Teacher Inquiry: A Vehicle to Merge Prospective Teachers' Experience And Reflection during Curriculum-Based, Technology-Enhanced Field Experiences

Kara Dawson
University of Florida

Abstract

This study describes and analyzes a four-year effort to provide curriculum-based, technology-enhanced field experiences for prospective teachers. These field experiences and this associated study espouse the notion that experiences and reflective activity must coalesce to yield professional growth for prospective teachers. The study suggests that teacher inquiry, a process that scaffolds prospective teachers to systematically and intentionally study their use of technology, may (1) counter many shortcomings associated with traditional strategies designed to promote reflective activity, (2) focus prospective teachers' attention on student learning outcomes, and (3) facilitate more desirable integration strategies during curriculum-based, technology-enhanced field experiences. The study notes that teacher inquiry is widely recognized in the general teacher education literature, yet novel within the context of curriculum-based, technology-enhanced field experiences, and encourages educational technologists to further explore its possibilities as a tool for teacher preparation and educational research. (Keywords: teacher preparation, field experiences, K–12/university partnerships, teacher inquiry.)

INTRODUCTION

The need to provide prospective teachers with authentic opportunities to use technology in classrooms is well-documented (Cooper & Bull, 1997; Dexter & Riedel, 2003; Grove, Strudler, & Odell, 2004; Jacobsen & Lock, 2004; NCATE, 1997; O'Bannon & Judge, 2005; Ryan, 2003; Strudler & Wetzel, 1998; Thomas, 1999; USDOE, 1999). This article expands work in this area by asserting that teacher inquiry is a viable tool to merge prospective teachers' experience and reflective activity during curriculum-based, technology-enhanced field experiences. Teacher inquiry scaffolds prospective teachers as they systematically and intentionally explore their uses of technology through a focused investigation. For example, a prospective teacher may wonder: "Does technology-supported, project-based learning really support higher levels of thinking as I was taught in university courses?"

During these investigations prospective teachers examine the unique educational context in which they are working, review literature related to their investigation, develop data collection strategies that can be embedded in their teaching practices to inform the inquiry, analyze data to develop a picture of their learning, and share the results of their work in a professional context.

This four-year study suggests that teacher inquiry counters many of the shortcomings associated with traditional strategies designed to promote reflective activity, focuses prospective teachers' attention on student learning outcomes

rather than the logistical and managerial aspects of technology integration, and facilitates more desirable integration strategies during curriculum-based, technology-enhanced field experiences.

CONTEXT

This work strives to merge the experiences and reflective activity of prospective teachers enrolled in a three-credit, graduate level, field-based course for Educational Technology specialists in their final year of ProTeach (**Pro**fessional **Teach**er), a five-year teacher education program (Bondy & Ross, 2005). Prospective teachers gain firsthand opportunities to integrate technology in K–5 classrooms and reflect on those experiences (through traditional reflective strategies such as journaling during the first two years of the study and through the process of teacher inquiry during the last two years).

During these experiences each prospective teacher collaborates with a practicing teacher. The relationship between prospective and practicing teachers is based on the notion of collaboration rather than on an expert/novice relationship. The team pools its experiences and knowledge to develop activities, projects, and strategies that support student learning and 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 who support them during the semester. During the meeting, each pair is provided with a graphical overview of the undergraduate technology integration course taken by all prospective elementary teachers during the final undergraduate year (See Figure 1) and an evolving table of possible uses for technology in K–5 classrooms. (See Figure 2, page 268.) These serve as springboards for initial discussions and promote a framework for technology integration throughout the semester.

Since January 2002, more than 45 technology integration efforts by 30 prospective-practicing teacher pairs have been supported in eight local elementary schools. These field experiences and this associated study espouse the notion that field experiences and reflective activity must coalesce to yield professional growth for prospective teachers (Posner, 2005) and are built on literature related to technology-enhanced field experiences and teachers' reflective activity.

LITERATURE REVIEW

Field experiences are a hallmark of teacher education programs (Conant, 1963; McIntyre, Byrd, & Foxx, 1996). They provide opportunities within actual teaching settings, facilitate authentic learning, allow students to practice and implement the knowledge and skills developed within university-based methodology courses, and promote a high degree of emotional involvement leading to intrinsic motivation for success and increased professional growth (Casey & Howson, 1993; Henry, 1989). In effect, they enculturate prospective teachers into a community of practice (i.e., the teaching professional) and epitomize learning through "legitimate peripheral participation in communities of practice" (Lave, Wenger, & Pea, 1991, p. 31). Field experiences also provide opportunities to improve both university and K–12 environments through a process known as simultaneous renewal (Clark, Foster, & Mantle-Bromley, 2005; Goodlad, 1994).

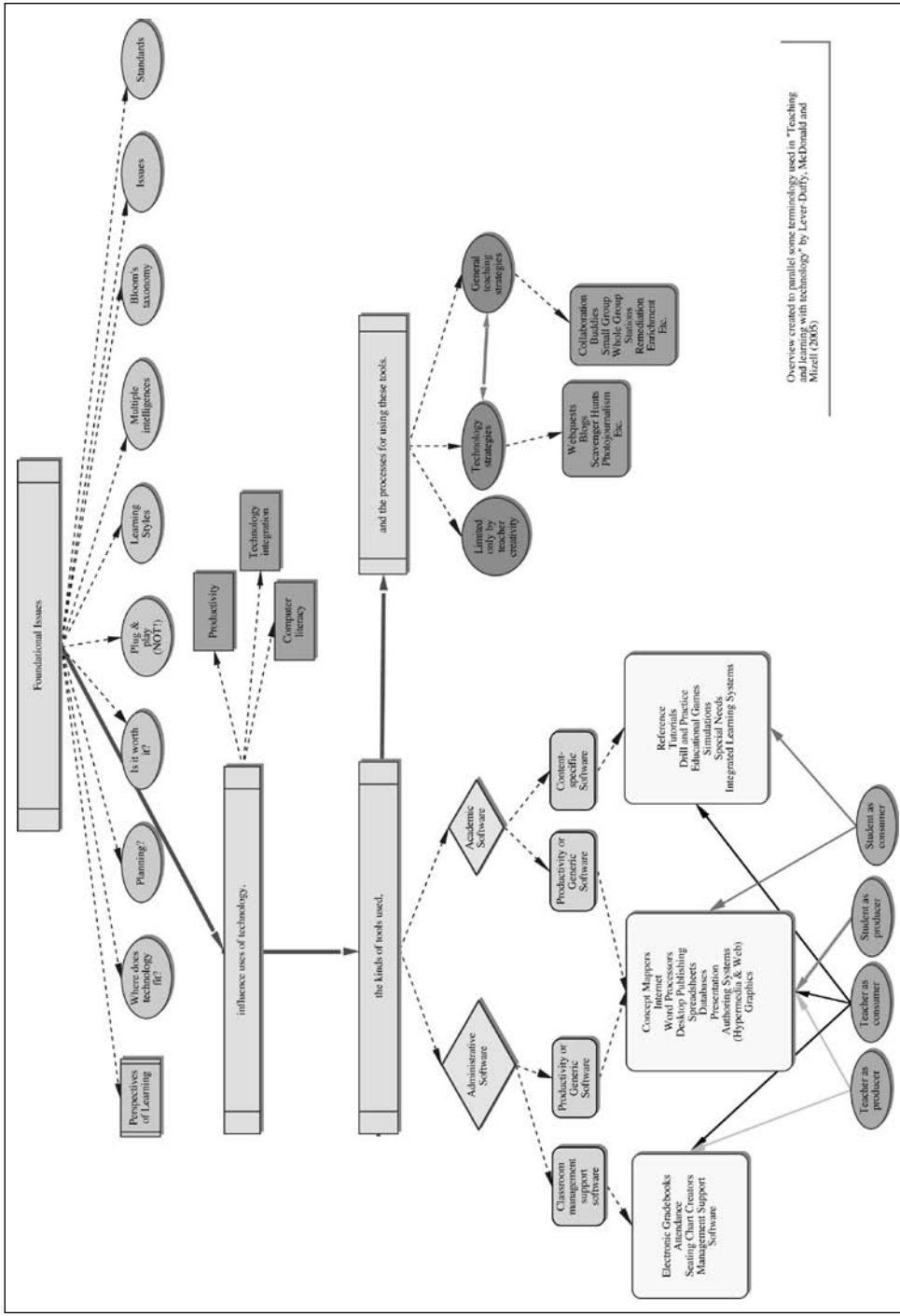

Figure 1. Overview of using technology in K–12 schools.

Despite the long-standing tradition of field experiences in teacher preparation and their noted benefits, implementation proves complex (Slick, 1995). Implementation is further complicated when these experiences involve the use of technology (American Council of Education, 1999; NCATE, 2002). Numerous strategies designed to promote prospective teachers' technology use in authentic contexts are documented, including requiring technology integration in student teaching experiences (Dexter & Riedel, 2003; Strudler & Grove 2002), working within existing Professional Develop Communities to integrate technology in preinternship experiences (Yendol-Hoppey et al., in press) linking field experi-

Possible Ways to Integrate Technology

We created this table in an effort to ensure that technology is *a part* of what is already happening in the classroom instead of *apart* from it. Please note that these uses are NOT mutually exclusive and the same lesson, project or activity may incorporate two or more uses simultaneously. Before making any decisions, be sure to ask the "Is it worth it?" questions. That is, "Does technology enable you to do something you could not do before?" or "Does technology enable you to do something you could do before but better?" (Harris, 1998) and be sure to start your planning with the curriculum.

Using technology to support all students	***Using technology in classroom instruction***	***General Uses***
– Support a struggling reader – Support a struggling mathematician – Meet student needs with assistive technologies – Meet the needs of students with differing "intelligences" – Meet the needs of visual, auditory and/or tactile learners – Meet the needs of an ESOL student(s) – Meet the needs of a gifted student(s) in a regular classroom – Meet higher levels of Bloom's taxonomy	– Content-specific software in a whole group setting – Content-specific software in a small group setting – Generic software in a whole group setting – Generic software in a small group setting – Alternative assessment strategies – Whole class projects – Small group projects – Interdisciplinary projects – Authentic projects – Daily uses – Differentiated instruction	– Technology to improve teacher productivity – Technology to support teacher communication – Technology to support teacher planning – Technology to improve delivery of instruction

Figure 2. Possible ways to integrate technology.

ences to methods courses (Glazewski, Berg, & Brush, 2002), creating teams of university faculty, clinical faculty, and preservice teachers to explore and develop effective uses of technology in K–12 classrooms (O'Bannon & Nonis, 2002), using microteaching experiences to simulate field experiences (Dawson, Pringle, & Adams, 2003), changing semester-long educational technology courses to intensive school-based workshops (Hernandez-Ramos & Giancarlo, 2004), providing competitive grants for university faculty members, classroom teachers, and student teachers to collaboratively develop innovative uses of technology (Jacobsen & Lock, 2004), enabling vicarious field experiences through videoconferencing (Knight, Pederson, & Peters, 2004), and creating separate technology-based field experiences within programs (Dawson & Nonis, 2000; Schmidt, 2001).

This study promotes technology use in authentic contexts through curriculum-based, technology-enhanced field experiences within a five-year teacher education program. These experiences are grounded in the concepts of simultaneous renewal (Goodlad, 1994) and situated learning (Lave et al., 1991), are modeled after a nationally recognized K–12/university collaboration (Dawson & Nonis, 2000; NCATE, 1997) and infuse characteristics of exemplary field experiences (Dawson & Nonis, 2000; Dexter & Riedel, 2003; O'Bannon & Judge, 2005; Strudler & Grove, 2002; Thompson, Schmidt, & Stewart, n.d.). Regardless of the strategies used to provide opportunities for authentic technology use, prospective teachers "do not actually learn from experience as much as [they] learn from reflecting on experience" (Posner, 2005, p. 21).

Teacher reflection has a long history tracing back to John Dewey (1933). Despite diverse meanings, tumultuous debates, and implementation challenges, promoting teacher reflection remains a cornerstone of teacher education (Fendler, 2003). Reflective activity aligns with a metacognitive approach to learning (Bransford, Brown, & Cocking, 1999) and ideally involves prospective teachers linking theory to practice, analyzing their own practice and learning from their experiences (Feiman-Nemser, 2001). In practice, efforts to promote teacher reflection often fall short for a variety of reasons (Fendler, 2003). These reasons include, but are not limited to, prospective teachers merely focusing on the logistical issues associated with teaching, ignoring the contextual factors in school-based environments, displaying shallow thought unaccompanied by action (Zeichner, 1996), and failing to reflect in systematic and intentional ways (Dana & Silva, 2003).

Teacher inquiry addresses such criticisms by supporting the systematic, intentional study of one's own practice (Dana & Silva, 2003). It scaffolds prospective teachers to move beyond logistical concerns to a focused passion, wondering or burning question, involves careful study of the educational context, and requires action-based responses. Teacher inquiry is often used synonymously with action research or teacher research (Carr & Kemmis, 1986; Cochran-Smith & Lytle, 1999); 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 rather than 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).

The process of teacher inquiry involves teachers defining a "wondering" or "burning question" that emerges from practice, developing a 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).

A combination of authentic experiences and reflective activity yield professional growth for prospective teachers (Posner, 2005). This study grounds curriculum-based, technology-enhanced field experiences within this equation. (See Figure 3.)

RESEARCH QUESTIONS

This four-year study considers both the experiences and reflective activity of 30 prospective teachers participating in curriculum-based, technology-enhanced field experiences. Three research questions guided the study:

1. What are the tangible results when prospective teachers participate in the curriculum-based, technology-enhanced field experiences under study?

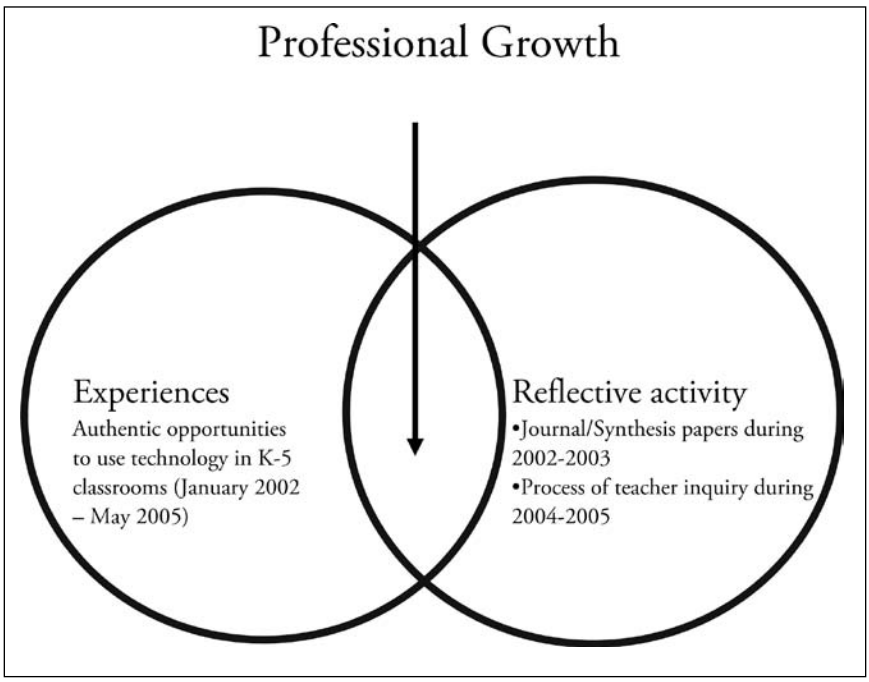

Figure 3. Experience + Reflective activity = Professional growth (Posner, 2005).

2. How do prospective teachers engage in reflective activity when traditional reflective strategies are used during the curriculum-based, technology-enhanced field experiences under study?
3. How do prospective teachers engage in reflective activity when the process of teacher inquiry is supported during the curriculum-based, technology-enhanced field experiences under study?

METHODS

Participants

The participants for this study were prospective elementary teachers completing the final semester of a five-year teacher preparation program. During the fifth year of this program all prospective teachers choose to specialize in a particular area (i.e., educational technology, literacy, mathematics, children's literature, and so on) and take 12 credits in their selected area. All participants in this study had completed a semester-long student teaching experience, chose educational technology for their specialization, and were enrolled in a required course for the educational technology specialization called Practicum in Educational Media. All participants were between the ages of 21 and 23, two were male, and one was non-Caucasian.

Research Question #1

What are the tangible results when prospective teachers participate in the curriculum-based, technology-enhanced field experiences under study?

Technology use in K–12 classrooms is often categorized on a continuum. Many continuums have been developed; however, the similarities among them are strong. The low end of the continuum typically represents little to no technology use while the high end signifies innovative technology use. Several continuums were considered for use in this study. Some were developed with an administrative eye toward "technology forecast and assessment" (Itzkan, 1994, p. 60), while others were developed through study of classroom teachers in ordinary schools (Knezek & Christensen, 2000), study of technology-focused, reform-oriented schools (Sandholtz, Ringstaff, & Dwyer, 1997), synthesis of existing literature on technology integration patterns (Hooper & Rieber, 2005), or integration of classroom practices with relevant literature (Moersch, 1995).

The Levels of Technology Implementation (LoTi) continuum (Moersch, n.d.) was chosen to categorize prospective teachers' technology integration in this study for several reasons. First, LoTi is a conceptual framework grounded in more than three decades of literature on change, technology integration, and teachers' uses of technology (Moersch, 1995). Second, LoTi has been adopted by ten states (including Florida) as a tool to gauge technology integration efforts. Third, numerous research studies, including multiple dissertations, have used this instrument. Fourth, and most important for this study, LoTi provides descriptions of each level of technology use and guidelines for what each level looks like in practice (Moersch, n.d.). (See Figure 4, page 272.) This descriptive information provided a useful guide as integration efforts were analyzed.

These descriptions and guidelines, coupled with my experiences as a former technology-using elementary teacher, a current educational technologist, and

the leader of the field experiences, enabled me to categorize each technology integration effort. In addition, a school-based colleague with expertise in technology integration participated in an adapted form of member checking by corroborating the LoTi levels assigned to activities implemented within her school. Frequency counts in each category were translated into percentages and presented in table format.

Research Question #2

How do prospective teachers engage in reflective activity when traditional reflective strategies are used during the curriculum-based, technology-enhanced field experiences under study?

Prospective teachers' written reflections were analyzed using qualitative analytic procedures (Rossman & Rallis, 1998). Traditional weekly reflections were

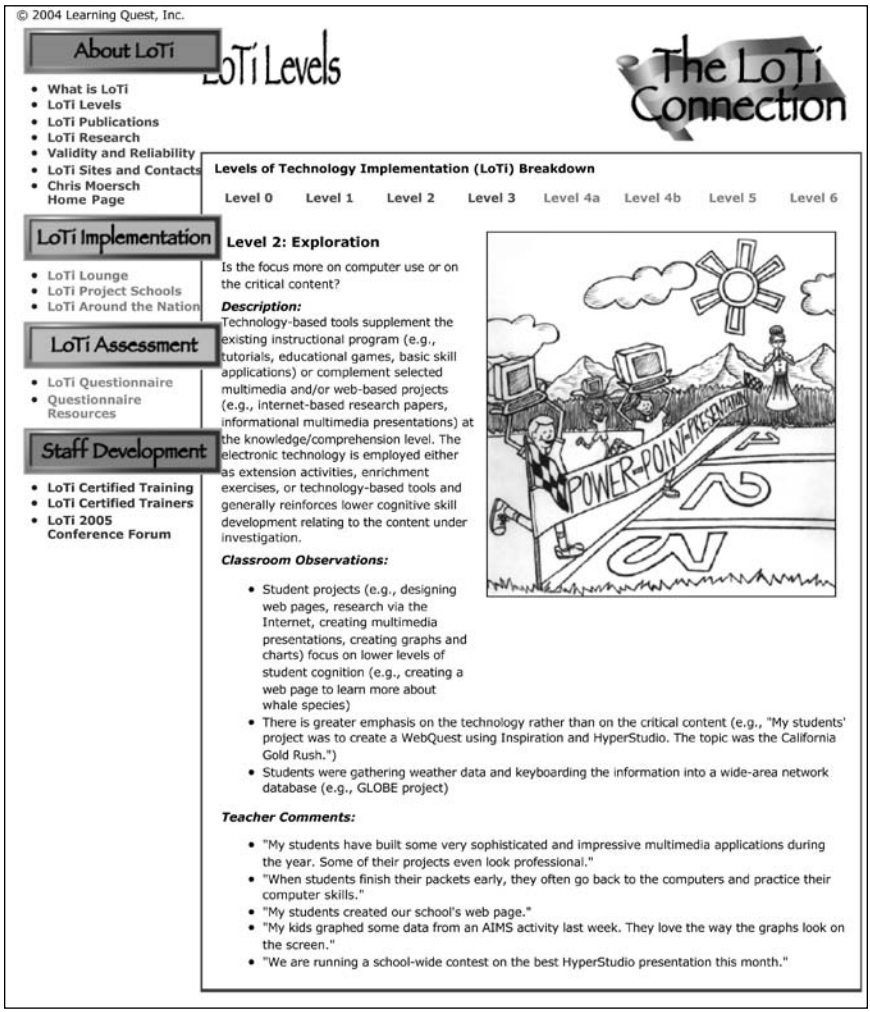

Figure 4. The LoTi Connection.

required during the first year of these experiences (2002). Traditional weekly reflections and three synthesis papers in which prospective teachers analyzed and synthesized weekly reflections were required the following year (2003). Data were first organized by students in chronological order and then read in their entirety two times to establish familiarity. 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. The four broad categories identified in the weekly reflections surfaced in 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) supporting (or disconfirming) each category. The four categories emerging from this process were triangulated using informal observations of and consultations with prospective teachers and informal conversations with school-based personnel assigned to support the field experiences.

Research Question #3

How do prospective teachers engage in reflective activity when the process of teacher inquiry is supported during the curriculum-based, technology-enhanced field experiences under study?

The primary data source was prospective teachers' final inquiry papers. Data were analyzed using qualitative analytic procedures (Rossman & Rallis, 1998) in ways similar to the methods associated with the second research question. First, each inquiry was read its entirety two times to establish familiarity. Then, the data were organized in a three-column table to make the data more manageable. Table 1 (page 274) shows two rows from this table. Next, themes within the inquiries were preliminarily identified and data from the table were coded initially. Finally, the data were read in their entirety again to extract salient "snippets and segments of data" (Rossman & Rallis, 1998, p. 180) supporting (or disconfirming) each category.

RESULTS

Question #1: What are the tangible results when prospective teachers participate in the curriculum-based, technology-enhanced field experiences under study?

Table 2 (page 275) provides a description of each LoTi level and a percentage-based breakdown of the uses exhibited by prospective teachers from January 2002 to May 2005.

Examples within the Awareness level included prospective and practicing teachers creating classroom Web pages to support home-school communication, compiling topic hotlists to promote further exploration of curricular topics, and using technology to support or record class plays on curricular topics such as

Table 1: Organization of Teacher Inquiry Data

Name	Wondering	Findings
Laura	What similarities and differences emerge when integrating hotlists, scavenger hunts and student-directed Internet searches into the curriculum?	*Teacher Goals and Lesson Objectives* -Internet strategies must be varied based on teacher goals and lesson objectives *Student Characteristics & Preferences* -Internet strategies must be varied in order to meet the individual needs of each student -Student motivation and on task behavior increase when Internet strategies match their personal preferences. *Skills* -Internet search strategies vary in the skills they require of students. *Safety* -Internet strategies range in the amount of safety they provide students -Teachers must be prepared with alternative lessons for students who cannot participate in Internet searches. *Time considerations* Time allotment is a factor in selecting the most effective Internet strategy Some strategies demand more skills of students than others and require teachers to spend time teaching these skills
Crystal	What happens to students learning experiences when they begin to use technology as a tool versus a toy?	*Time* The overall feeling gained from the students was specifically that through using the Internet for research their projects would be completed faster. *Collaboration* I found that the interactions by the students were promoted by the use of technology. *Student Learning* -The effectiveness of the learning is dependent upon the activity. As a tool, technology is most effective when technology assignments are geared toward the higher levels of Bloom's Taxonomy. -Technology can be used a motivator for learning. -Student responsibility, exploration and authentic learning were also increased through the use of technology. *Scaffolding* -Using technology created time and space for teachers to observe students learning and to work with students one-on-one. -Scaffolding provided students with a chance to share their progress toward completing the assignment at different phases with their teacher and prove their quality of work in a meaningful way. *Bias* There were three types of bias frequently noted: gender, at-home computer use, and language.

the Lewis and Clark expedition. Examples within the Exploration level included creating electronic books, brochures, and presentations, using knowledge hunts to conduct Internet-based research and implementing WebQuests that promoted lower-level thinking skills. Examples within the Infusion level included using WebQuests to promote higher-level thinking skills, using digital images to analyze data collected through science experiments, and using educational software in ways that supported higher-level thinking. Examples in the Integration

Table 2: 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 support students' 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%

(Routine) level included integrating technology into a project-based learning experience about bridge building and using technology to create a video-based documentary about the environmental importance of the plants and insects on a school campus.

Question #2: How do prospective teachers engage in reflective activity when traditional reflective strategies are used during the curriculum-based, technology-enhanced field experiences under study?

The four categories that emerged from analysis of prospective teachers' reflections were (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:

> 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 but there is no attempt to problem solve or to learn from the experience. The reflection is essentially a statement of frustration. On the other hand, Krystal is also experiencing frustrations with access but she thinks through the situation and finds a learning experience within it. Her reflection continues when she discusses how she plans to handle access issues in her own classroom. Although the synthesis papers tended to include reflections on how to address logistical issues, as evidenced in Krystal's quote, prospective teachers failed to consider these logistical issues within the context of the school or classroom culture and environment.

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, and 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 papers.

> 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 their 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.

Likewise, all prospective teachers expressed surprise with and concern about the diverse level of technical expertise found in one classroom. Although 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 reflected 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 do 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: All of the prospective teachers included thoughts about their inservice partners 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)

Table 3: Inquiry Steps

Step*	Description
Defining a wondering	Prospective teachers identify a burning question, concern, or wondering that arises from participation in curriculum-based, technology-enhanced field experiences. The wondering is often described to prospective teachers as a passion or something about which they lay awake at night thinking. They describe their wondering and how it came about.
Developing a plan to collect data	Prospective teachers are guided to develop a data collection plan that fits with what is going on in the classroom. Inquiry should integrate with classroom happenings rather than become separate from them. The goal is to help prospective teachers think about the multiple forms of data available to them in their classroom. One data collection strategy must be a literature search related to the wondering. Other data often includes student artifacts, test scores, journals, informal interviews, and rubric-type assessments.
Analyzing data	Prospective teachers are supported as they develop a plan for making sense of the data collected. They are encouraged to use systematic strategies that directly relate to the wondering.
Presenting findings	Prospective teachers present their findings (often in terms of themes, pattern, categories, assertion or metaphors) in written format and through a presentation at the annual Teaching, Inquiry, and Innovation Showcase, a regional event recently recognized as an exemplary practice by the Florida Association of Staff Development.

**Modified slightly from Dana & Silva (2003).*

Table 4: Schedule for Scaffolding the Inquiry Process

Date & Time	Topic	Assignment to be completed before class
Wed., Jan. 5 1:45 – 4:30 PM	Meet your partner Learn about Littlewood Syllabus	
Wed., Jan. 12 2:45 – 4:30 PM	Overview of technology integration in K–12 school Introduction to inquiry	Read Chapter 1: "Teacher inquiry defined"
Wed., Jan. 19 No meeting	Instructors and support personnel will be at Littlewood and available by appointments. They will also be visiting your classrooms during these weeks. Please take time to stop by to say "hello" or schedule an appointment if you need anything specific. FETC: Friday, January 28 ☺	
Wed., Jan. 26 No meeting		
Wed., Feb. 2 2:45 – 4:30 PM	FETC Proposal sharing What is a wondering? Identify potential wonderings	Curriculum-based, technology-enhanced proposals due (information appended to syllabus) Read Chapter 2: "The start of your journey: Finding a wondering"
Wed., Feb. 9 No meeting	Instructors and support personnel will be at Littlewood and available by appointments. They will also be visiting your classrooms during these weeks. Please take time to stop by to say "hello" or schedule an appointment if you need anything specific.	
Wed., Feb. 16 No meeting		
Wed., Feb. 23 2:45 – 4:30 PM	Share wonderings Plan inquiry	Wondering due Read Chapter 4: "Developing a research plan: Making inquiry a part of your teaching practice" Read pages 107–113 (Write-up Step 1) "Background information" for write-up due

Wed., Mar. 2	UF Spring Break: Enjoy! Attach your Time Spreadsheet to Kara before you leave.	
Wed., Mar. 9 No meeting	Instructors and support personnel will be at Littlewood and available by appointments. They will also be visiting your classrooms during these weeks. Please take time to stop by to say "hello" or schedule an appointment if you need anything specific.	
Wed., Mar. 16 No meeting	If you have questions about your inquiry project please schedule an appointment.	Read pages 113–117 (Write-up Step 2) "Design of Inquiry" for write-up due
Wed., Mar. 23 No meeting		Read Chapter 7 and note abstract examples provided Abstract for Teacher Showcase due via email
Wed., Mar. 30 No meeting	Instructors and support personnel will be at Littlewood and available by appointments. Please take time to stop by to say "hello" or schedule an appointment if you need anything.	
Wed., April. 6 Schedule an individual appt. to discuss your data	SBAC Spring Break Data Analysis (individual appt)	Read Chapter 5: "Finding your findings: Data Analysis" Read Write-up Step 3 (p. 117–135) *before* your appt. Bring data & analysis ideas to your meeting
Wed., Apr. 13 No meeting		Course evaluations will be in the Littlewood Media Center. Please stop by to complete this week "Stating the Learning…" (Step 3) due
Wed., Apr. 20 2:45 – 4:30	Practice inquiry presentations Final preparation for Curriculum Fair	Be prepared to give your inquiry presentation to your peers today Read Write-up Step 4 (p. 135–137)
Thurs. Apr. 21 Curriculum Fair	Evening (TBA)	Be prepared for Curriculum Fair
Sat., Apr. 23 9:00 – 12:15	Teacher Showcase at P.K. Younge	Be prepared to give your presentation and to learn from others
Wed., Apr. 27	All materials due	Products CD Audio Reflections Inquiry Write-up Time Spreadsheet

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.

Question #3: How do prospective teachers' engage in reflective activity when the process of teacher inquiry is supported during the curriculum-based, technology-enhanced field experiences under study?

Dissatisfaction with prospective teachers' reflective activity during the first two years of the experiences (2002 and 2003; See Results from Question #2) spurred me to try a different strategy. Teacher inquiry was used to promote reflective activity during the second two years of the field experiences (2004

Table 5: Focus of Prospective Teachers Inquiries (i.e., Wonderings)

Primary Focus	Student Name	Inquiry Title
Teaching	Jessica	What happens when a Webquest is integrated into a second grade curriculum?
	Laura	What similarities and differences emerge when integrating hotlists, scavenger hunts and student directed searches into the curriculum?
	Caran	Creative projects and accountability: A look at the integration of academic skills, technical skills, creativity, and empowerment issues in terms of assessment in the modern classroom.
	Leslie	What is the impact of technology when it is integrated in the curriculum and when it is not?
Students	Chris	What happens to students' learning experiences when they begin to use technology as a tool versus a toy?
	Laurel	What happens when third graders become teachers utilizing PowerPoint to instruct classmates about the solar system?
	Michael	What is the relationship between students creating their own Web-based activities and their learning of content?
	Mirka	Project-based learning: What do they really learn?
	Melissa	Technology and autism: How can technology support the communication skills of a first grade student with autism?
	Leila	How can cooperative groups with individuals of varying academic skill be supported by technology integration?
	Cycil	Can the implementation of basic technology improve reading comprehension?
Inservice Partner	Heather	Building blocks: The necessary elements for teachers to seamlessly integrate technology in their classroom.
School Culture	Jazmine	How can teachers facilitate a school's collective gaze at how technology can be advanced?

and 2005). Prospective teachers followed a series of recursive steps that helped guide them as they systematically and intentionally studied their own practice through teacher inquiry during these curriculum-based, technology-enhanced field experiences. (See Table 3.) A university course taught by a university professor and school-based colleague provided scaffolding throughout this process. (See Table 4, page 280, for the schedule for the 2005 course.) This course was taught in a local school, involved a high level of personal interactions with each prospective teacher, and included a required text, *The Reflective Educator's Guide to Classroom Practice: Learning to Teach and Teaching to Learn through Practitioner Inquiry* (Dana & Silva, 2003).

The focus of these inquiries paralleled the categories identified when traditional reflective strategies were used (See Results from Question 2): (1) Logistics, (2) Teaching, (3) Students, and (4) Inservice Partners. However, 11 of the 13 inquiries fell within the Teaching or Students categories. (See Table 5.)

Teaching: Prospective teachers explored many of the complexities associated with technology integration through their inquiries. 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. Her inquiry abstract synthesizes many of these points:

> 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.

Recognizing the complexities of teaching with technology through teacher inquiry also enabled prospective teachers to consider their beliefs about teaching and how technology fits within them. For example, Laura's inquiry related to the use of different Internet-based instructional strategies helped her move from seeing teaching as black and white to seeing it as gray. A portion of her inquiry reads

> While I had originally believed that my efforts would allow me to answer my wondering concerning the use of Internet strategies in the classroom, the inquiry process provided me with a different end. Rather than identifying the "perfect" Internet strategy, …I now understand that this is impossible as there is no one right Internet strategy to use in every situation.

These inquiries also gave prospective teachers an avenue for carefully considering the way they handled certain teaching situations and gave them a means to

alter it when appropriate. For example, Chris's inquiry about ensuring technology's use as a tool rather than a toy arose from the following scenario as reported in the introduction to her inquiry paper:

> The first questions I heard as we entered the computer lab were, "What game do we get to play?" and, "Is this free time?" My inexperience agreed to allow students to freely explore the Internet with only basic instructions and familiarity with an acceptable use policy. Before I knew it, almost every student had found a gaming site on the Internet and I'd lost my composure along with my control.

Students: When reflective activity was implemented within the framework of teacher inquiry, seven prospective teachers explicitly addressed student learning and all but two inquiries addressed it in either an implicit or explicit manner.

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 about body systems and their learning of the content, while Leslie studied the academic achievement of third 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 two 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.

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)

DISCUSSION

Prospective Teachers' Experiences

With few exceptions, the technology uses resulting from these field experiences epitomize incrementalist uses (Schofield, 1995). In fact, more than 70% of the uses analyzed in this study fell within Level 2 (Exploration) or Level 3 (Infusion). In other words, technology use did not bring about fundamental changes in instruction but instead either replaced, improved, or extended traditional instruction. Given what is known about the time (Hadley & Sheingold, 1993; Sheingold & Hadley, 1990), processes (Dexter, Anderson, & Becker, 1999; Ravitz, Becker & Wong, 2000), and conditions (Becker, 1994; O'Bannon & Judge, 2005) necessary for teachers to become effective technology-using teachers, this finding is disappointing but not surprising. Nonetheless, these experiences did enable prospective teachers to apply some of the content in 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)

These experiences also provided prospective teachers with authentic experiences on which to reflect. This is important given that prospective teachers "do not actually learn from experience as much as [they] learn from reflecting on experience" (Posner, 2005, p. 21).

Prospective Teachers' Reflective Activity

Data from reflections collected through traditional strategies (journaling and synthesis papers) revealed prospective teachers' reflective activity 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, prospective teachers 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 neither synthesized technology integration with the inherent complexities of teaching nor considered its influence on student learning.

Both of these shortcomings were countered when teacher inquiry was used as a tool to promote reflective activity, as evidenced by the results presented above. However, other limitations found with traditional reflective strategies (i.e., journaling and synthesis papers) such as inattention to contextual factors, shallow thought unaccompanied by action, and lack of sharing were also countered. Part of the inquiry process involves writing a thick-rich description of the educational context in which the inquiry occurs. This helped prospective teachers gain a different perspective on their experience. For example, Jazmine noted that the inquiry process "brought about opportunities [to build] relationships, to lay a new foundation for the positive support vital to integration of technology in a school culture, [and to] alter the collective focus on integrated technology."

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 practicing teachers, prospective teachers, K–12 administrators, teacher educators, and university-level administrators. In addition to the satisfaction that comes from being recognized as a professional, research suggests teachers who participate in professional activities are more likely to become effective technology-using educators (Becker & Riel, 1999).

MERGER OF EXPERIENCES AND REFLECTIVE ACTIVITY

It is important to consider both the experiences and reflective activities of prospective teachers participating in curriculum-based, technology-enhanced field experiences. After all, if prospective teachers merely "*do* [a] field experience without thinking deeply about it, if [they] merely allow [their] experiences to wash over [them] without savoring and examining them for their significance, then [their] growth will be greatly limited" (Posner, 2005, p. 21).

Shortcomings in prospective teachers' reflective activity during the first two years of these experiences spurred me to look for a different strategy to help prospective teachers merge experiences and reflective activity. For the past two years (2004 and 2005), teacher inquiry (Dana & Silva, 2003) has been used for this purpose. Evidence from these two years suggests teacher inquiry may be a vehicle to systematically and intentionally merge experience and reflective activity during curriculum-based, technology-enhanced field experiences. In addition, data suggest teacher inquiry may be a tool to focus prospective teachers on student

learning outcomes during such experiences. Moreover, teacher inquiry may support technology integration efforts on the higher end of the LoTi continuum. Technology integration activities categorized at highest levels of implementation during this four-year study (i.e., Level 3—Infusion and Level 4a—Integration [Routine]) were exclusively implemented by prospective teachers engaged in the process of teacher inquiry. Current research is exploring this phenomenon.

Merging experiences and reflective activity through teacher inquiry may even set the stage for prospective teachers to develop an inquiry stance toward teaching in which they are "well-versed in the constant posing of questions" about their practice (Dana & Silva, 2002, p. 85) as evidenced by these final thoughts from an inquiry paper:

> I have discovered that I have a passion for inquiry. Inquiry equals change and change equals growth. My Pastor tells us that if we are not growing spiritually then we are dead, because if something is alive it must grow. I am fearful of being dead, stale, and stagnant with my teaching. Inquiry gives educators the opportunity to pace their own growth and in unlimited areas of interest to avoid stagnation. (Jazmine, 2004, p. 24)

CONCLUSIONS

Despite the fact that teacher inquiry has been widely recognized in the general teacher education literature for more than 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 et al., 1999; Wellman, 2002), by university faculty to improve teacher education (Bhattacharya & Richards, 2001; Montgomery & Whiting, 2000; Radigan & Smith, 2003), 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 (Adamy, 2000; Borrás, 2000; Davis & Resta, 2002; Espinoza & Justice, 2003; Godfrey & Hansen, 2003; Hansen & Godfrey, 2003).

Yet, one of the most powerful uses of teacher inquiry rests 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 (Posner, 2005). It is a strategy that parallels many calls for educational technology research (Fouts, 2000; Pollard & Pollard, 2005) and, more important, 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 new 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" (Schrum, 2005, p. 217), teacher inquiry should be explored as a strategy to help prospective teachers in the process of learning to become effective technology-using teachers.

Contributor

Kara Dawson is an associate professor in the School of Teaching and Learning at the University of Florida. Her research intersects the fields of educational technology, teacher education, and online learning. She currently serves as program coordinator for educational technology and co-coordinator of online Masters and EdS programs in "Teaching, Learning, and Facilitating Change with Educational Technology." (Address: Kara Dawson, University of Florida, 2403 Norman Hall, PO Box 117048, Gainesville, FL 32611-7048; dawson@coe.ufl.edu.)

References

Adamy, P. (2000). Using computers to enhance action research. *Society for Information Technology and Teacher Education International Conference 2000*(1), 1672–1676.

American Council of Education. (1999). *To touch the future, transforming the way teachers are taught: An action agenda for college and university presidents*. Washington, DC.

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.

Becker, H. J., & Riel, M. M. (1999). Teacher professionalism and the emergence of constructivist-compatible pedagogies. Paper presented at the American Educational Research Assocation. [Online]. Available http://www.crito.uci.edu/TLC/findings/special_report2/index.htm

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 inservice K–12 school teachers. *Society for Information Technology and Teacher Education International Conference 1999*(1), 617–622.

Bransford, J. D., Brown, A. L., & Cocking, R. B. (1999). *How people learn: Brain, mind and experience*. Washington, DC: National Academy Press.

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

Casey, B. M., & Howson, P. (1993). Educating preservice teachers based on a problem-centered approach to teaching. *Journal of Teacher Education, 44(5),* 361–369.

Clark, R. W., Foster, A., & Mantle-Bromley, C. (2005). *Hybrid educators and the simultaneous renewal of schools and the education of educators*. Seattle, WA: Institution for Educational Inquiry.

Conant, J. B. (1963). *The education of American teachers.* New York: McGraw-Hill.

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.

Dawson, K., Pringle, R., & Adams, T. (2003). Providing links between technology integration, methods courses and traditional field experiences: Implementing a model of curriculum-based and technology-enhanced microteaching. *Journal of Computing in Teacher Education, 20(1),* 41–47.

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., Anderson, R. E., & Becker, H. J. (1999). Teachers' views of computers as catalysts for changes in their teaching practice. *Journal of Research on Computing in Education, 31(3),* 221–239.

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.

Feiman-Nemser, S. (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. *The Teachers College Record 103(6)*, 1013–1055.

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.

Glazewski, K., Brush, T., & Berg, K. (2002). Integrating technology into preservice teacher education: Comparing a field-based model with a traditional

approach. In *Proceedings of Society for Information Technology and Teacher Education International Conference 2002* (pp. 1968–1972). Norfolk, VA: AACE.

Godfrey, N., & Hansen, M. (2003). Technology as a resource for students' action tesearch 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.

Hadley, M., & Sheingold, K. (1993). Commonalities and distinctive patterns in teachers' integration of computers. *American Journal of Education, 101*, 281–315.

Hansen, M., & Godfrey, N. (2003). Technology and action research. *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2003*(1), 2932–2933.

Hernandez-Ramos, P., & Giancarlo, C. A. (2004). Situating teacher education: From university classroom to the "real" classroom. *Journal of Computing in Teacher Education, 20(3),* 121–128.

Henry, M. A. (1989). Change in teacher education: Focus on field experiences. In J. A. Braun (Ed.), *Reforming teacher education*. New York: Garland Publishing, Inc.

Hooper, S., & Rieber, L. P. (1995). Teaching with technology. In A. Ornstein (Ed.), *Teaching: Theory into practice*, (pp. 154–170). Neeham Heights, MA: Allyn & Bacon.

Itzkan, S. (1994). Assessing the future of telecomputing environments: Implications for instruction and administration. *The Computing Teacher, (22)4*, 60–64.

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.

Knezek, G. & Christensen, R. (2000). Refining best teaching practices for technology integration key instructional design strategies (KIDS). [Online]. Available: http://www.iittl.unt.edu/KIDS2000/

Knight, S. L., Pedersen, S., & Peters, W. (2004). Connecting the university with professional development school: Preservice teachers' attitudes toward the use of compressed video. *Journal of Technology and Teacher Education, 12(1),* 139–154.

Lave, J., Wenger, E., & Pea, R. (1991). *Situated learning: Legitimate peripheral participation (Learning in doing: Social, cognitive & computational perspectives).* New York: Cambridge University Press.

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.

Moersch, C. (n.d.) *The LoTi Connections.* [Online]. Available: http://www.loticonnection.com.

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.

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

National Council for Accreditation of Teacher Education. (2002). *NCATE: The standard of excellence in teacher education*. Retrieved March 25, 2002 from http://www.ncate.org.

O'Bannon, B., & Nonis, A. (2002). A field-based initiative for integrating technology in the content areas: Using a team approach to preparing preservice teachers to use technology. In *Proceedings of Society for Information Technology and Teacher Education International Conference 2002* (pp. 1394–1397). Norfolk, VA: AACE.

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.

Ravitz, J. L., Becker, H. J., & Wong, Y-T. (2000). *Constructivist compatible beliefs and practices among U.S. teachers. (Teaching, Learning & Computing Report 4.)* Irvine, CA: Center for Research on Information Technology and Organizations, University of California. [Online]. Available: http://www.crito.uci.edu/TLC/findings/report4/.

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

Ryan, T. (2003). *Take a field trip to the K–12 schools: A study of field experiences for instructional technology* [Online document]. Available: http://pages.towson.edu/pryan/field/.

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

Schmidt, D. A. (2001). *Simultaneous renewal in teacher education: Strategies for success.* Paper presented at the Society for Information Technology and Teacher Education, Orlando, FL.

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

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

Sheingold, K., & Hadley, M. (1990). *Accomplished teachers: Integrating computers into classroom practice*. New York: Center for Technology in Education, Bank Street College of Education.

Slick, G. A. (Ed.). (1995). *The field experience: Creating successful programs for new teachers*. Thousand Oaks, CA: Corwin Press, Inc.

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, DC.

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.

U.S. Department of Education. (1999). *Preparing tomorrow's teachers to use technology.* Retrieved February 15, 2001 from http://www.ed.gov/teachtech/.

Wellman, E. (2002). Towards a discipline based reflective thinking process for K–12 students and teachers through online discourse and action research. *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2002*(1), 2042–2047.

Yendol-Hoppey, D., Dawson, K., Dana, N., League, M., Jacobs, J., & Malik, D. (in press). Professional development communities: Vehicles for re-shaping field experiences to support school improvement. *Florida Journal of Teacher Education.*

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.