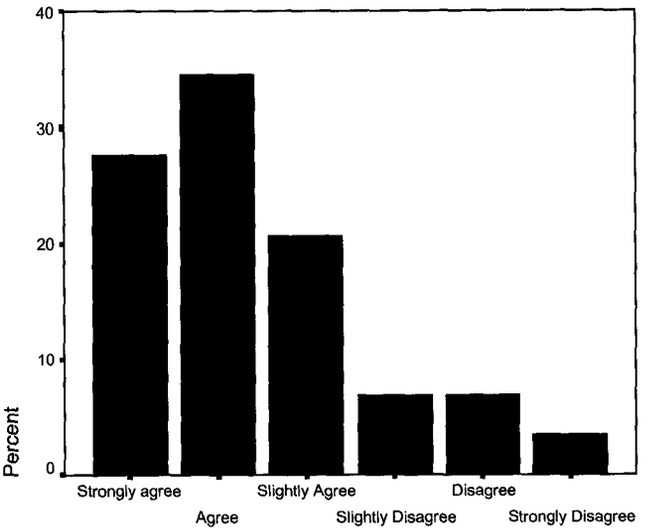

Figure 14. Percentage of teachers who responded that online project participation was the most effective way in which they learned ICT incorporation into their teaching practice.

Teachers' agreement with the statement in question 57, "Helping my students to participate in online projects helped me to increase and/or improve my technology skills," was 100%, (34.5% strongly) as indicated in figure 15.

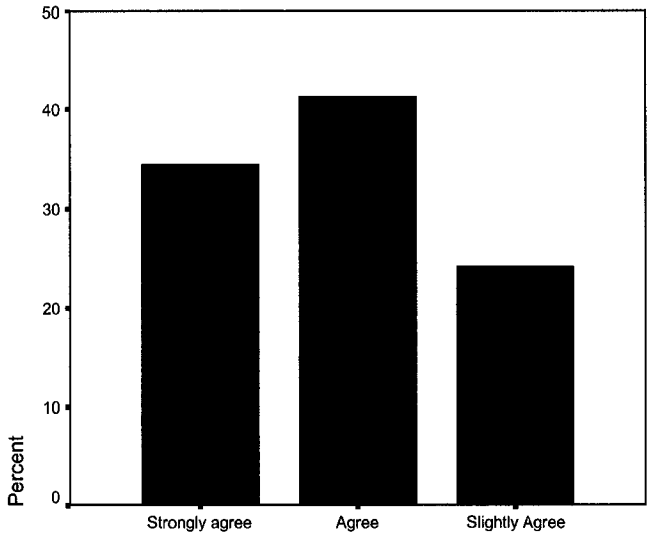

Figure 15. Percentage of teachers who responded that online project participation helped them to increase and/or improve my technology skills.

Teachers' agreement with the statement in question 58, "I regularly evaluate and adjust my teaching practices," was 96.6%, (31% strongly) as indicated in figure 16.

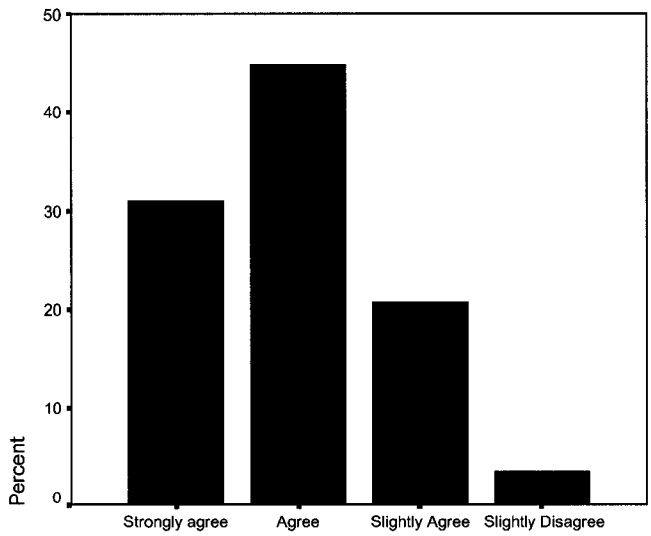

Figure 16. Percentage of teachers who responded they regularly evaluate and adjust their teaching practices.

Question 60 asked teachers, "How would you rate your online project experiences in terms of learning ICT integration skills." 93.1% of teacher respondents reported that online project experiences were an effective manner (31% extremely effective) of learning ICT integration skills as indicated in figure 17.

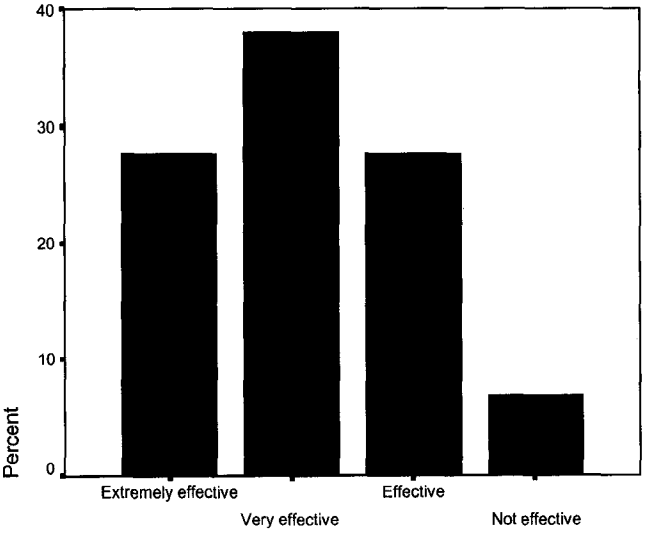

Figure 17. Percentage of ratings teachers gave for the effectiveness of online project experience as a method of learning ICT integration skills.

Innovativeness

A standardized score of innovativeness, from Hurt and Cook's (1977) Scales for the measurement of innovativeness, was presented to respondents in questions 61 through 80. Possible scores range from 20 to 140, with higher scores indicating more innovativeness. Mean, standard deviation, and t-test results for the innovativeness test scores are provided in Table 15. As can be seen, no significant difference between the two groups appears to exist.

Table 15: Standardized test of innovativeness

Group	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Collab. Group	29	79.69	6.066	.562	37	.577
Non-collab. Group	10	78.40	6.802			

Table 16 presents hypothetical "normal population" scores as well as the observed and expected population distributions with respect to the Measure of Innovativeness for the collaborative project group and non-collaborative project group.

Table 16: Measure of Innovativeness Results

		Group		
"Normal Population"		Collaborative Project Group	Non-collaborative Project Group	Scores
2%	innovators	0 (0)	0 (0)	118 - 140
14%	early adopters	1 or 4% (4)	0 (1)	93 - 117
34%	early majority	28 or 96% (10)	10 or 100% (4)	68 - 92
34%	late majority	0 (10)	0 (4)	44 - 67
16%	laggards	0 (5)	0 (1)	20 - 43
100%	TOTAL	(29)	(10)	

( ) = expected distribution

Collaborative Project Participation

The final stage of the data analysis will look at the six open-ended questions presented to the respondents in the survey. As data collected in these questions describes personal experiences from teachers (case study data), an interpretational data analysis was applied. Responses were grouped into themes that represented all of the responses and these themes are presented as categories of responses, with frequencies for each theme presented in tables. Where teachers' responses covered more than one of the common themes identified, they were added in to the frequency counts for both (or more) themes.

Question fourteen in the first component of the survey (teaching environment description) asked all respondents to describe in what primary ways they have learned to use Internet and/or Web-based tools and resources in their teaching. Results are presented in Table 17. There were 6 blank responses (13.04%) in the total sample: 4 (13.8 %) from the collaborative project group and 2 (11.77%) from the non-collaborative group.

Table 17: What primary methods respondents have learned to use the Internet and/or Web-based tools and resources in their teaching

	Collab. Group		Non-collab. Group	
	f	%	f	%
Learn Computer skills [1]			2	11.8
Research [2]	8	27.6	8	47.1
Online Projects supporting curriculum [3]	3	10.3	1	5.9
Drill and practice [4]	3	10.3		
Misread question *				
Self directed, trial and error, exploration [5]	12	41.4	4	23.5
In-servicing [6]	8	27.6	3	17.6
2Learn Project [7]	5	17.2		
University courses [8]	5	17.2		
Working with colleagues [9]	3	10.3		

[1] "To reinforce curriculum concepts through desk top publishing, multi-media, and web development."
[2] "Internet sites to complement curriculum in various subjects."
[3] "Research, Collaborative Projects."
[4] "Language, reading, phonics internet sights for remediation (special education), word processing."
* Describe in what primary ways you have learned to use Internet and/or Web-based tools
[5] "Through self discovery and self directed exploration, self taught out of necessity."
[6] "In-service, Group projects, experiment."
[7] "Taken courses through Telus 2Learn Project and our district PD."
[8] "Taking my masters in Instructional Technology."
[9] "Sharing with colleagues, Help from colleagues."

Question eighty-one in the final component of the survey (online educational project experiences) asked the collaborative project group to describe what they have learned while involved in online projects with their students. There were 5 blank

responses (of a possible 29) for this question posed to the collaborative project group and the categories of responses are listed below in descending frequency of response themes.

1. Motivation (8 responses) - Students are highly motivated to try new things on the computer, specifically when they are sharing with others outside the classroom.
2. New things about their students (6 responses) - Students need to take more responsibility for their learning in the online project setting as they are required to be active participants - aids them in becoming responsible for their learning to a higher degree. "I have learned that many of these projects allow my students to expand in new ways and show strengths in areas that were previously hidden to me. I am most impressed at the way students are able to become more reflective thinkers and utilize higher order thinking skills when engaged in online conversations."
3. New communication tool (6 responses) – Teachers learned that technology is really about using new ways to communicate with others and this includes learning how to carry out this new kind of communication.
4. New teaching practices (5 responses) - Teachers reported that they learned new ways of teaching – both with regards to technology integration overall, as well as how to teach technology communication skills to students.
5. Learn to work with digital media (4 responses) - Teachers responded that they had learned how to edit and use digital media such as images during their participation in online projects.

6. Online projects and time management (3 responses) – Teachers learned that online projects do take a considerable amount of time to organize and manage, and that this needs to be considered when starting them.

Question eighty- two asked collaborative project teachers "What advice would you give a teacher who is planning to do a first online project with students?" There were 2 blank responses (of a possible 29) for this question posed to the collaborative project group and the categories of responses are listed below in descending frequency of response themes.

1. Ask for help (7 responses) – Find a mentor or partner who can help you along through the process.
2. Give yourself enough time (6 responses) - "Be prepared to spend a lot of extra time to accomplish the project, and be aware that the time spent is well worth the outcomes for which one plans."
3. Take chances (5 responses) – Learn with your students; "give online learning a chance and it will help you to move into more project based learning with student centered activities that enhance learning."
4. Start small (4 responses) - "Start by integrating the technology into a project that you already do and know that works."
5. Plan it out (4 responses) –Test it out before working with your student groups.
6. Be Flexible (3 responses) - Be ready for anything and be flexible and willing to make changes along the way.
7. Access to resources (3 responses) - Make sure all necessary resources are in place.

Question eighty- three asked collaborative project teachers "What would you tell a teacher who is unsure whether to do an online project with students?" There were 3 blank responses (of a possible 29) for this question posed to collaborative project teachers and the categories of responses are listed below in descending frequency of response themes.

1. Try it (8 responses) – Change is sometimes just what the doctor ordered.
2. Get help from others (8 responses) – Find a mentor, or team up with someone who has already done an online collaborative project.
3. Learn and teach at same time (4 responses) – projects are a great opportunity for you and your students to learn new ICT skills.
4. Try with small project / small group (4 responses) – keep it simple silly.
5. Student motivation is really key (3 responses) - Kids get turned on with this.
6. Worth it? (2 responses) - Do it for the right reasons; is it worth it?

Question eighty-four asked collaborative project teachers to describe what are the required components for making the online project a positive experience for teachers and their students. There were 3 blank responses (of a possible 29) for this question posed to collaborative project teachers and the categories of responses are listed below in descending frequency of response themes.

1. Good organization and planning is a key to successful collaborative projects (8 responses) – Planning will allow teachers to work along a timeline and yet be flexible when challenges arise.
2. Computer environment (6 responses) - Ensure that the computer environment, and your access to it is sufficient for the needs of the project.

3. Time (6 responses) - Make sure to allow enough time to complete the project as they take more time to complete that teachers would think.
4. Mentor-facilitator (5 responses) - Try to arrange for a mentor to assist you with setting up and supporting you through your collaborative project experience.
5. Make sure it is worth doing (4 responses) - When starting an online project make sure that the project is worth doing for the students.
6. Enthusiasm (3 responses) - You will spend considerable effort on the project, and enthusiasm for the project will really help.
7. Perseverance / flexibility (2 responses) - Collaborative projects do not always go the way they are initially planned and teachers need to persevere and be flexible in allowing solutions to arise.
8. Cooperation (2 responses) - Ensure that teachers involved in the project are prepared to commit to the effort the project will require.

The final question of the survey asked all respondents to describe what kinds and levels of support, and necessary factors would need to be present to interest them in future participation in online educational projects with their students. There were 10 blank responses (of a possible 46) for this question posed to all teachers. The categories of responses are listed below in descending frequency of responses.

Collaborative project teachers (27 of 29 or 93.1% of the collaborative project group responded) – The factors that need to be present to continue to interest them in future participation in online collaborative projects are the following:

1. Mentor support (14 responses),

2. Technical support (10 responses),
3. Funding (5 responses),
4. Worth-it-ness of the project and curricular fit (3 responses),
5. PD and Inservice support (2 responses).

Non-collaborative project teachers (10 of 17 or 58.8% of non-collaborative group responded) – The factors that need to be present to interest them in trying online collaborative projects are:

1. Computer / lab /Internet access (6 responses),
2. Worth-it-ness of the project and curricular fit of projects (4 responses),
3. Time, time, time (3 responses),
4. PD and Inservice support (1 responses).

Summary

This chapter provided a detailed description of the analysis for both the quantitative and qualitative data collected. This analysis was presented in four main sections. The first section presented a description of the survey sample. Second, the demographics describing the teacher respondent sample were explored. Third, the online and collaborative experiences, as described by Likert-scale and numerical responses were analyzed and presented. Finally, the open-ended responses describing in teachers' own words their collaborative project experiences were categorized thematically. In the next chapter, the results will be interpreted in relation to the current study's questions and other literature describing the phenomenon of collaborative online project experiences.

Chapter 5: Discussion of Results

Profession-centered Technology Learning

The intent of this research is to describe what relationships exist between authentic teacher professional development and teacher participation in collaborative online projects. As such many of the study's questions of teachers were designed specifically for the collaborative project group. The teachers involved in this study were characterized by their participation in online projects – on average they participated in six projects as both project leader and participant with their own classes. What is significant is that they were planning and participating at essentially the same rate, creating and participating in their own projects - as opposed to participating in other teachers' projects This finding indicates is that teachers are creating their own online collaborative projects to participate in; what these teachers are really involved in is "collaborative" ICT lesson planning for their classes. ATPD has been described in the literature as occurring "when we actively learn – and reflect on that learning, both individually and collaboratively – as we teach" (Harris and Grandgenett, p. 54). The collaborative project teachers in this study were clearly participating in, as described by Harris and Grandgenett (2002), "ATPD," and this chapter describes in detail the kinds of technology learning that was reported by teachers.

The collaborative participant sample of 29 teachers in this study is further characterized as a reflective, flexible, innovative group similar to those who participated in the Harris and Grandgenett (2002) study. 100% of the collaborative group teachers agreed or strongly agreed with the following three statements: "I

reflect frequently on my teaching practice," "I am flexible in my classroom practice," and "I regularly evaluate and adjust my teaching practices." These collaborative teachers are a very diverse group, teaching from K-12, ranging from 26-57 years old, teaching in 40% rural and 60% urban settings, and with an average of 17.6 years of teaching experience. What is encouraging to find is that unlike the Harris and Grandgenett (2002) respondents who are highly skewed to the innovative end of the "innovativeness" scale (Hurt et al, 1977) these respondents were self-reported as less innovative and therefore more representative of a "normal" teacher. Harris and Grandgenett (2002) reported that their respondents were 67% innovators, and 32% early adopters; in the collaborative project group, 4% were early adopters and 96% early majority with none of the respondents identifying themselves in any other of Rogers (2003) categories. This is an encouraging finding in that there is some indication of a shift in the kinds of teachers participating in collaborative online projects –most report themselves as early majority like those reported by Abbott (2000), and may indicate that online collaborative participation is slowly becoming a mainstream activity. Rather than only the "cutting edge" educator being involved, more "risk-taking" teachers are participating – an indication that collaborative project participation may be a viable alternative TPD activity for an increasing number of teachers, and with various types of support, for all teachers.

To explore the authentic learning reported by the collaborative project teachers, six questions were asked. The first research question was "What profession-centered technology learning is reported by teachers who participate in collaborative online projects?" 97.1% of teachers agreed or strongly agreed "While helping my

students to use online resources for their learning, I feel that I learned something that related to my practice of teaching, or to teaching in general" (51.4% strongly). 91.4% of teachers agreed or strongly agreed, "Helping my students to use online resources as part of learning has changed my teaching approaches or practices" (28.6% strongly). 89.7% of teachers agreed or strongly agreed, "I learned more about the subjects I teach from helping my students participate in online projects" (27.6% strongly). These findings are supported by the findings reported in the Abbott (2003) study that indicates teachers' telecommunications do provide meaningful learning experiences and increased knowledge about subject matter. Harris and Grandgenett (2002) reported very similar results (slightly higher for each level of agreement) for these three statements adding further support to their validity. Teacher responses in the qualitative segment of this study (question 81) further bring to light this first theme of "**learning new teaching practices**" during project participation. Teachers in the study describe in detail the kinds of learning about teaching they experienced: "I improved my skill at teaching very young children how to use the internet," and "I have learned that students need to practice a skill several times before they can use it with much comfort...and [you need to be focused on] breaking down the skills needed and have them practice them in a simpler context." A conclusion then is that teachers who are participating in online collaborative projects experience ATPD relevant to teaching practice. This learning new teaching practice is the first of four common themes of teacher "learning" identified; the other three are **technology skill development, learning new ways of thinking about their students, and technology motivates students.**

One significant finding in this study is that 100% of the collaborative project teachers identified that their technology skill development had improved/increased due to their online project involvement. 85.7% of teachers agreed or strongly agreed, that their presentation skills had improved (21.4% strongly), and 93.1 % agreed or strongly agreed their online communication skills improved (20.7% strongly). These findings are supported by several studies and articles (McKenzie , 2001, 2000; Norris et al, 2000; Trotter, 1999), which state new approaches to technology TPD can be very effective, and that technology skill development is one area that could benefit from online teacher collaborations. This theme of **technology skill development** is continued in teacher's responses describing their learning. Teachers stated that they learned technology is about using new ways to communicate with others and that they also learned how to communicate with others using these new technologies: "I have learned that technology isn't just a tool for information, but more importantly, one for communication. That realization has changed the direction of my teaching," and "[I have learned] how to use webboards as part of the collaborative projects that we've done this year." Teachers also reported that they learned how to edit and use digital media such as images during their participation in online projects: "I learn new things as well as my students do. I've also became very good at working with digital photos. Editing and working with them in projects." A second conclusion about teachers' learning that occurs is therefore supported: teachers learn new technology skills during online collaborative projects participation.

The third theme of teacher reported learning occurring during online project participation is that teachers are learning new ways of thinking about their students.

93.1% of respondents agreed or strongly agreed "Helping my students to participate in online projects helped me to understand more about my students' learning needs and preferences" (24.1% strongly). 89.7 of respondents agreed or strongly agreed that "Helping my students to participate in online projects helped me to understand more about my students' learning and development" (27.6% strongly). These findings are supported by the Harris and Grandgenett (2002) study which reports almost identical responses to these questions as well as the Abbott (2000). Teachers were also very much in agreement (80%) with the statements that online project participation increased their understanding about the processes for acquiring knowledge and skills and about thinking in ways different than their own. This theme of teachers learning new things is the second most common theme described by teachers in the qualitative component of the study. The theme is summarized as new teacher understandings that students need to take responsibility for their learning in the online project setting as they are required to be active participants and that this aids students in becoming more responsible for their learning. "They must take the ownership for their learning: they are active participants in their learning versus passively sitting back listening in a traditional classroom," and "I have learned that many of these projects allow my students to expand in new ways and show strengths in areas that were previously hidden to me" are examples of teacher responses that describe this theme. A third conclusion can be drawn at this point: teachers learn new ways of thinking about their students.

The final theme describing what teachers learned during online projects is teachers are learning that technology motivates students. Question 81 in the survey

asked teachers to "describe what you have learned while involved in online projects with your students." Teachers most common theme of response (34% of responding teachers) to this question was that students are highly motivated to try new things on the computer, specifically when they are sharing with others outside the classroom. Teacher responses such as "The students seem to really respond to the online experience. They become involved.... hands on and their interest is high" and "The students were very motivated and proud of their work and could also share these experiences with parents and relatives" are examples of teacher descriptions of this student motivation. This is consistent with established understandings about technology in the classroom and is consistent with the findings of the Abbott (2000) study. It seems likely that this new understanding that teachers have about student motivation and technology results in continued teacher participation in collaborative projects – possibly why in this study the average number of collaborative projects that teachers participated in was six.

Another coincidental consequence of teacher participation in online projects seems to be that teachers feel more successful as educators. 89.7% of teachers agreed or strongly agreed "I feel more successful as an educator as a result of helping my students to participate in online projects" (24.1% strongly). These findings are consistent with the Harris and Grandgenett study (2002) and the "feelings of success" that teachers experience may be yet another motivating factor for continued teacher participation. Clearly then it can be concluded that technology ATPD is occurring during online project participation in three specific areas: learning new teaching

practices, technology skill development, and learning new ways of thinking about their students.

Profession-centered compared to traditional technology learning

The second research question was "How does the profession-centered technology learning reported by teachers participating in collaborative online projects compare to traditional technology learning" The two groups of respondent teachers was intended to allow for comparisons to be made between traditional technology learning and learning occurring during collaborative online projects. The first notable difference between the groups is that there is a considerably larger group of female teachers (72.4 %) who are participating in collaborative projects than male teachers (27.6% – total sample population 60.9% female and 39.1% male), and at the same time there are more male teachers who have not participated in collaborative online projects (58.8%).

With respect to teaching experience, age, access to computers, and use of online networking applications the two groups were essentially the same. Access to the Internet at home was slightly higher in the collaborative project group, and this leads us to another area of interest between these two groups – where they do most of their own work on online networking projects for their students. The collaborative project teachers reported about 50% of the work was done at school, and 50% at home. The non-collaborative project group reported that 82% of this type of work was done at school. It seems then that collaborative project teachers are using personal time at home to prepare and participate for their collaborative projects. This conclusion is further supported by 82.9% of the collaborative project teachers'

agreement that "I have learned to incorporate use of online resources for student learning largely on my own, without formal or specific training in how to do so" (42.9% strongly), and both the Harris and Grandgenett (2002) and Abbott (2000) studies.

The final notable difference between these two groups in the study appears in their description of the ways they have learned to use Internet and/or Web-based tools in the classroom. This question in the study was misinterpreted by almost half of all the respondents in both groups, however both interpretations of the question happen to provide insight for this study. The first interpretation is "how are you using these tools in the classroom." In this the two groups vary significantly in their responses – teachers in the collaborative project group indicate they use online tools for drill and practice (10.3%), online projects (10.3%), and research (27.6%). Whereas the non-collaborative project group reports they use online tools for teaching computer skills (11.8%), online projects supporting curriculum (5.9%) and research (47.1%). The notable difference being in the reported use of these tools in the classroom, which indicates collaborative project teachers are using online tools far less for research.

Collaborative Project Motivations

The third research question asked in this study is "What factors of the online collaborative project experience motivate teachers to participate for the first and successive times?" Two teacher motivations have already been discussed in the beginning of this chapter and findings indicate that an understanding that ICT projects motivate students, and teachers feel more successful as educators by participating in projects, contribute to teacher motivations to participate repeatedly. Initial

participation in collaborative projects seems to be linked to teachers' feelings that collaborative online projects would provide meaningful learning for their students. 100% of the collaborative teacher group agreed or strongly agreed with the statement "I decided to help my students participate in online activities because I thought that these would be valuable learning experiences for them" (67.5% strongly). This is a significant finding, supported by both the Harris and Grandgenett (2002) and Abbott (2000) studies, in that if teachers feel the experience will be "worth-it" for their students, they may choose to participate in online collaborative projects. As indicated previously, once teachers participate in online projects, they continue to be motivated by their classroom experiences. Further support for this concept is indicated by 89.7% of teachers who agreed or strongly agreed "I am motivated by participating in online projects with my students" (34.5% strongly). It can be concluded that teachers choose to participate in online collaborative projects if they appear (to the teacher) to be meaningful learning experiences, and that motivation for successive participation in online projects comes from previous project participation. What makes this conclusion extremely important for those supporting collaborative project participation is that it is imperative that the first online collaborative project experience needs to be supported in some way to ensure that it is successful.

The final question in the survey provides us with themes by which teachers can be motivated to participate for initial and successive times in online collaborative projects Question 58 asked all respondents to "describe what kinds and levels of support, and necessary factors would be needed to be present to interest you in future participation in online educational projects with your students?" From the

collaborative project group the responses provided two clear themes – provide mentor support and provide technical support. This has considerable implications for those planning online project participation in that teachers who have participated state they need initial and ongoing mentorship to successfully continue with online collaborative projects in the classroom. Secondly they indicate that technical assistance with the hardware, software, and online networking access is critical to their continued success with these projects. These are new findings not previously reported which certainly have significant implications for schools and school divisions planning ICT implementation systems for teachers. The non-collaborative project teachers also identified the technical assistance theme as of primary importance, with computer access being of considerable concern for this group. Curricular "worth-it-ness" of projects is the second most reported theme by this non-collaborative group, and this too seems to be in line with the "mentor" concept identified by the collaborative project group.

Further support for these two factors that teachers identify as critical for their participation in online projects comes from another open-ended question in the survey. Question 83 asked collaborative project teachers "What would you tell a teacher who is unsure whether to do an online project with students?" The two most common themes in their responses were "get help from others, find a mentor," and "try it – change is sometimes just what the doctor ordered." This re-occurring concept of teacher mentor continues appear in teacher responses, giving some indication of its importance. In the author's own experience supporting and participating with teachers in online collaborative projects, this recurring theme of "I

need someone to help me through the project" is evident in many if not all online collaborative projects. It can be concluded then that what is required in order for teachers to participate for the first and successive times is an environment that provides them with at least some type of mentorship support, as well as technical assistance.

Student Attitudes

The fourth research question in the study was "How do teachers perceive their incorporation of collaborative online projects into curriculum activities affects student attitudes?" Another significant finding in this survey is that 100% of teachers agreed or strongly agreed "My students seem to be motivated by participating in online projects" (48.3% strongly). This contributes to previous conclusions of this study that suggest that student motivation in these projects leads to further teacher motivations to continue participating and planning online collaborative projects. Research by Abbott (2000) and Forman (1997) also indicate that student motivations are high with technology-integrated tasks, and that these student motivations do play a role in continued teacher motivations to integrate ICT into the classroom.

Effectiveness of Technology Learning

The fifth research question was "Is teacher-centered learning that occurs during collaborative online projects more effective than other types of technology PD for teachers?" An overwhelming majority of collaborative project teachers rated the online project experience as the most effective way in which to learn both ICT integration skills and ways to incorporate these new skills into their teaching practices. 82.8% of respondents agreed or strongly agreed that "Participating in

online educational projects is the most effective way in which I learn to incorporate ICT into my teaching practices"(27.6% strongly). These results are supported by Abbott (2000, 2003), McGee (1998), and Lieberman et al (1996), who indicate that online collaborative project participation provides a more effective manner of technology professional development activities compared to the one-shot workshop or just-in-case inservice approach. 93.1% of collaborative project respondents reported that their online collaborative project experiences were an effective manner (31% extremely effective) of learning ICT integration skills. As technology skills and integration has been in Alberta since 1996, it can be assumed that many if not all of these teacher respondents have previously had experience with the inservice or one-shot workshop approach to technology skill development. What the literature (McKenzie , 2001, 2000; Colgan et al, 1999; Rakes et al., 1999; Trotter, 1999; Lundeberg, 1997; Macmillan et al., 1997; Edelson and Lento, 1996; Lieberman et al., 1996) continues to point out is that past approaches to professional development, specifically technology TPD, are not working and what is needed is an approach that incorporates more a collaborative, ongoing, self-directed, and constructivist environment. The respondents in this survey identify the collaborative project experience as just that kind of approach – providing an avenue for meaningful "worth-it" technology learning experiences for teachers – in their experience, the most effective way to learn ICT integration skills. However, due to the small sample size, a comparison of the effectiveness between traditional TPD and the ATPD resulting from collaborative project participation was not possible.

Worth-it-ness of Collaborative Online Projects

The final research question of this study asked "What do teachers identify as the professional value of the collaborative project experience for themselves and their students?" One theme identified in this study answers this question clearly - teachers have the opportunity to collaborate with other teachers and professionals in the development of meaningful curricular projects. 85.7% of the collaborative project teachers agreed that they "regularly help other teachers learn how to incorporate online resources into their teaching practices" (37.1% strongly). The Harris and Grandgenett (2002), Abbott (2000), and McGee (1999) studies provide support of this "helping others" relationship. It is this type of shared-learning relationship that makes the collaborative nature of online projects that makes the experience "worth-it" for teachers.

This concept of providing collaborative environments where teachers can plan meaningful curricular activities is supported by Trotter (1999) and Mackenzie (2000, 2001) who identify project based learning activities as important for teachers in learning ICT integration skills. The profession collaborative environment provided by online project participation allows teachers to co-construct materials and create materials that support new technology teaching practices. Studies by Abbott (2003, 2000), Colgan et al. (1999), McGee (1998), Lundeberg (1997), Edelson and Lento (1996), and Lieberman et al. (1996) all highlight the need for the "collaborative teacher-centered learning environment" if meaningful ICT integration is to be implemented by teachers. Teacher isolation, especially novice teacher isolation (Abbott, 2003) highlights the complexities of providing support to other teachers,

especially in the field of technology where many teachers feel overwhelmed. It can be can be concluded then that teachers identify "collaboration on meaningful curricular planning and learning" as one of the professional values of their online project participation.

Weaknesses of the Study

Within any study the interpretation of results must by definition be biased by the viewpoint of the interpreter, and this study is no different. One of the weaknesses of the study is the fact that respondents were volunteers, rather than chosen at random from a population. This biases a study in that volunteers tend to represent a skewed segment of a population. As the study does look at a specific type of respondent, teachers who have participated in online collaborative projects, more than likely teachers who have had bad experiences with collaborative projects would not participate in the survey. It could also be, as observed in this researchers experience, that teachers who participate in online collaborative projects continue their participation, making this bias much less significant.

A second weakness of the study is the relatively low sample size. Despite repeated calls for participation, teachers' busy schedules and the time of the year seemed to contribute to the low response rate. As well the online nature and length of the study may have contributed to specific teachers not completing the survey (such as the 7 teachers who did not respond after question 21 in the survey). This in turn brings into question the validity of the conclusions and generalizations (Gall et al., 1996) made from the results.

A third weakness introduced into this study is researcher familiarity with the groups included in the study. I have been a member of the TLC initiative since inception in 1996, participating in all provincial Inservices as a visible teacher leader of the TLC project. As a TLC session moderator, event photographer, and active member of the TLC project, I am a recognizable supporter of the 2Learn project. As well, I have been a member of the ATACC (ATA computer council) for several years, and again there is likely name recognition within the ATACC listserv membership. Teachers may have chosen to participate, or not to participate based on their relationships with the researcher. Several respondents were contacted on a personal basis to invite participation in the survey, as a result of the fact the researcher has worked with them in the past on collaborative online projects.

Although there are several weaknesses and biases reported above, the findings in this study are consistent with the Harris and Grandgenett (2002) research (a study including over 330 teacher respondents). All of the reported findings of this study generally agree with the frequencies and percentages that Harris and Grandgenett reported. As this study is largely a replication of the Harris and Grandgenett study, because of its parallel nature, this research finds support for the credibility of its results.

Practical Implications

There are three main groups for which this study's findings have practical implications: provincial professional development institutions, school divisions and administrators looking to support ICT implementation, and teachers looking to integrate technology into their classroom. As the data collected in this study is

considerable with respect to the "state of ICT integration" in Alberta, and the findings can have significant implications for teachers working with students, it is the intention of the researcher to publish a series of articles highlighting the findings of this study. The Alberta educational system needs to know what is working with respect to ICT integration and TPD in order to develop support systems for collaborative online project development.

The implications of this study's findings are significant for provincial professional development institutions, such as ATACC and TLC. What teachers report works in the development of ICT integration into the classroom needs to be shared and supported in all parts of the province. TLC should continue to support and enhance the Teacher-Leader concept of collaborative online project support, including providing access to funding for these endeavors. These findings suggest that all levels of support by Alberta Learning and Industry Canada's Grassroots for collaborative online projects needs to continue, as there is huge potential to make meaningful changes in ICT classroom integration.

Several implications from the findings exist for school divisions and administrators as well. At the division level planning and supporting meaningful implementation of the ICT curriculum seems to require teacher access to "mentors" familiar with the K-12 curriculum who can support teachers in their collaborative project experiences. Rather than planning large group sessions that introduce ICT skills or technologies for the classroom, teachers should be given opportunities to work in small collaborative groups of their own choosing, in order to co-construct meaningful ICT integration projects for their students. Time for collaborative

planning should be included in any designs for effective teacher technology professional development. Adequate access to technical support is a requirement to continued enthusiasm and success of ICT integration in classrooms.

Finally, there are many implications of the findings of this study for the classroom teacher. One area that is of particular importance is the advice given by teachers on how to make online collaborative project experiences positive for teachers and students. Collaborative project teachers state the following need to be considered to make these projects successful and "worth-it" in the classroom:

- Good organization and planning
- Adequate computer environment
- Time
- Access to a mentor – facilitator
- Enthusiasm
- Perseverance and flexibility
- Cooperation

Collaborative project teachers also provided the following advice to teachers who are planning their first online collaborative project for their classroom:

- Ask for help: find a mentor or partner who can help you along through the process
- Give yourself enough time: "Be prepared to spend a lot of extra time to accomplish the project, and be aware that the time spent is well worth the outcomes for which one plans."

- Take chances and learn with your students: "Give online learning a chance and it will help you to move into more project based learning with student centered activities that enhance learning."
- Start small: "start by integrating the technology into a project that you already do and know that works"
- Plan it out: test it out before working with your student groups.
- Be flexible: be ready for anything and be flexible and willing to make changes along the way
- Make sure all necessary resources are in place

Directions for Future Research

One of the most intriguing components of this research project has been the challenge in obtaining a sufficiently large sample using online communication methods. Although the groups sought out as participants were specifically computer-interested teachers, email and issues with responses to email seem to have hindered the online survey process. I thought that computer-interested teachers, all with email addresses and many with experience participating in the 2Learn collaborative projects process, would jump at the chance to participate in a study that relates directly to ICT and Alberta teachers. Despite the enthusiasm and successes reported by collaborative project participants at provincial TLC meetings, and the current push towards ICT integration in the Alberta K-12 education system, computer-interested teachers did not respond in large numbers to requests to participate. Future research, I believe, should be conducted on why teachers are not choosing to participate in an online survey. Is it that teachers do not have enough time? Is the email process of

contacting potential participants too easy to dismiss for recipients? How does the online survey response rate compare to traditional paper and pencil surveys that come with pre-addressed return envelopes? Should other researchers consider using the instrument used in this study, the online versus paper delivery format should be seriously debated.

Another area of consideration for future research is the effect on teaching practice that collaborative project participation has for participating teachers. The final question of whether or not the collaborative project experience is "worth-it" for teachers to participate in rests in the ability of teachers to integrate the knowledge and processes they learn into ongoing teaching strategies. Are collaborative projects "events" that provide opportunities to learn specific types of technology integration strategies? And if so, what might these new kinds of teaching strategies be? Although this study described the collaborative project experiences of a group of Alberta teachers, an in-depth case-study exploration of the collaborative project experience from both the teacher and student points-of-view may yield value insights to effective ICT integration in the classroom.

Conclusion

The purpose of this study is to describe and evaluate the nature of the authentic teacher professional development occurring as a consequence of participation in K-12 curriculum-based online projects. What profession-centered technology learning is reported by teachers who participate in collaborative online projects? The profession-centered technology learning occurring during online project participation was identified by teachers as: learning new teaching practices,

technology skill development, learning new ways of thinking about their students, and technology motivates students.

How does the profession-centered technology learning reported by teachers participating in collaborative online projects compare to traditional technology learning? Due to the small sample, comparisons between the collaborative project and non-collaborative project groups did not yield results that were statistically significant and this question was unable to be answered.

What factors of the online collaborative project experience motivate teachers to participate for the first and successive times? Factors that are required in order for teachers to participate for the first and successive times are a teaching environment that provides them with at least some sort of mentorship support, and access to adequate technical assistance.

How do teachers perceive their incorporation of collaborative online projects into curriculum activities affects student attitudes? Findings indicate that teachers participating in collaborative online project recognize the positive value of collaborative projects in providing motivation for students.

Is teacher-centered learning that occurs during collaborative online projects more effective than other types of technology PD for teachers? The respondents in this survey identify the collaborative project experience as an avenue for meaningful "worth-it" technology learning experiences for teachers. However this study was unable to answer this research question conclusively due to the small sample size.

What do teachers identify as the professional value of the collaborative project experience for themselves and their students. Findings of the study indicate that

teachers identify collaboration on meaningful curricular planning and learning activities that include ICT outcomes as a key value of collaborative project participation.

Teachers continue to be expected by school boards, government agencies, and the public to keep abreast of computer technology and incorporate it into the classroom. Although this task is so challenging that many teachers are unable to so, some are finding successes through the use of collaborative online projects in their classroom. Teacher participation in a collaborative online project, with adequate educational mentorship and technical support, can provide meaningful technology TPD while fulfilling classroom ICT requirements.

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Appendix A

Permission Letter to School Superintendents

March 3rd, 2003

As an Alberta teacher and technology implementation planner in my school division, I am well aware of the challenges presented to school boards and teachers regarding the ICT outcomes integration over the past several years. I am writing to you to request permission for approximately 3 of your teachers to participate in an online survey early this year.

I am currently studying teacher technology professional development in Alberta schools and my research will examine Alberta teachers' participation in online educational projects. Results of this research will provide direction for future technology PD delivery that meets the needs of teachers as described by Alberta teachers. Upon completion of the survey I will forward the results of the research to you.

The purpose of the survey is to collect information about teacher professional development. The data collected through this survey will be used to complete my M.Ed. thesis (University of Alberta – Instructional Technology) and will be published on my thesis website (http://www.teachertechpd.com) in order for education professionals to access the findings. Data from this research will be used in the writing of research articles and presentations and data for these purposes will be handled in compliance with ethical standards. This online survey will take approximately 15 minutes to complete, and participation is completely voluntary; teachers may choose to not participate, without prejudice. In addition, all responses to the online survey will remain confidential. An email address, obtained from either the ATACC (ATA Computer Council) or the TLC (Telus Learning Connection) will be used as a contact method and these will be held in the strictest confidentiality. The University of Alberta Ethics Board has given approval for this study. If you have any questions or comments regarding the survey, please contact my thesis advisor, Dr. Craig Montgomerie at
Phone: (780) 492 - 3667 Ext 227
Email: Craig.Montgomerie@ualberta.ca
"This study has been reviewed and approved by the Research Ethics Board of the Faculties of Education and Extension at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the Research Ethics Board at (780) 492-3751."

As this research is planned for April 1st to the 30th of this year, your timely response would be very much appreciated. Should you wish to contact me further regarding this request, please feel free to email me at **nostashewski@nlsd.ab.ca**, or call me at (780)826-3366 (school) or (780) 826-6825 (home)

Thank you for your time and consideration,
Nathaniel Ostashewski

Appendix B

Collaborative Project Participant Request for Participation

Participant Letter of Informed Consent/Notification

Dear Teacher:

As a fellow Alberta teacher, I am well aware of the challenges presented to teachers regarding the ICT outcomes integration over the past several years. I am currently studying teacher technology professional development in Alberta schools and my research will examine technology PD activities Alberta teachers participate in. Results of this research will provide direction for future technology PD delivery that meets the needs of teachers as described by Alberta teachers, **and I am asking for your participation in an online survey to be completed before May 1.**

The purpose of the survey is to describe and compare the teacher professional development occurring during curriculum-based online projects and traditional technology professional development. The data collected through this survey will be used to complete my M.Ed. thesis and will be published on my thesis website (www.teachertechpd.com) in order for education professionals, to access the findings. Data from this research will be used in the writing of research articles and presentations and data for these purposes will be handled in compliance with the Standards. . Data will be only reported in aggregate form and will be destroyed by 04/30/2008.

This online survey will take approximately 15 minutes to complete, and your participation is completely voluntary; you may choose to not participate at any time, without prejudice. In addition, the online survey has no tracking ability and all responses remain confidential; your email address as a contact method is held in the strictest confidentiality and under no circumstances will be released to other parties.

Please be aware that both the University of Alberta Ethics Board as well as the board of trustees of Buffalo Trail Public Schools Regional Division No. 28 have given approval for this study. If you have any questions or comments regarding the survey, please contact my thesis advisor, Dr. Craig Montgomerie at:

Phone: (780) 492 - 3667 Ext 227
Email: Craig.Montgomerie@ualberta.ca

"This study has been reviewed and approved by the Research Ethics Board of the Faculties of Education and Extension at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the Research Ethics Board at (780) 492-3751."

I will ask you to enter your e-mail address on the survey. It will help me validate responses. Upon completion of the research, I will notify you via your e-mail address where the results of the study can be found.

Thank you for your time and consideration,
Nathaniel Ostashewski, B.Sc., B.Ed/AD
(780)-826-6825
The link to the survey can be accessed RIGHT HERE by going to http://www.teachertechpd.com - on the SURVEY Page...

YOUR PASSWORD to enter the survey: *****

Appendix C

ATACC Article – Specialist Council Newsletter

Request for participants in online survey that looks at teacher technology professional development in Alberta.

By Nathaniel Ostashewski, ATACC member

Technology professional development in Alberta over the past several years has taken Alberta teachers down many different roads. From PD cadres devoted to technology integration, to courses on specific skill development, to the TLC and the TLT projects, teacher technology professional development has taken many roads. As a fellow Alberta teacher, I am well aware of the challenges presented to teachers regarding the ICT outcomes integration. I am currently studying teacher technology professional development in Alberta schools and am doing research that examines technology PD activities Alberta teachers participate in. Results of this research will provide direction for future technology PD delivery that meets the needs of teachers as described by Alberta teachers, and I am looking for participants in an online survey.

The purpose of the survey is to describe and compare the teacher professional development occurring during curriculum-based online projects and traditional technology professional development. The data collected through this survey will be used to complete my M.Ed. thesis and will be published on my thesis website (www.teachertechpd.com) in order for education professionals such as yourselves, to access the findings.

If you are willing to be a participant in this online survey focusing on teacher technology professional development please email me (nostashewski@nlsd.ab.ca) to request the password for the online survey. The survey is to be completed by May 15, 2003.

Please be aware that both the University of Alberta Ethics Board as well as the board of trustees of almost every Alberta School Board has given approval for this study. If you have any questions or comments regarding the survey, please contact my thesis advisor, Dr. Craig Montgomerie at:

Phone: (780) 492 - 3667 Ext 227
Email: Craig.Montgomerie@ualberta.ca

"This study has been reviewed and approved by the Research Ethics Board of the Faculties of Education and Extension at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the Research Ethics Board at (780) 492-3751."

Thank you for your time and consideration,

Nathaniel Ostashewski, B.Sc., B.Ed/AD
(780)-826-6825 home
(780)-826-3366 school
Email: nostashewski@nlsd.ab.ca

Appendix D

ATACC Request for Participation

Request for Participation

Dear Alberta Computer Council Teacher member:

As a fellow Alberta teacher, I am well aware of the challenges presented to teachers regarding the ICT outcomes integration over the past several years. I am currently studying teacher technology professional development in Alberta schools and my research will examine technology PD activities Alberta teachers participate in. Results of this research will provide direction for future technology PD delivery that meets the needs of teachers as described by Alberta teachers, and I am asking for your participation in an online survey.

The purpose of the survey is to describe and compare the teacher professional development occurring during curriculum-based online projects and traditional technology professional development. The data collected through this survey will be used to complete my M.Ed. thesis and will be published on my thesis website (www.teachertechpd.com) in order for education professionals, to access the findings. Data from this research will be used in the writing of research articles and presentations and data for these purposes will be handled in compliance with the Standards. This online survey will take approximately 15 minutes to complete, and your participation is completely voluntary; you may choose to not participate at any time, without prejudice. In addition, the online survey has no tracking ability and all responses remain confidential; your email address as a contact method is held in the strictest confidentiality and under no circumstances will be released to other parties.

Please be aware that both the University of Alberta Ethics Board as well as the board of trustees of almost every Alberta School Board has given approval for this study. If you have any questions or comments regarding the survey, please contact my thesis advisor, Dr. Craig Montgomerie at:

Phone: (780) 492 - 3667 Ext 227

Email: Craig.Montgomerie@ualberta.ca

"This study has been reviewed and approved by the Research Ethics Board of the Faculties of Education and Extension at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of the Research Ethics Board at (780) 492-3751."

If you are willing to be a participant, please email me (nostashewski@nlsd.ab.ca) to request the password for the online survey. The survey is to be completed by May 15, 2003.

I will ask you to enter your e-mail address on the survey. It will help me validate responses. Your e-mail address and all records will be destroyed at the end of the study. Upon completion of the research, I will notify you via your e-mail address where the results of the study can be found.

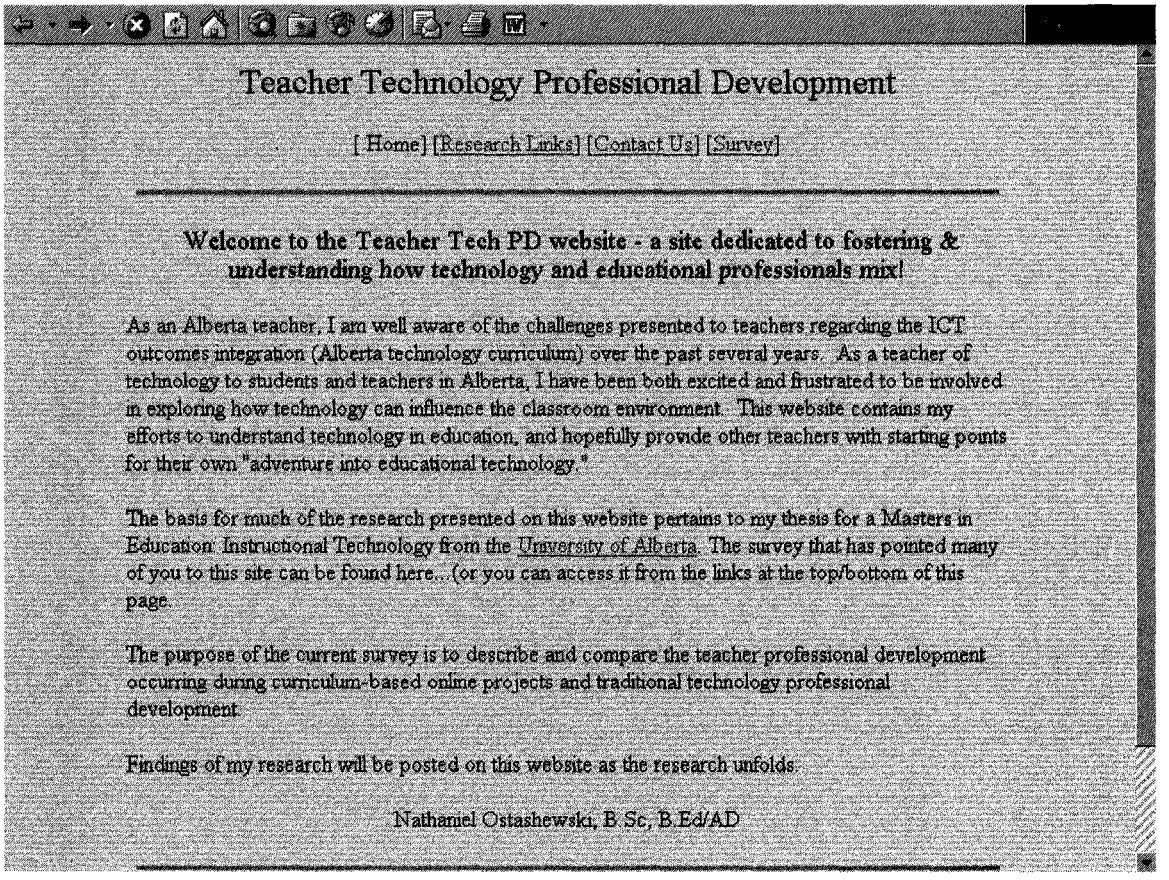
Thank you for your time and consideration,

Nathaniel Ostashewski, B.Sc., B.Ed/AD
(780)-826-6825

Appendix E

Teacher Technology PD Website

Available at http://www.teachertechpd.com/



Appendix F

Online Survey Instrument

Online Survey Instrument**

Delivered by password protected online survey found at
http://www.teachertechpd.com/instument.html

Teachers' Learning During

Curriculum-Based Online Projects

Hello! I am a researcher who would like to discover what educators experience when they help their students to participate in online projects. I hope you will be willing to help by responding to the 85 questions included in this survey.

IMPORTANT: Please respond to this survey only if you regularly teach elementary, middle-level, and/or secondary students.

If you do NOT regularly teach elementary, middle-level, and/or secondary students, please click the sentence below.

I don't regularly teach elementary, middle-level, or secondary students.

The above sentence was hyperlinked to take the person to a "thanks for participating page...as you are not a classroom educator, your participation in this survey is not required."

I. You and Your Teaching Situation (14 questions)

Please provide the following information about your teaching assignments and computer use.

1. Please type your primary e-mail address here:

I will use this information only to differentiate your set of responses from someone else's, and to notify you when study results are available for your review in 2003. Your email address is held in confidence and will only be used to contact you with regards to this online survey

2. Grade level(s) currently taught: (check all that apply)

☐	Pre-Kindergarten	☐	6th grade	☐	Undergraduate
☐	Kindergarten	☐	7th grade	☐	Graduate
☐	1st grade	☐	8th grade	☐	Community College
☐	2nd grade	☐	9th grade	☐	Teacher inservice
☐	3rd grade	☐	10th grade	☐	Other teacher ed.
☐	4th grade	☐	11th grade	☐	Other higher ed.
☐	5th grade	☐	12th grade		

3. Other level(s) taught previously: (Please click all that apply.)

☐	Pre-Kindergarten	☐	6th grade	☐	Undergraduate
☐	Kindergarten	☐	7th grade	☐	Graduate
☐	1st grade	☐	8th grade	☐	Community College
☐	2nd grade	☐	9th grade	☐	Teacher inservice
☐	3rd grade	☐	10th grade	☐	Other teacher ed.
☐	4th grade	☐	11th grade	☐	Other higher ed.
☐	5th grade	☐	12th grade		

4. Curriculum or subject areas that you currently teach or previously taught: (Please click all that apply.)

Curriculum/Subject	Teach Currently	Taught Previously
Language Arts/English	☐	☐
Mathematics	☐	☐
Social Studies/History/Geography	☐	☐
Science	☐	☐
Foreign Language/Language other than English	☐	☐
English as a Second Language	☐	☐
Art	☐	☐
Music	☐	☐

Drama	☐	☐
Physical Education	☐	☐
Health/Family Studies	☐	☐
Speech/Debate	☐	☐
Study Skills	☐	☐
Life Skills	☐	☐
Vocational/Technical	☐	☐
Computer Skills/Multimedia Development/Television	☐	☐
Religion	☐	☐
Service Learning	☐	☐

---

5. Total number of years of teaching experience: ☐

6.Type of formal preparation to become a teacher: (Please choose the one best answer from the list below)

- ○ College or university undergraduate teacher preparation program
- ○ College or university graduate teacher preparation program
- ○ College or university after-undergraduate certification program
- ○ Alternative certification program
- ○ College or university program other than teacher preparation
- ○ Credit for experience working in educational situations
- ○ Other -- Please specify: ☐

---

7. Sex: ○ Male ○ Female

---

8. Age: ☐

9. What type of school setting do you presently teach in (Please choose only one answer.)

- ○ Rural (country)
- ○ Urban (city)
- ○ Online Environment

10. Which of the following have you used with your students and/or by yourself? (Click all that apply.)

Application	Use with students	Use myself
electronic mail	☐	☐
computer conferencing (e.g., WeBoards, Web forums, e-groups, electronic bulletin boards)	☐	☐
World Wide Web pages/sites that others created	☐	☐
World Wide Web pages/sites that my students and/or I created	☐	☐
realtime text chat (e.g., IRC, chat rooms)	☐	☐
MUDs (e.g., MOOs, MUSHes)	☐	☐
audio/video conferencing (e.g., CU-SeeMe)	☐	☐

11. In all of the rooms in which you teach, how many total computers that students use can access the Internet? ☐

12. Do you have access to the Internet at home? ○ Yes ○ No

13. Where do you do most of your own work that's related to student online projects? (Please choose the one best answer.)

- ○ At home
- ○ At school

○ Elsewhere

---

14. In what primary ways have you learned to use Internet and/or Web-based tools and resources in your teaching?

II. Your Online Project Experience (42 questions)

Please answer the following questions about your experience helping your students to participate in projects that involved use of Internet and/or Web-based tools and resources. Note that the word "online" refers to any use of the Internet, World Wide Web, electronic mail, computer conferencing, realtime chat, MUDs, audio/video conferencing, etc.

Section Question: Have you ever used any online tools with your students?

YES – proceed to question 15

NO – proceed to Section III of the survey

15. I decided to help my students participate in online activities because I thought that these would be valuable learning experiences for them.

Strongly agree: ○
Agree: ○
Slightly Agree: ○
Slightly Disagree: ○
Disagree: ○
Strongly Disagree: ○

---

16. While helping my students to use online resources for their learning, I feel that I learned something that related to my practice of teaching, or to teaching in general.

(Author's note: Instrument reply choices have been removed for the remaining questions in order to conserve space in this document – response choices are all identical as that found in question 15 above for questions 16 to 59)

---

17. I was not seeking to learn something related to teaching when I decided to help my students use online resources in their learning.

18. Helping my students to use online resources as part of learning has changed my teaching approaches or practices.

19. I reflect frequently on my teaching practice.

20. Helping my students to use online resources as part of learning has inspired me to reflect more on my teaching practice.

21. I have learned to incorporate use of online resources for student learning largely on my own, without formal or specific training in how to do so.

22. I regularly help other teachers learn how to incorporate online resources into their teaching practices.

23. I find that the quality and extent of my professional learning is directly affected by the support that I receive from other teachers at my school.

24. I find that the quality and extent of my professional learning is directly affected by the administrative support that I receive at my school.

25. My colleagues probably perceive me as teaching in a manner that is different from traditional approaches to instruction.

26. My way of teaching is better for students' learning than many of my colleagues' ways.

27. I feel frustrated with my colleagues who seem resistant to incorporating online resources into their instruction.

Section Question: Have you ever participated in any online educational projects with your students?

YES – proceed to question 28

NO – proceed to Section III of the survey

28. What was your level of participation in any online educational projects? (check all that apply)

- ☐ Participant with your students
- ☐ Project developer or leader
- ☐ Other -- Please specify: _____

29. How many times have you been involved with online educational projects as a: (fill in all that apply)

Participant with your students? ☐
Project developer or leader? ☐
Other? ☐

30. I have improved my presentation skills as a result of being involved with online educational projects.

31. I am flexible in my classroom practice.

32. I have learned to be more flexible in my classroom practice as a result of being involved with online educational projects.

33. My students seem to be motivated by participating in online projects.

34. I am motivated by participating in online projects with my students.

35. Helping my students to participate in online projects helped me to improve my classroom management.

36. My participation in online projects for students helped me to feel more connected and/or empathetic toward other people.

37. I feel more successful as an educator as a result of helping my students to participate in online projects.

38. Helping my students to participate in online projects helped me to understand more about my students' learning and development.

39. Helping my students to participate in online projects helped me to understand more about my students' learning needs and preferences.

40. Helping my students to participate in online projects helped me to understand more about thinking in ways different than my own.

41. Helping my students to participate in online projects helped me to understand more about the processes for acquiring knowledge and skills.

42. Helping my students to participate in online projects helped me to know better how to carry out my school's mission.

43. I learned more about the subjects I teach from helping my students participate in online projects.

44. I understand more about people of other cultures and in other locations after helping my students participate in online projects.

45. Helping my students to participate in online projects helped me to increase the variety of my teaching/learning strategies.

46. Helping my students to participate in online projects caused me to increase my expectations for my students' learning.

47. Helping my students to participate in online projects helped me to collaborate better and/or more with my peers.

48. Helping my students to participate in online projects helped me to collaborate better and/or more with volunteers from the community (e.g., guest speakers).

49. Helping my students to participate in online projects helped me to communicate better and/or more with my students' parents.

50. Helping my students to participate in online projects helped me to understand more about evaluation or assessment of my students' learning.

51. Helping my students to participate in online projects helped me to improve and/or increase my assessment of my students' learning.

52. Helping my students to participate in online projects helped me to improve and/or increase my assessment of my own teaching practice.

53. Helping my students to participate in online projects helped me to improve my online communication skills.

54. Participating in online educational projects is the most effective way in which I learn to incorporate ICT into my teaching practices.

55. Helping my students to participate in online projects helped me to improve my instructional design or lesson planning skills.

56. Helping my students to participate in online projects helped me to become more organized.

57. Helping my students to participate in online projects helped me to increase and/or improve my technology skills.

58. I regularly evaluate and adjust my teaching practices.

59. Helping my students to participate in online projects helped me to improve my writing.

60. How would you rate your online project experiences in terms of learning ICT integration skills.

Extremely effective: ○
Very effective: ○
Effective: ○
Not effective: ○
Very ineffective: ○

Extremely ineffective: ○

III. General Attitudes About Innovation (20 questions)

The following group of questions is related to your general attitudes about new things or new ways of doing things. These questions don't refer just to technology or teaching. We would like to find out how you respond to innovation.

Scale for the Measurement of Innovativeness*

---

61. My peers often ask me for advice and information.

Strongly agree: ○
Agree: ○
Moderately agree: ○
Undecided: ○
Moderately disagree: ○
Disagree: ○
Strongly disagree: ○

(Author's note: Instrument reply choices have been removed for the remaining questions in order to conserve space in this document – response choices for questions 62 to 80 are identical as that found in question 61 above)

---

62. I enjoy trying out new ideas.

---

63. I seek out new ways to do things.

---

64. I am generally cautious about accepting new ideas.

---

65. I frequently improvise methods for solving a problem when an answer is not apparent.

66. I am suspicious of new inventions and new ways of thinking.

67. I rarely trust new ideas until I can see whether the vast majority of people around me accept them.

68. I feel that I am an influential member of my peer group.

69. I consider myself to be creative and original in my thinking and behavior.

70. I am aware that I am usually one of the last people in my group to accept something new.

71. I am an inventive kind of person.

72. I enjoy taking part in the leadership responsibilities of the groups I belong to.

73. I am reluctant about adopting new ways of doing things until I see them working for the people around me.

74. I find it stimulating to be original in my thinking and behavior.

75. I tend to feel that the old way of living and doing things is the best way.

76. I am challenged by ambiguities and unsolved problems.

---

77. I must see other people using new innovations before I will consider them.

---

78. I am receptive to new ideas.

---

79. I am challenged by unanswered questions.

---

80. I often find myself skeptical of new ideas.

---

* SOURCE: Hurt, H. T., Joseph, K., & Cook, C. D. (1977). Scales for the measurement of innovativeness. *Human Communication Research, 4,* 58-65. Used with permission of the authors.

IV. Additional Reflections (5 questions)

Please complete Questions 81-84 in this final section only if you <u>have participated</u> in online educational projects with your students.

If you have <u>not participated</u> in online educational projects with your students, please proceed to Question 85.

I used multiple-choice responses in the previous parts of this survey so that you could respond quickly and easily. However, I realize that you probably have considerably more that you would like to share about your experiences with online projects. Now please tell me about your experiences and observations in a more open-ended way. I'm very interested in what more you have to say.

81. I'm interested in understanding what your online project experience is/was like. In your own words, please describe what you have learned while involved in online projects with your students.

---

82. What advice would you give a teacher who is planning to do a first online project with students?

---

83. What would you tell a teacher who is unsure whether to do an online project with students?

---

84. What would you say are the required components for making the online project a positive experience for teachers and their students?

---

85. We're interested in understanding how teachers become interested in beginning their participation in online educational projects. In your own words, please describe what kinds and levels of support, and necessary factors would need to be present to interest you in future participation in online educational projects with your students.

** SOURCE: Harris, J & Grandgenett, N. (2002) Teachers' Learning During Curriculum-Based Online Projects. Used with permission of the authors.

I appreciate the valuable information that you have shared with me!

Please take a moment to check back over all of your answers, making any and all changes that you would like to make. There should be an answer for every question, including each of the five open-ended questions in Part IV above.

When you are sure that you have answered all of the questions, and answered them in the ways that best reflect your thoughts, feelings, and experiences, please click the SUBMIT button below.

Thanks again for helping me to understand your experiences with online projects and once the research is completed I will email you to share our results with you!

Nathaniel Ostashewski

Appendix G

Statistical Analysis Results

Question 10: Chi-Square Tests - Electronic email

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.235[a]	2	.327
Likelihood Ratio	2.288	2	.319
Linear-by-Linear Association	1.060	1	.303
N of Valid Cases	46		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .78.

Question 10: Chi-Square Tests - Computer conferencing

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.005[a]	3	.391
Likelihood Ratio	3.782	3	.286
Linear-by-Linear Association	.736	1	.391
N of Valid Cases	46		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .78.

Question 10: Chi-Square Tests - World Wide Web pages/sites that others created

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.935[a]	3	.586
Likelihood Ratio	2.278	3	.517
Linear-by-Linear Association	.047	1	.828
N of Valid Cases	46		

a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is .39.

Question 10: Chi-Square Tests - World Wide Web pages/sites that my students and/or I created

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.426[a]	3	.935
Likelihood Ratio	.424	3	.935
Linear-by-Linear Association	.230	1	.632
N of Valid Cases	46		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.96.

Question 10: Chi-Square Tests - realtime text chat

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.821[a]	2	.148
Likelihood Ratio	4.787	2	.091
Linear-by-Linear Association	3.737	1	.053
N of Valid Cases	46		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .78.

Question 10: Chi-Square Tests - audio/video conferencing

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.221[a]	2	.121
Likelihood Ratio	5.941	2	.051
Linear-by-Linear Association	1.714	1	.190
N of Valid Cases	46		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .39.

Question 10: Chi-Square Tests - MUDs

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.104[b]	1	.747		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.101	1	.750		
Fisher's Exact Test				1.000	.635
Linear-by-Linear Association	.101	1	.750		
N of Valid Cases	46				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .78.