Teacher inquiry: A vehicle to merge prospective teachers' experience and reflection during curriculum-based, technology-enhanced field experiences

Kara Dawson (dawson@coe.ufl.edu)
University of Florida

Experience combined with reflection results in professional growth (Posner, 2005) and professional growth and preparation is a goal of all field experiences (McIntyre *et al.,* 1996). Data from a four-year effort to facilitate curriculum-based, technology-enhanced field experiences is analyzed in terms of prospective teachers' experiences and reflective activities. Results suggest that teacher inquiry is a viable strategy for systematically and intentionally merging experience and reflection for professional growth during such experiences. A case is made for leaders in the field of Information Technology and Teacher Education to recognize teacher inquiry as an important strategy to support prospective teachers as they become technology-using educators.

A coveted plastic sweater bin resides behind childproof locks below our kitchen sink. It has affectionately been dubbed "mine art box" by our three-year-old son and contains tools such as construction paper, glue, scissors, stamps, stickers, pipe cleaners, crayons, markers, pom-poms, googly eyes and paint. Phrases such as "Mommy, let's play with mine art box", "Mommy, let's make something with glue for Daddy", and "Mommy, let's cut some paper" resonate throughout our house when "mine art box" is in demand. Then, "mine art box" will sit unused for days as our sons focuses on other interests such as balls, books, trains, Legos or Lincoln Logs. As I watch this fascinating childhood behavior, I see many parallels between our son's developmental stage and the integration of technology in schools.

Many teachers have a technological "mine art box" in their classrooms that includes necessary supplies to integrate technology into the curriculum. In fact, the ratio of students to computer is now better than 6:1 (NCES, 2001). Yet, it is frequently not viewed as an ever-present teaching tool. "Let's play on the computer" resonates

throughout schools just as "Let's play with mine art box" does in our house. Its use is fun and motivational but not purposeful. Likewise, many computers are off-limits to students for fear of the mess that may occur just like "mine art box" is kept behind childproof locks unless supervision is provided. Then, when it comes time to use technology (frequently at the end of the year after standardized testing) it often takes the front seat to curriculum just as using glue and scissors is our son's focus during art projects.

Our son's development will eventually allow him to consider the tools in "mine art box" based on the task he wants to accomplish. Likewise, research suggests that teachers can progress to a point where technology is viewed as a tool to accomplish meaningful, curricular goals ((Moersch, 1995; Sandholtz *et al.*, 1997). Indeed, some teachers have been at this stage for many years (Becker, 1994). Just as our son needs nurturing support as he grows, teachers need significant support to develop into effective technology-using teachers. This developmental process can and should begin during preservice teacher education (Milken Exchange on Educational Technology, 1999).

Scholars and accreditation agencies concur that authentic opportunities for preservice teachers to use technology in classrooms are essential in this process (Cooper & Bull, 1997; NCATE, 1997; Strudler & Wetzel, 1998; Thomas, 1999; USDOE, 2001). Much has been written about technology-based field experiences (Dexter & Riedel, 2003; Grove *et al.*, 2004; Jacobsen & Lock, 2004; O'Bannon & Judge, 2005; Ryan, 2003) and this article adds to the body of knowledge by analyzing a four-year effort to facilitate curriculum-based, technology-enhanced field experiences.

Purposes of the Article

Experience combined with reflection results in professional growth (Posner, 2005) and professional growth and preparation is a goal of all field experiences (McIntyre *et al.*, 1996). This four-year study considers both the experiences and reflective activity of 30 preservice teachers involved in curriculum-based, technology enhanced field experiences. First, the experiences are described in terms of technology integration efforts and categorized using the "Levels of Technology Implementation" (Moersch, 1995). Second, strategies designed to support prospective teachers' reflection during the first two years of the experiences (2002 and 2003) are described and analyzed using qualitative analytic procedures (Rossman & Rallis, 1998). Third, results from efforts to improve reflective activity through teacher inquiry in the next two years (2004 and 2005) are described. Finally, teacher inquiry is presented as a strategy for systematically and intentionally merging experience and reflection for professional growth during curriculum-based, technology-enhanced field experiences.

Description of curriculum-based, technology-enhanced field experiences

Since January 2002, over 45 technology integration efforts by 30 inservice-preservice pairs have been supported in 8 local elementary schools through curriculum-based, technology-enhanced field experiences. These experiences are grounded in John Goodlad's concept of simultaneous renewal (Goodlad, 1994), are modeled after a nationally recognized K-12/university collaboration (Dawson & Nonis, 2000; NCATE, 1997) and infuse the characteristics of exemplary field experiences espoused by experts

(Brush *et al*., 2001; Dexter & Riedel, 2003; O'Bannon & Judge, 2005; Strudler & Grove, 2002; Thompson *et al*.).

Specifically, these field experiences are built into a 3-credit, graduate-level course for Educational Technology specialists in their final year of ProTeach (**Pro**fessional **Teach**er), a five-year teacher education program (Bondy & Ross, 2005). Through these experiences preservice teachers are given firsthand experience integrating technology in K-5 classrooms via collaboration with an inservice teacher. The relationship between prospective and practicing teacher is based on the notion of collaboration rather than on an expert/novice relationship. The team pools their experiences and knowledge to develop activities/projects/strategies that support student learning and that improve both partners' ability to integrate technology into the curriculum.

At the beginning of the semester, teams meet with a university faculty member and a school-based liaison. At this time, each pair is provided with a graphical overview of the undergraduate technology integration course taken by all prospective elementary teachers during the junior year (See Figure 1 –opens a PDF file) and a table of possible uses for technology in K-5 classrooms (See Figure 2 –opens a PDF file). These serve as springboards for initial discussions and promote a framework for technology integration grounded in current theory and practice. A university faculty member and a school-liaison identified within each school support prospective teachers during these experiences. This support is individualized since each prospective teacher is operating within a unique context, however, support in the form of class sessions, individual consultations, classroom assistance and technical assistance is commonplace.

Analysis of curriculum-based, technology-enhanced field experiences

Over the four years, 30 fifth-year prospective teachers specializing in Educational Technology participated in these experiences (Masters level graduate students in our Educational Technology program also participated in these experiences but were not included in this study). The tangible results of these experiences are as varied as the teams and contexts involved. However, categorizing these efforts can provide insights into prospective teachers' experiences. For this particular analysis, the Levels of Technology Implementation (LoTi) continuum was used to categorize technology integration within the field experiences for several reasons. First, LoTi is a conceptual framework grounded in over three decades of literature on change, technology integration and teachers' use of technology (Moersch, 1995). Second, LoTi has been used in school districts throughout the United States and in numerous dissertation studies since its conception. Third, and most, importantly for this study, LoTi provides descriptions of each level of technology use and guidelines for what each level looks like in practice (Moersch). These descriptions and guidelines coupled with my experience as a former technology-using elementary teacher, current educational technologist and leader of the field experiences enabled me to accurately categorize each technology integration effort. In addition, a colleague with expertise in technology integration triangulated my categorizations.

Table 1 provides a description of each LoTi level and a percentage-based breakdown of the uses in each level.

Table 1: Levels of Technology Implementation

Level of Use	Category	Description	Percentage
0	Nonuse	Technology is not used.	0
1	Awareness	Technology is used for productivity, to support teacher-directed lessons or presentations or to record student work (i.e. videotaping a student play).	21%
2	Exploration	Technology is used to supplement the curriculum through extension or enrichment activities and reinforces lower level thinking.	56%
3	Infusion	Technology is used to complement selected lessons, provide in-depth coverage of content and emphasizes higher-level thinking.	15%
4a	Integration (Mechanical)	Technology is integrated in ways that supports student understanding of content but there is heavy reliance on prepackaged materials or atypical support structures or resources.	0%
4b	Integration (Routine)	Technology is integrated in ways that provide a rich context for students' understanding of content. Emphasis is placed on higher-level thinking, authentic learning and depth of knowledge. Teachers can design and implement these experiences with little to no extra support or resources.	6%
5	Expansion	Technology integration extends beyond the classroom walls and includes networking with others. Technology use also involves authentic learning, problem solving and activism.	0%
6	Refinement	Technology integration is essential to teaching and learning in the classroom and involves primarily learner-centered strategies geared toward higher-level thinking.	0%

With few exceptions, the technology uses resulting from these field experiences epitomize incrementalist uses (Schofield, 1995). That is, technology use did not bring about fundamental changes in instruction but instead either replaced, improved or extended traditional instruction. Learning to integrate technology is a multi-stage journey

for teachers and no journey can be completed without initial steps. These experiences enabled prospective teachers to begin their journey prior to becoming inservice teachers. Thus, the levels of implementation demonstrated in the field experiences concern me much less than the level of reflection articulated by the prospective teachers throughout the experiences. After all, prospective teachers "do not actually learn from experience as much as [they] learn from reflecting on experience" (Posner, 2005, p. 21).

Description and analysis of strategies to support prospective teachers' reflection

Teacher reflection has a long history that is frequently traced back to John Dewey (Dewey, 1933). Despite diverse meanings, tumultuous debates and implementation challenges, promoting teacher reflection remains a hallmark of teacher education (Fendler, 2003) and is an important goal of the curriculum-based, technology-enhanced field experiences.

During the first year of these experiences (2002), weekly journals were used to facilitate reflection and a course goal on the syllabus stated that prospective teachers should be able to "think critically about the integration of technology in K-12 environments." Prospective teachers were given little structure, beyond a weekly journal format, as to how this goal should actually be accomplished during the first year. One of the many issues related to the weekly journals was the fact that prospective teachers made no references to previous journals in these weekly reflections. Each was a separate assignment with no synthesis between weekly thoughts.

This was addressed in the second year of the field experiences (2003) by requiring students to write three synthesis papers in which they reviewed their weekly

reflections, extracted themes and considered their professional growth. In addition, students were encouraged to write reflections that included the integration of personal experiences with professional knowledge, discussed the reasons behind positive and negative aspects of the experience, hypothesized ways to remedy the negative and continue the positive, explored ways students were reacting to, learning with and learning from the technology and provided a synthesis of their learning as a result of these experiences.

The journals from 2002 and synthesis papers from 2003 were analyzed using qualitative analytic procedures (Rossman & Rallis, 1998). Data was first organized by student in chronological order and then read in its entirety two times to establish familiarity. Not surprisingly, these readings suggested differences between the reflections from weekly journals and synthesis papers. I knew I wanted to capture these differences so I initially read only the weekly journals for a third time with a focus on identifying patterns. Four broad categories emerged as I simultaneously identified patterns and coded data within them. Next, I read the synthesis papers for a third time. Interestingly, the four broad categories identified in the weekly reflections held true for the synthesis papers. As I coded the remaining data into these categories I kept track of the source from which the data came (i.e. weekly journals or synthesis papers and student name). Then, with an eye toward making the categories "concrete", I read through all the data again and extracted salient "snippets and segments of data" (Rossman & Rallis, 1998, p. 180). The four categories that emerged include reflections on: (1) Logistics, (2) Teaching with Technology, (3) Students and (4) Inservice Partners.

Logistics: This category was anticipated and included everything from scheduling woes, time constraints, access issues and technical challenges to frustration and concern with mandates related to standardized testing and classroom management. Reflections related to logistics were more pervasive and less thoughtful in the weekly journals as illustrated in the following two quotes about access from two prospective teachers:

> The lack of a computer lab with Internet connections and up-to-date programs is really limiting our options. Although it [the school] says that there are five computers in the library that are connected to the Internet, two of those are in staff members' offices and one of those does not work (Angela, 2002, Weekly Reflection)

> The students that I am currently working with, really like to help each other out when someone does not know exactly what to do. They point things out on the keyboard or on the screen. It is definitely beneficial to create groups where there are low and high level learners. I think students gain a lot of knowledge about the subject matter, working with computers, and working with different kinds of people when they have to work in-groups. Having only one computer in the class could turn out to have positive Benefits, rather than negative! (Krystal, 2003, Reflection 1)

In the first quote Angela is simply noting that access is a problem and there is no attempt to problem solve or learn from the experience. The reflection is essentially a statement of frustration. On the other hand, Krystal is also experiencing frustrations with access but thinks through the situation and finds a learning experience within. Her reflection continues by discussing how she thinks she will handle access issues in her own classroom. While reflections about how to address logistical issues did appear in some synthesis papers, a failure to look at the logistical issues facing these technology integration efforts within the context of an entire school culture and environment were absent.

Teaching with Technology: All activities implemented within these experiences were required to have a curricular focus and classroom observations suggest a strong relationship between the projects/activities/strategies and the curriculum. However, reflections in this category suggest that the prospective teachers struggled to put curriculum-related objectives at the forefront of their teaching plans. In many instances technology skills took the front seat to curriculum as illustrated in following quote.

> We will be working together to teach the students about Hyperstudio, Microsoft Excel, and Internet searching. We have also decided which subject areas we will be incorporating technology. (Nanette, Weekly Reflection, 2002)

The "subject areas" mentioned in this quote were never discussed within that weekly reflection.

Frequently, even when curriculum-related objectives were mentioned, technology still appeared to be in the driver's seat:

> [I plan to] help the students search the Internet effectively to research their science projects, teach students to use PowerPoint to present their science projects for the science fair, and teach students to use Quicken since they will be using it later to actually keep track of profit from their greenhouse. (Deidre, Weekly Reflection, 2002)

All prospective teachers struggled to keep a curriculum focus, however, this tension was frequently articulated in the synthesis reflections.

> The main concerns that I am having about this semester are deciding which technology projects will either let the students do something that they couldn't do before, or let them do something better than before. My teacher wants me to help integrate technology into a 10-day unit on the solar system. The problems that I am facing are deciding what kinds of projects to add to this unit or how to change existing projects into a technology based project. I have to ask myself, "Is it worth it?" I have found that on many of the small projects, that it really isn't worth it to add technology. So I am struggling to find what technology projects would enhance the unit without wasting unnecessary time and effort. (Ashleigh, Reflection 2, 2003)

> My only concern about making these WebQuests with these second graders is that I am not so sure I am promoting higher-order thinking skills. Like I have said before, I like letting the students learn how to use the technology and create something but I am not so sure it is really helping them make connections to their weekly stories. (Krystal, Reflection 2, 2003)

The fact that these prospective teachers faced this tension is not surprising, however, the fact that many did not seem to recognize it enough to include it in future reflections is cause for pause. They were using technology within the curriculum but the curriculum was often not the focus of planning and apparently was never a focus on assessment. Prospective teachers did not reflect on whether their technology integration efforts were influencing student learning. In fact, only one reflection mentioned assessment at all and this prospective teacher's query was quickly silenced:

> I suggested having the students write in journals or collect their notes for assessment during our project but she just told me their participation was enough assessment. (Laurel, Weekly Reflection, 2002)

Students: Reflections about students were commonplace in both the weekly journals and synthesis papers. All prospective teachers mentioned that students were motivated and excited at the prospect of using technology. However, references to technology integration both facilitating and hindering struggling students suggest that these prospective teachers recognize that technology is not an educational panacea and understand the importance of considering individual needs.

Likewise, all prospective teachers expressed surprise with and concern about the diverse level of technical expertise found in one classroom. While the concerns about providing technology skills to those behind the curve permeated the majority of reflections, issues related to students knowing more than teachers and to preparing students for the ethical and legal implications of technology use is noteworthy. After discussing issues related to students who are lacking technology knowledge, Bobby reflects that

> On the other side of the spectrum are some students that I feel know more about computers than I do. One such student has already brought up ethical and legal issues that I will need to prepare myself for. How do I teach a student that knows more about computers than me? How to I discourage him from illegal or unethical activities (like making computer viruses) without making him tune me out? How do I get him to trust or listen to me before I begin preaching to him about these issues? … The students knew about Napster, and many of them burn copies of CDs that they have not paid for. They see nothing wrong with that on an individual level, but they do see that it would be wrong for them to copy many CDs and sell them. (Bobby, Reflection 1, 2003).

Interestingly, there was not a single reference to the influence of these technology integration efforts on curricular learning or to the effects they had on individual learners.

Inservice Partners: Every prospective teacher included thoughts about their inservice partner in their reflections. The vast majority were positive in nature and included references to personal affinities, respect and appreciation. Many prospective teachers also developed a sense of responsibility to "help my cooperating teacher learn how to incorporate computers more easily into her curriculum" so "that she will use some of the things …again in the future" (Annabel, Reflection 1, 2003). References to a "two-way learning experience" (Annabel, Reflection 1, 2003) resonated throughout many reflections as well.

Frustrations related to the inservice partner were rare. The most prominent frustrations related to the inservice teacher's apparent lack of dedication to the field experiences and/or knowledge of technology integration. With few exceptions these frustrations were simply voiced with no consideration of the larger context within which the partners were operating or to the reasons for the observed lack of knowledge. When rationales for these frustrations were given they looked similar to the following examples:

> Research shows that inservice teachers resist using technology because it just doesn't fit into the curriculum. (Bobby, Reflection 3, 2003)

> I think the reason many teachers are not use technology in their classrooms stems from a fear or intimidation of computers in general. They do not feel comfortable using them and therefore they prevent their students from using an unbelievable tool that could ultimately enhance both teaching and learning. (Annabel, Reflection 3, 2003)

Prospective teachers appeared unable to assimilate the internal and external factors that contribute to whether a teacher is an effective technology user. Reflections in this category point to the importance of the inservice partner, the emphasis prospective teachers place on personal relationships with their partners and suggests that these prospective teachers were not able to see technology integration within the larger context of the teaching profession.

While the synthesis papers from the second year of the experiences (2003) appeared to facilitate better reflection than the weekly journals from the first year (2002); both proved relatively ineffective. In fact, they often typified criticisms of teacher reflection such as focusing on logistical and classroom management issues, ignoring contextual factors, supporting individualistic thinking rather than collaborative sharing and facilitating shallow thought unaccompanied by action (Zeichner, 1996). In addition, they failed to consider how or if technology integration influenced student learning, a key criticism of our field (Oppenheimer, 2003). In a nutshell, prospective teachers' reflective activity failed to synthesis technology integration with the inherent complexities of teaching.

Description and analysis of teacher inquiry to support prospective teachers' reflection

Shortcomings in the weekly journals and synthesis papers spurred me to look for a different strategy to help prospective teachers synthesize the integration of technology

with the complexities of teaching during their field experiences. For the past two years of the curriculum-based, technology-enhanced experiences (2004 and 2005), teacher inquiry (Dana & Silva, 2003). has been used for this purpose. Teacher inquiry is often used synonymously with action research or teacher research, however, the absence of the word 'research' is intentional because it tends to conjure up images of laboratory experiments, control and experimental groups, and high-powered statistics for those not well versed in the many paradigms of educational research. 'Research' is also intentionally omitted because the goal is to focus on providing a process for teachers to gain insight to improve their practices not to prepare them to be researchers in the traditional sense of the word.

Teacher reflection is an important component of teacher inquiry. However, teacher inquiry is distinctive in that it is "less happenstance." This is "not to suggest that reflection is never intentional but in the busy complex, life of teaching, reflection is often something that occurs in an unplanned way" (Dana & Silva, 2003, p. 7). In essence, teacher inquiry is the systematic and intentional study of one's own practice. The process involves teachers defining a "wondering" or "burning question" that emerges from practice, developing a research plan for data collection through such mechanisms as journals, student work, interviews with students, and field notes, analyzing data in relationship to their wondering to develop a picture of their learning, taking action to implement what was learned through their investigation, and sharing the results of their work with other professionals (Dana & Silva, 2003).

Results from the 2004 and 2005 curriculum-based, technology-enhanced field experiences suggest that teacher inquiry systematically and intentionally merged experience and reflection for professional growth. One poignant finding from the first

two years of reflective activity (2002 and 2003) was that prospective teachers did not consider whether their technology integration efforts were influencing student learning. This is a crucial oversight if technology is to be used as an effective and viable instructional tool. Interestingly, when reflective activity was implemented within the framework of teacher inquiry during 2004 and 2005, eleven (11) of the thirteen (13) inquiries related to technology integration and student learning.

Some of these inquiries focused on whole-class learning as a result of technology integration. For example, Michael studied the relationship between students creating their own web-based activities and their learning of content while Leslie's studied the academic achievement of 3rd graders who used multimedia presentations to teach their classmates about the solar system. Other inquiries addressed long-standing questions related to technology integration and student learning. For example, Miriam explored whether implementation of a technology-infused, project-based learning activity facilitated higher levels of thinking as she was taught in her university courses. She wondered "..how do we know students are truly making strides that could not be achieved by more traditional teaching strategies that require less planning, time and hands to implement?" Latasha's inquiry "compared the group interaction and dynamics and individual participation and achievements of 2 groups (a group of individuals with various academic levels and a group with similar academic levels) during a curriculum-based, technology-enhanced learning project." Likewise, Carol's inquiry addressed the perpetual problem of merging creativity and academic standards. The abstract of her inquiry reads

> With all the accountability needed in the modern classroom, this inquiry examines how to assess a classroom project that integrates creative writing and technology. This inquiry uses the Sunshine State Standards, the ISTE

> technology standards, and survey questions concerning the students' use of creativity and their empowerment from using technology to create a more holistic assessment of creative work. The goal of this inquiry was to see if these four elements contribute to a more reliable assessment of students for projects that meet accountability standards, but use a creative and interest driven approach. (Inquiry Abstract, 2005).

Still other inquiries focused on using technology to meet the needs of individual students. For example, Christina explored whether implementation of technology-based strategies could improve two struggling readers' comprehension. Likewise, Missy looked at how technology could be used to support the communication skills of a first-grade student with autism. Her passion for meeting the needs of all students resonates in her abstract:

> My goal as a teacher is to meet the challenges of students with diverse needs. I believe that in many situations technology can be used practically and meaningfully to support curricular goals while simultaneously meeting the unique needs of students. My inquiry involves what I learned about a first-grade student with autism and how technology can enhance and support one of his greatest challenges: communicating with others academically and socially. (2005).

These examples provide data to suggest that teacher inquiry is a viable strategy to counter limitations previously observed in prospective teachers' reflective activity during curriculum-based, technology-enhanced field experiences. This statement is elaborated on in the next section.

Discussion

These curriculum-based, technology-enhanced field experiences were designed merge experiences and reflective activity to support prospective teachers' growth as technology-using educators. The experiences provided prospective teachers the opportunity to apply the content of university-based, technology integration courses to authentic classroom environments as Laurel explains in the following metaphor:

> I cannot begin to explain how much this experience has helped me feel comfortable with technology. It is true that my specialization is technology and that I took many classes which included many projects; however, it has all really been theory until now. I have compared it to my S.C.U.B.A. lessons.
>
> I learned all the statistics and how to stay down, come up, etc. – the book work. Actually putting on the suit and getting in the water, it was a whole different story. They don't talk about peripheral vision being cut off, how cold the water is, how huge the barracudas look, how hard it is to actually not touch the reef with your foot etc. I had to dive over and over to finally become accustomed to the whole process; only then was I finally able to enjoy the dive for what it was. (Laurel, Reflection 3, 2003).

While the majority of technology uses were not transformational in nature, these experiences enabled preservice teachers to use technology in ways that parallel national studies of technology use by inservice teachers (Learning Quest, 2004) before setting foot in their own classrooms. Of more concern to me than the experiences themselves is the prospective teachers' reflective activity because experience with no reflection at best leads to superficial knowledge. If you merely "*do* [a] field experience without thinking deeply about it, if you merely allow your experiences to wash over you without savoring and examining them for their significance, then your growth will be greatly limited." (Posner, 2005, p. 21).

Major weaknesses noted in the literature and identified in the reflective activities from 2002 and 2003 included (1) failure to consider how or if technology integration influenced student learning, (2) focusing on logistical and classroom management issues, (3) ignoring contextual factors, (4) facilitating shallow thought unaccompanied by action and (5) supporting individualistic thinking rather than collaborative sharing.

An increased focus on student learning through teacher inquiry is the most noticeable improvement from the data presented in this study, however, other limitations were also countered. Part of the inquiry process involves writing a thick-rich description of the educational context and inquiry focus. This process enabled students to explore,

rather than focus on, logistics and classroom management issues while simultaneously considering the complexities of teaching. For example, Carol's inquiry about how to assess creative writing required her to develop logistic and managerial strategies to conduct her work while adhering to other classroom complexities such as parental communication, state-mandated standards, issues of student empowerment and regulations for special needs students.

Likewise, teacher inquiry provided a platform for prospective teachers to transform a shallow thought into an action-oriented plan. For example, had Miriam participated in the field experiences during 2002 or 2003 her reflection may have read "I wonder if these students are really learning more because of this project-based effort?" Through the process of teacher inquiry this shallow thought blossomed into reflective activity that considered many complexities of project-based learning including group dynamics, teacher facilitation, collaboration with school support personnel and classroom management. It concluded with the analysis that technology-enhanced, project-based learning can support higher levels of Bloom's cognitive processing but only with substantial planning, support and preparation on the part of the teacher. Miriam also concluded that it a worthy endeavor for classroom teachers to undertake.

Finally, a critical component in the process of teacher inquiry involves sharing. Each of these prospective teachers shared their inquiry in a public forum attended by inservice teachers, preservice teachers, K-12 administrators, teacher educators and university-level administrators. In addition to the satisfaction that comes from being recognized as a professional, such forums promote educational change from those in the best position to make a difference in education – those working in classrooms.

Conclusions

Despite the fact that teacher inquiry has been widely recognized in the general teacher education literature for over a decade (Carr & Kemmis, 1986; Cochran-Smith & Lytle, 1999) use of this strategy by prospective teachers in curriculum-based, technology-enhanced field experiences is novel. Teacher inquiry has been used to scaffold prospective teachers as they explore a specific technology-based innovation (Lundeberg, Bergland, Klyczek & Hoffman, 2003), by K-12 teachers to improve practice (Bowman, Swan, Callender, Currie, Holmes & Richardson, 1999; Wellman, 2002) by university faculty to improve teacher education (Bhattacharya & Richards, 2001; Radigan & Smith,2003; Montgomery & Whiting, 2000) and by teams of educators to improve collaborative technology integration efforts (McNeil, Smith, Stringer & Lin, 2002; Pierson & McNeil, 2000). Technology has also been explored as a support structure for teacher inquiry efforts (Hansen & Godfrey, 2003; Borras, 2000; Adamy, 2000; Davis & Resta, 2002; Godfrey & Hansen, 2003; Espinoza & Justice, 2003).

Yet, one of the most powerful uses of teacher inquiry rest in its ability to support prospective teachers as they intricately intertwine teaching experiences and systematic, intentional inquiry (Dana & Silva, 2003). In essence, teacher inquiry epitomizes the merger of experience and reflective activity for professional growth (Posner, 2005) . It is a strategy that parallels many calls for educational technology research (Fouts, 2000; Pollard & Pollard, 2005) and, more importantly, enables teachers to work within their own contexts to determine the effects of their technology integration practices. Teacher inquiries also provide rich research contexts for educational technologists to explore

prospective teachers' experiences and thoughts as technology-users. As leaders in the Information Technology and Teacher Education community work to develop a "proactive approach to a research agenda for educational technology" (Schrumm, 2005, p. 217) teacher inquiry should be explored as a strategy to help prospective teachers in the process of learning to use their technological "mine art box."

References

Adamy, P. (2000). Using Computers to Enhance Action Research. *Society for Information Technology and Teacher Education International Conference 2000*(1), 1672-1676.

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education, 26*(3), 291-321.

Bhattacharya, M., & Richards, C. (2001). Innovative Course Design as Action Research: Instructional Technology for Teacher Education. Society for Information Technology and Teacher Education International Conference 2001(1), 1052-1057.

Bondy, E., & Ross, D. D. (2005). *Preparing for inclusive teaching: Meeting the challenge of teacher education reform.* Albany, NY: State University of New York Press.

Borrás, I. (2000). Preparing Teachers to Investigate the Effects of Technology-Supported Instruction in Effective Partnership with Researchers. *Society for Information Technology and Teacher Education International Conference 2000*(1), 587-592.

Bowman, Jr., J., Swan, K., Callender, M., Currie, S., Holmes , A., & Richardson, J. (1999). Diffusion, Technology Planning, Professional Development, for In-Service K-12 School Teachers. *Society for Information Technology and Teacher Education International Conference 1999*(1), 617-622.

Brush, T., Igoe, A., Brinkerhoff, J., Glazewski, K., Ku, H., & Smith, T. C. (2001). Lessons from the field: Integrating technology into preservice teacher education. *Journal of Computing in Teacher Education, 17*(4), 16-20.

Carr, W., & Kemmis, S. (1986). *Becoming critical: Knowing through action research.* Geelong, Victoria: Deakin University Press.

Cochran-Smith, M., & Lytle, S. L. (1999). The teacher research movement: A decade later. *Educational Researcher, 28*(7), 15-25.

Cooper, J. M., & Bull, G. L. (1997). Technology and teacher education: Past practice and recommended directions. *Action in Teacher Education, 19*(2), 97-106.

Dana, N. F., & Silva, D. Y. (2003). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry*. Thousand Oaks, CA: Corwin Press.

Davis , B., & Resta, V. (2002). Online Collaboration: Supporting Novice Teachers as Researchers. *Journal of Technology and Teacher Education 10*(1), 101-117.

Dawson, K., & Nonis, A. (2000). Preservice teachers' experiences in a k-12/university technology-based field initiative: Benefits, facilitators, constraints and implications for teacher educators. *Journal of Computing in Teacher Education, 17*(1), 4-11.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking in the educative process.* New York: D.C. Heath and Company

Dexter, S., & Riedel, E. (2003). Why improving preservice teacher educational technology preparation must go beyond the college's walls. *Journal of Teacher Education, 54*(4), 334-346.

Espinoza, S., & Justice, M. (2003). Teachers, Action Research and Technology. *Society for Information Technology and Teacher Education International Conference 2003*(1), 1913-1916.

Fendler, L. (2003). Teacher reflection in a hall of mirrors: Historical influences and politic reverberations. *Educational Researcher, 32*(3), 16-25.

Fouts, J. T. (2000). *Research on computers in education: Past, present and future*. Seattle, WA: Bill and Melinda Gates Foundation.

Godfrey, N., & Hansen, M. (2003). Technology as a Resource for Students' Action Research Projects. *Society for Information Technology and Teacher Education International Conference 2003*(1), 1840-1843.

Goodlad, J. (1994). *Educational renewal*. San Francisco: Jossey-Bass Publishers.

Grove, K., Strudler, N., & Odell, S. (2004). Mentoring toward technology use: Cooperating teacher practice in supporting student teachers. *Journal of Research on Technology in Education, 37*(1), 85-107.

Hansen, M., & Godfrey, N. (2003). Technology and Action Research. World Conference on Educational Multimedia, Hypermedia and Telecommunications 2003(1), 2932-2933.

Jacobsen, D. M., & Lock, J. V. (2004). Technology and teacher education for a knowledge era: Mentoring for student futures, not our past. *Journal of Technology and Teacher Education, 12*(1), 75-100.

Learning Quest (2004). National LoTi technology use profile.

Lundeberg, M., Berglan, M., Klyczek, K., Hoffman, D. (2003). Using action research to develop preservice teachers' confidence, knowledge and beliefs about technology. *The Journal of Interactive Online Learning, 1(4)*, 1-16.

McIntyre, D. J., Byrd, D. M., & Foxx, S. M. (1996). Field and laboratory experiences. In J. Sikula, T. Buttery & E. Guyton (Eds.), *Handbook of research on teacher education: A project of the association of teacher educators* (2nd ed.). New York: Macmillan Library Reference.

McNeil, S., Smith, D., Stringer, E., & Lin, G. (2002). Effecting Pedagogical Change Through an Action Research Process. *Society for Information Technology and Teacher Education International Conference 2002*(1), 1761-1765.

Milken Exchange on Educational Technology. (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education*. Santa Monica, CA: Milken Exchange on Educational Technology.

Moersch, C. (1995). Levels of technology implementation (LoTi): A framework for measuring classroom technology use. *Learning and Leading with Technology, 23*(4), 40-42.

Montgomery, L., & Whiting, D. (2000). Teachers Under Construction—Incorporating Principles of Engaged and Brain Based Learning into a Constructivist "Technology in Education" Program. Society for Information Technology and Teacher Education International Conference 2000(1), 795-800.

NCATE. (1997). *Technology and the new professional teacher: Preparing for the 21st century classroom*. Washington, D.C.: National Council for Accreditation of Teacher Education.

NCES. (2001). *Teacher preparation and professional development*. Washington, D.C.: National Center for Educational Statistics.

O'Bannon, B., & Judge, S. (2005). Implementing partnerships across the curriculum with technology. *Journal of Research on Technology in Education, 37*(2), 197-216.

Oppenheimer, T. (2003). *The flickering mind: The false promise of technology in the classroom and how learning can be saved*. New York: Random House.

Pierson, M., & McNeil, S. (2000). Preservice Technology Integration through Collaborative Action Communities. *Contemporary Issues in Technology & Teacher Education,* 1(1), 189-199.

Pollard, C., & Pollard, R. (2005). Research priorities in educational technology: A Delphi study. *Journal of Research on Technology in Education, 37*(2), 145-160.

Posner, G. J. (2005). *Field experiences: A guide to reflective teaching* (6th ed.). New York: Allyn and Bacon.

Radigan, J., & Smith, D. (2003). Emerging Themes in Technology Integration. Society for Information Technology and Teacher Education International Conference 2003(1), 3816-3821.

Rossman, G. B., & Rallis, S. F. (1998). *Learning in the field.* Thousand Oaks, CA: SAGE Publications.

Ryan, T. (2003). Field experiences in instructional technology: Take a field trip to the k-12 schools: P.

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

Schofield, J. W. (1995). *Computers and classroom culture*. Cambridge: Cambridge University Press.

Schrumm, L. (2005). Editorial: A proactive approach to a research agenda for educational technology. *Journal of Research on Technology in Education, 37*(3), 217-220.

Strudler, N., & Grove, K. (2002). Integrating technology into teacher candidates' field experiences: A two-pronged approach. *Journal of Computing in Teacher Education, 19*(2), 33-38.

Strudler, N., & Wetzel, K. (1998). *Lessons from exemplary teacher education programs*. Paper presented at the Society for Information Technology and Teacher Education, Washington, D.C.

Thomas, L. (1999). National educational technology standards project. Retrieved November 3, 1999, from http://cnets.iste.org

Thompson, A., Schmidt, D., & Stewart, E. (n.d.) Technology collaboratives for simultaneous renewal in K-12 schools and teacher education programs.

USDOE. (2001, August 24, 1999). Preparing tomorrow's teachers to use technology. Retrieved February 15, 2001, 2001, from http://www.ed.gov/teachtech/

Wellman, E. (2002). Towards a Discipline Based Reflective Thinking Process for K-12 Students and Teachers Through On-line Discourse and Action Research. *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2002*(1), 2042-2047.

Zeichner, K. (1996). Teachers as reflective practitioners and the democratization of school reform. In K. Zeichner, S. Melnick & M. L. Gomez (Eds.), *Current reforms in preservice teacher education* (pp. 199-214). New York: Teachers College Press.