Instructional Technologist as a Coach: Impact of a Situated Professional Development Program on Teachers' Technology Use

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This article details a study that sought an alternative method to instruct public school teachers on how to integrate technology in their classrooms. Paired with a technology coach, nine teachers participated in this situated professional development technology program. Results from this technology coach program detail successful technology coaching approaches, activities, and skills, as well as the ability of this coach program to enable teachers to gain confidence in using technology in their classrooms. Details on how to best implement a technology coach or mentor program are recommended and a reexamination of instructional designer competencies is proposed.

Two groups of obstacles affect teachers' ability to adopt and integrate technology within schools, namely *external* (e.g., lack of equipment) and *internal* (e.g., lack of confidence) factors (Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Woods 1999). Originally proposed by Ann Thompson (e.g., Thompson, Schmidt, & Hadjiyianni, 1995), a technology coach program can be a possible solution in overcoming these barriers, particularly internal or affective domain factors. Recently, several studies (Cole, Simkins, & Penul, 2002; Kariuki, Franklin, & Duran, 2001; Polselli, 2002; Smith, 2000; Smith & O'Bannon, 1999; Sprague, Kopfman, & de Levante Dorsey, 1998; Swan,

Holmes, Vargas, Jennings, Meier, & Rubenfeld, 2002) have focused on the benefits of having a technology mentor or coach. Chuang, Thompson, and Schmidt (2003) also summarized and provided an overview of various faculty mentoring programs within higher education and public school settings. A technology coach[1], mentor, counselor, or a technology learning coordinator (Cole et al.) is assigned to a group of teachers to provide technology support and guidance. Similar to the concept of linking experienced teachers with novice teachers for professional development purposes (e.g., Anzul, 2000), a technology coach guides teachers in the use and integration of technology in their respective classrooms. These technology coaches take on an assortment of roles in this coach-teacher relationship, including "reviewer, director, monitor, facilitator, and evaluator" (Smith, 2000). Overall results from these studies indicated that an overwhelming number of teachers benefit from a technology coach program (e.g., Polselli, 2002).

Currently, public schools employ individuals, who provide technology assistance for teachers and school administrators. These individuals have an assortment of job titles, including technology facilitators, technology coordinators, technology specialists, and other similar titles. These individuals perform two main roles. One role is to troubleshoot problems with technological hardware and to resolve technical problems that the school may have. The other role focuses on supporting teachers and administrators in effectively instructing their students using an assortment of technologies. This latter role directly relates to a technology coach's activities and is the focus of this study. A "technology coach" role is found in various school districts across the nation. For example, North Carolina Department of Public Instruction's IMPACT Guidelines for Media and Technology programs recommend that:

> The school library media coordinator and the instructional technology facilitator work closely with teachers, administrators, students, and support personnel. All of these people must be involved in the planning, implementation, and evaluation of an instructional program infused with media and technology (North Carolina Department of Public Instruction, 2000).

A coach does not necessarily need to involve technology use. The key ingredient of a teacher-coach relationship is collaboration. In Boston Public Schools' coaching model, "the teacher(s), school leader, and coach engage, as colleagues, in a process of inquiry about how students learn and what are effective instructional practices that support student learning (Boston Public Schools, 2001). The role of a technology coach within a school district

increasingly has become a response to providing technology professional development for inservice teachers.

There is a definitive consensus that existing professional development programs need to be revised. Teachers reported that they attend professional development workshops and receive the necessary renewal credits, but the content of the workshops was not meeting their professional technology needs (Bradshaw, 2002). Mouza (2002) noted "traditional sit-and-get training sessions without follow-up support have not been effective in preparing teachers to integrate classroom technologies. Rather thoughtful and ongoing professional development programs are needed" (p. 273). Conventional one-day, inservice technology workshops (usually conducted during after school or during a teacher work day) are inadequate. To become effective, future workshops must concentrate on the long-term development of teachers (Bonk, Ehman, Hixon, & Yamagata-Lynch, 2002). Establishing a learning community (Stein, Smith, & Silver, 1999), encouraging teacher collaboration (Smylie, 1995), providing continual follow-up support within a teacher's classroom (Guskey, 1995; Marx, Freeman, Krajcik, & Blumenfeld, 1998), and developing a culture that embraces technology innovations (Liberman & Miller, 1991) all are proposed alternatives to this one-day, technology workshop format. As Caverly, Peterson and Mandeville (1997) advocated, we must not only *train* teachers about various technology skills, but *educate* these individuals about the integration of technology in their respective classrooms.

Situated Professional Development: Technology Coach Program

A technology coach program is a potential answer to these recent findings regarding professional developing technology integration in the public schools. Vannatta and Beyerbach (2000) reported "although a technology-specific course develops basic computer skills, it does not prepare educators to use technology in a variety of settings" (p. 132). In a survey of public school teachers conducted by the US Department of Education, only "approximately one-third of the teachers reported feeling well prepared or very well prepared to use computers and the Internet for classroom instruction" (Department of Education, 2000, p. viii). Though it is positive news that one-third of the teachers do feel confident, we must focus our attention on the two-thirds of the teachers, who do *not* feel confident in using computers and other technology tools in their instruction. Several researchers (e.g.,

Bradshaw, 2002; Swan, et al., 2002) have attributed this lack of preparation to the current status of professional development initiatives for technology. New models of professional development are needed to help ensure teachers' ability to use technology in a variety of settings and to express confidence in doing so.

Bradshaw (2002) observed, "The link between staff development and implementation is not automatic. Workshops and conferences, by themselves, do little to ensure that technology will be used in our schools and classrooms in ways that improve student learning" (p. 132). Thus, the goal is to create a transparent link between the content found in a staff development workshop and a teacher's classroom. Establishing a situated professional development program for teachers is a solution to form this link (Carney, 1998). Based upon on the concept of situated cognition (Brown, Collins, & Duguid, 1989), a situated professional development approach focuses on particular technology needs that teachers would like to learn and integrate in their classroom as opposed to dictating particular technology competencies that a teacher must exhibit and possess. Situated professional development advocates purport that "traditional professional development programs...are instructionist, application-driven" (Swan et al., p. 171). In contrast, situated learning experiences "ground teachers' learning experiences in their own practice" (Putnam & Borko, 2000, p. 6). Teachers can be trusted and can adopt a proactive role in professional development needs, particularly with regards to their technology needs. The goal of a situated professional development technology program is to serve teachers' *specific* technology needs within their *specific* environment (e.g., classroom).

PURPOSE OF STUDY

This study investigated the benefits of a technology coach program and whether this proposed program could be an effective professional development approach to educating teachers about technology integration. Originally funded through a *Technology Literacy Challenge Fund* grant, this technology coach program was implemented in five schools within a school district located in the southeastern region of the United States. Instead of concentrating on instructing teachers about a single application (such as Polselli's [2002] technology mentor program), this technology coach intervention was a "bottoms-up" approach in integrating technology in schools and is an example of a situated professional development approach. This study intended to examine the following issues about this proposed situated professional development technology coach program, namely: Impact on teachers'

technology skills and activities, projects, and roles of a technology coach. Results from this study and implications of a situated professional development technology coach program on educating instructional technologists are found in the following sections.

METHOD

Technology Coach Project

To explore the role of a technology coach, I first conducted a pilot study involving a single coach during the school year, 2000-2001. Five high school teachers participated in this pilot study for six weeks. To continue these efforts, the technology coach program was expanded to include the original high school in the pilot study and four additional schools (two elementary school and two middle schools) in the same school district. This technology coach project adhered to the tenets of a situated professional development program. This program addressed the teachers' selected technology needs and focused on existing technology within each teacher's classroom environment.

Nine teachers participated in this study for a period of four months. To select these teachers, I applied Patton's (2002) purposeful sampling procedures through a preassessment survey. This survey assessed the skills and attitudes of the faculty at this high school. The goal was to select a heterogeneous group of teachers. To achieve this combination, I selected teachers based upon the following three factors: content area, experience with specific technologies (e.g., e-mail, World Wide Web, computer graphics Power-Point, etc.), and gender. Table 1 lists the selected teachers and their specific responses in the preassessment survey.

Participating Teachers

Six female teachers and three male teachers participated in this study. Their curricular areas were diverse and included subjects such as Science, Math, Exceptional Children, Social Studies, and other content areas (Table 1). Participating teachers had a variety of previous technology skills prior to working with a technology coach. Four of the nine teachers reported that they had no experience with the technologies listed on the preliminary survey. The rest of the teachers listed e-mail and/or Internet as technology skills already acquired. Each of the nine teachers worked on several projects

Table 1
Teachers' Survey Responses

Content area/ School level	Previous technology skills	Acquired technology skills & activity	Future goals & activities
Special Education (High)	None (*Survey*); Microsoft Works word processing	Internet searches; Spreadsheets; Computer maintenance; Listservs/discussion boards	Internet searching skills (*Some progress*); E-mail attachments (*Little progress*)
Science (High)	None (*Survey*); Attended past TI-83 workshops	Troubleshooting computers; Texas Instruments technology tools (i.e., calculator and probes); Web page; Grant proposal	TI-83 calculator probes and labs (*Some progress*)
2nd grade (Elementary)	None (*Survey*); She has had a lot of experience with computers. She has 12 computers in her classroom; Troubleshooting computers	Internet searches; Web page; Digital pictures and movies; Computer maintenance; WSFTP software	Incorporating online encyclopedias and word processing into curriculum (*Some progress*)
6th grade - Math (Middle)	E-mail (*Survey*); Accelerated Math; At the "baby level of technology"	STAR tests; Accelerated Math; Spreadsheets; Internet searches; Digital camera; Computer maintenance	Spreadsheets for student activities (*Some progress*); Integrating relevant web pages into curriculum(*Some progress*); Computer lab student project (*Little progress*)
Kindergarten (Elementary)	E-mail; Internet (*Survey*)	PowerPoint; Web page; Computer maintenance; Digital camera and movies	Web page development (*Little progress*); Digital camera (*Lots of progress*); Incorporating digital movies into PowerPoint and web pages (*Some progress*)
Social Studies (High)	E-mail; Internet (*Survey*); Has created own web pages	Web pages; Digital images and publishing; Internet searches; WS-FTP software	Videotapes & DVD's (*Little progress*); Online PowerPoint presentations (*Some progress*)
3rd grade (Elementary)	E-mail; Internet (*Survey*)	Accelerated Reader; Microsoft Office applications; Internet searches; "Time" simulations; Digital grade book; Technology integration; PowerPoint; Digital camera; Computer maintenance	Integrating technology into existing curriculum (*Lots of progress*)
5th grade (Elementary)	None (*Survey*); Was one of the first teachers to use computers (PRS-80) and programming	PowerPoint; Computer maintenance; Database; E-mail attachments	Developing additional PowerPoint "stories" (*Lots of progress*); Computer scanner (*No progress*)
Exceptional children (Elementary)	E-mail; Internet (*Survey*); Video; Comfortable in "creating classroom materials in the form of worksheets and student aids."	Web pages; Troubleshooting computers; Internet searches; Accelerated Reader; E-mail attachments; Digital camera and movies	Learn more about Dell computer (*Lots of progress*); Generally learning more about "new" technologies (*Some progress*)

with the technology coach. These projects ranged from computer mainte-nance tasks to creating web pages to technology integration strategies. The nine teachers proposed working on an assortment of future technology projects including learning how to use e-mail attachments, spreadsheets, web page development, online PowerPoint presentations and other similar projects. In a follow-up survey, teachers rated their own progress towards these initiatives that is found in Table 1.

Technology Coach

Tony[2], a recent Instructional Technology graduate and a previous mid-dle school History teacher, was the technology coach. The purpose of Tony's weekly coaching meetings was open-ended. No specific topic was predetermined and the individual teacher initiated the goals of the coaching meeting. Prior to these coach sessions, Tony was instructed to be "empathet-ic" to these teachers' needs and to not promote an established agenda of technology topics. In addition to these face-to-face meetings, Tony main-tained regular e-mail communications with some of the teachers. The pur-pose of these e-mails was to provide follow-up information and resources pertaining to weekly coaching sessions.

Data Collection Methods

Teachers and staff members who participated in the technology coach study completed three surveys. A two-page survey was administered at the beginning of the third month of the technology coach project that asked par-ticipants to assess the effectiveness of the project, so far. A six-page survey was administered after the end of the technology coach project. In this sur-vey, participants evaluated the overall effectiveness of this project and ranked each of their respective technology coach project. Another four-page survey was administered seven months after the completion of this technolo-gy coach project. The intent of this survey was to have participants reflect upon their experiences with the technology coach project. They also evaluat-ed the overall effectiveness of this project, ranked each of their respective technology coach projects and reported progress (if any) on learning and in-corporating new recent technologies in their classroom. The principals at the respective schools also completed surveys about their teachers and staff members' experiences with the technology coach project. The intent of these

surveys was to document the effectiveness of the technology coach project, as well as record the teachers' and staff members' technology coach experiences.

At the end of the project, technology coach participants also were interviewed for approximately 90 minutes. During this semi-structured interview, they commented on a variety of topics, including Tony's activities, current technology coach projects, inservice technology workshops, and future initiatives for the upcoming school year. Each interview was tape-recorded and transcribed.

Tony wrote weekly journal entries for each teacher and staff member. These journal entries summarized Tony's activities with the teachers, as well as his observations of the specific teacher's classroom activities. At the end of the study, Tony completed an extensive survey that reviewed his activities with each teacher and staff member and documented his respective accomplishments. We also collected existing documents relevant to the technology coach project. These documents included teachers' lesson plans, Tony's handouts, student projects, and other relevant materials.

Data Analysis

An adaptation of the constant comparison technique (Glaser & Strauss, 1967; Lincoln & Guba, 1985) was used to examine the various data (i.e., surveys, interviews, coach handouts and notes, lesson plans, and student projects) in this study. Using this method, I continually made a comparison of the data across data sources. Glaser and Strauss (1967), who originally defined this analysis technique, claimed that the constant comparative technique enables researchers to discover patterns in their data. These patterns emerge and become coded categories after several iterations of applying this technique. In this analysis, a typology or "core" categories were formed by continually comparing an observation or unit of data with another. Description of significant core categories is found in the Results section.

RESULTS

Of the 50 technology coach projects that the eight teachers[3] worked on, the teachers rated 94% of these projects as either "Effective" or "Very Effective." The three remaining technology projects were rated as "Undecided" on the projects' effectiveness. The 3rd grade teacher commented, "I would love to see this service extended to more teachers. It is the most

worthwhile service that I have been involved in. I learn exactly what I need." The 5th grade teacher noted that the technology coach project "has been very, very enlightening and very helpful and has opened a whole new avenue and a whole new world of learning for my students." All of the re- spondents believed the technology coach project should continue and be im- plemented in the future. The Kindergarten teacher concurred by stating, "ev- ery school should have a full-time coach! I feel much better and confident about creating projects." The principals also stated that the technology coach projects were either "Effective" or "Very Effective" with their respec- tive teachers. All of these principals thought the technology coach project should continue during the next school year.

Alternative to Inservice Technology Workshops

Another indicator of the success of this technology coach program was the considerable difference between this program and traditional, inservice technology workshops. One noticeable difference was the emphasis of hands-on training. The 5th grade teacher, who has taught for 32 years, noted:

> They [workshops and technology coach project] are miles apart. I was telling one of my co-workers this was really the most meaning- ful, most useful class I've had in computers and I have had a lot of them. But this one you're right here hands-on, right now and this is the way to go and the ideal thing.

Participants had the opportunity to focus on their own individual tech- nology needs, as opposed to attending a workshop that attempted to meet all of the participants' technology needs. The Social Studies teacher commented:

> Large groups—It's tough to do technology in large groups. If you end up everyone is at their own computer and someone up there is trying to explain how to do it, you've got somebody over here who knows everything, and somebody over here who knows nothing. The people who know how to do everything are joking and playing and they are not doing what they need to do. They are not helping people around them in some cases. In other cases they basically bring themselves over and do it for them. Usually I'm the one that ends up I get mine done and someone says can you come here. Yeah, sure. I go over and I end up doing it for them and in some cases there are things I don't hear that I would have if I would have just been having to take care of me instead of me and listen to the instructor and back and forth.

> Working one on one with [Tony] there hasn't been anybody else in-
> terfering with it, and I like that.

The Special Education teacher concurred. He remarked:

> The key thing of course is individuality. We had developed a relation-
> ship that made it very easy for me to say hey I'm really having trou-
> ble with this, and trouble with that, and go like to know more about
> this than that....

This technology coach not only concentrated on a teacher's individual
technology needs, but he also focused on the teacher's classroom and the
specific nuances associated with that particular environment. The 3rd grade
teacher noted:

> That is indeed the best probably in service workshop that you could
> do because it is so in key with what you need. I told [my principal], I
> said you know it so much more valuable than a workshop that you go
> and they teach you an overall curriculum because it's actually what I
> need in here. Because when you're in a group and you're being in-
> structed to 15 people it's just like a regular shop you go and you take
> your notes and you may have 17 questions about exactly what you're
> doing in your classroom and they are not addressed because it is an
> overall curriculum. When you have someone come in your individual
> room on your individual computer that is exposed to your grade level
> and the actual curriculum that you're using within your own class-
> room it's totally different. Your needs are directly met as opposed to
> [workshops].

Compared to a typical inservice technology workshop, this program ob-
viously made impact on teachers' perceptions of this technology coach pro-
gram.

Teachers' Approaches in Working with a Technology Coach

Three teachers (2nd grade teacher, 5th grade teacher, and Science teach-
er) focused on completing a single project with Tony. For each of these
teachers, Tony concentrated his efforts on assisting the teacher with their re-
spective project. Tony provided support to the 2nd grade teacher on develop-
ing a web page and he provided assistance to the 5th grade teacher on creat-
ing PowerPoint stories. Though he helped the Science teacher with various

maintenance tasks, the bulk of Tony's coach activity with the Science teacher focused on integrating TI-83 calculators and probes in the curriculum.

Tony offered support and encouragement throughout his interactions with each of the nine teachers. However this nurturing style was more evident with two of the participating teachers (Kindergarten and Special Education). The Kindergarten teacher mainly worked with Tony on two applications (i.e., PowerPoint and a web page). Evaluating her interactions with a technology coach, she noted, (I learned) "how not to be afraid of the computer." Her interactions with Tony were the main source of gaining this confidence. The Special Education teacher also gained confidence through his interactions with Tony. He noted, "I'm much more comfortable with Microsoft Works and for my limited faculties and needs, it [technology coach program] seemed adequate." The Special Education teacher's interactions with Tony made the teacher more secure with demonstrating new technology skills (i.e., e-mail, word processing, Internet searching, and spreadsheets).

Tony's interactions with the 3rd grade teacher and the Exceptional Children teacher focused on various instructional tools that were appropriate with the teacher's respective classroom. Tony and the 3rd grade teacher covered an assortment of technology tools, including Accelerated Reader, Microsoft Office applications, digital grade book, digital camera, and other similar tools (see Table 1 for a complete listing of the 3rd grade teacher's acquired skills). Eventually, the 3rd grade teacher and Tony discussed technology integration strategies. As she indicated on the follow-up survey (see Table 1), she made "lots of progress" on "integrating technology into existing curriculum." The Exceptional Children teacher also learned about an assortment of technology tools, including, web pages, troubleshooting computers, Accelerated Reader, e-mail attachments, and other technology tools. Her future goals focused on "learning more about [her] Dell computer and generally learning more about 'new' technologies."

The Social Studies teacher's primary interactions with Tony focused on learning how to use the school's newly acquired digitizing equipment and how to upload his existing web pages to the school district's web server. Compared to the other participating teachers, the Social Studies teacher can be considered a "maverick" or an "early adopter" of instructional technologies. None of the other teachers were even considering these "emerging" technologies.

Though her interactions with Tony focused on some technical skills (e.g., Excel) and two classroom projects, the 6th grade Math teacher was essentially on the "sidelines." During the technology coach sessions, she learned about spreadsheets, Accelerated Math, digital cameras, and other

technology tools. However, she never fully pursued using these technologies and integrating them in her classroom. The Math teacher purports that the main culprit of this inaction was time. She believed that it would have been more beneficial if the technology coach program could have started at the beginning of the year. She felt pressured to complete various end-of-the-school activities, including end-of-grade test preparation. On her follow-up survey, she noted that she purchased a computer for her home and made "some progress" in developing "spreadsheets for student activities" and "integrating relevant web pages into curriculum."

Ability to Overcome Affective Domain Obstacles

All of the teachers verbalized typical, physical obstacles that impeded their ability to utilize technology in their classroom, including money, equipment, and school facilities. In addition to these identified external obstacles, the participants also noted internal obstacles such as their ability to use technology in their classrooms. However, the technology coach program appeared to alleviate a majority of these concerns. There was almost unanimous consensus among technology coach participants about Tony's reassuring coaching style. When asked about the ideal technology coach skills, almost of all of the skills focused on affective domain skills. Some of these skills included: "listening to questions;" "friendly;" "can answer any question without making you feel dumb for asking it;" and "very patient." Though some of the statements included necessary computer skills and previous knowledge, it is apparent that an ideal technology coach doesn't need to possess technical skills as much that an ideal technology coach would need to possess "people skills." The 5th grade teacher noted: "He [Tony] was very patient with both myself and the students. He was very patient with us. He realized that I was not a computer genius. So he took me through it step by step."

The Exceptional children teacher also observed:

> Patience, he's got a lot of patience because I feel like sometimes you know I don't know how he does it. Knowledge, he knows what he's talking about, and sometimes people will as far as plain English some people would give you terms that you're thinking my gracious, you know, I've got to walk around with a dictionary, you know.

Not only does a technology coach need to be patient, but also to be empathetic. The Social Studies teacher noted a difference in how one "teaches" technology skills. He recalled:

I had mentioned the fact that I had gone to a couple of sites that are supposed to be telling you how to digitize your media and encode on a CD so it will play CD or a DVD player, and I can't hardly read anything. They are talking about all these different terms and phrases that I don't know what they mean, and I think that the technology coach needs to keep in mind who they are talking to and speak what that person understands.

The Science teacher also picked up on the empathetic theme and talking the "same language" as teachers. He stated:

He wasn't one of these "computer weenies" who talk down to you. He would talk on my level and understanding, and I could talk and he would understand what I was having problems with. You know that's a big thing. You know, you know could send a tech out here who is just really brilliant, but if he can't talk at a level where somebody can understand him or at least stand aside and let the person make their own mistakes, and then say okay do it this way. I've noticed with most people who know the computer really well, they have no patience with people with lesser experience. It's like "get out of the way. Let me do it."

However, it is not only a function of being able to describe technology terminology at laymen's (or teachers) level, but forming a relationship with individual teachers. The Special Education described this relationship: "He was easy to work with. I never felt like he was talking down to me. He would leave me a lot of options to try it myself. I felt that we were working on an adult level. He wasn't teacher and I wasn't student, you know. It was more of equalitarian relationship." This empathetic and supportive relationship, ability to have patience, and ability to describe technology terminology in a nonthreatening way are all factors in helping teachers overcoming affective domain barriers, such as lack of confidence.

Technology Coach Activities

As documented in Table 2, the technology coach performed a range of activities during his coaching meetings with teachers. These activities are classified into four main categories, namely, *Skills*, *Technical*, *Resources*, and *Projects*. Next is a description of these four groupings.

Skills: The participating teachers asked the technology coach to assist them with a variety of skills, including procedures, instruction, and Internet

searching. Tony supported all of the teachers with various, mundane, procedural tasks. For example, Tony registered the Special Education teacher's e-mail account and address or showed the 3rd grade teacher how to use her digital camera. Tony also developed instruction for seven of the nine teachers. He taught these teachers about a variety of topics and he usually provided this instruction as just-in time support. For a few of the teachers, Tony offered instruction on how to conduct effective Internet searches.

Technical: The technology coach also offered technical assistance for a majority of these teachers. Usually, these activities were not planned for a scheduled coach meeting. Tony provided this assistance on an "as needed" basis. For instance, at the beginning of a regularly scheduled meeting with the Exceptional Children's teacher, Tony found out about a "pressing need of a printer being looked at." Tony promptly fixed this problem and presented a successful resolution. Tony also offered advice to a majority of the teachers on how to maintain equipment in their classroom.

Resources: In addition to providing technical support, Tony created curricular materials for the teachers. He developed numerous handouts and resources for the teachers. These resources included a variety of topics, including spreadsheets, PowerPoint, technology integration materials, a MAC-PC translation table and other similar resources. Tony also served as a classroom resource for the Exceptional Children teacher. During one class period, he offered to take digital pictures of her students.

Projects: The technology coach collaborated with the teachers on developing curricular materials, as well as web pages for their respective classrooms. Tony also coauthored a grant with the Science teacher and discussed ways to integrate technology in the 3rd grade teacher's curriculum.

Technology Coach Projects

In examining the various technology coach projects, it appeared that a majority of the projects covered fairly basic technology competencies. Most of the skills revolved around skills such as Internet searches, creating PowerPoint presentations and web pages. Some of the projects involved learning how to use software packages such as Accelerated Reader and Math software, spreadsheets, and uploading files using WS-FTP software. A few projects involved multimedia software and tools, such as digital movies and simulations. Only the 3rd grade teacher expressed interest and started to integrate technology within her curriculum. Another teacher and the "maverick," Social Studies teacher also wanted to discuss emerging technologies. This lack of sophisticated technology projects is illustrated by the most popular

Table 2

Examples of Teacher-Coach Activity

Content area/ School level	Previous technology skills	Acquired technology skills & activity	Future goals & activities
Special Education (High)	None (*Survey*); Microsoft Works word processing	Internet searches; Spreadsheets; Computer maintenance; Listservs/discussion boards	Internet searching skills (*Some progress*); E-mail attachments (*Little progress*)
Science (High)	None (*Survey*); Attended past TI-83 workshops	Troubleshooting computers; Texas Instruments technology tools (i.e., calculator and probes); Web page; Grant proposal	TI-83 calculator probes and labs (*Some progress*)
2nd grade (Elementary)	None (*Survey*); She has had a lot of experience with computers. She has 12 computers in her classroom; Troubleshooting computers	Internet searches; Web page; Digital pictures and movies; Computer maintenance; WSFTP software	Incorporating online encyclopedias and word processing into curriculum (*Some progress*)
6th grade - Math (Middle)	E-mail (*Survey*); Accelerated Math; At the "baby level of technology"	STAR tests; Accelerated Math; Spreadsheets; Internet searches; Digital camera; Computer maintenance	Spreadsheets for student activities (*Some progress*); Integrating relevant web pages into curriculum(*Some progress*); Computer lab student project (*Little progress*)
Kindergarten (Elementary)	E-mail; Internet (*Survey*)	PowerPoint; Web page; Computer maintenance; Digital camera and movies	Web page development (*Little progress*); Digital camera (*Lots of progress*); Incorporating digital movies into PowerPoint and web pages (*Some progress*)
Social Studies (High)	E-mail; Internet (*Survey*); Has created own web pages	Web pages; Digital images and publishing; Internet searches; WS-FTP software	Videotapes & DVD's (*Little progress*); Online PowerPoint presentations (*Some progress*)
3rd grade (Elementary)	E-mail; Internet (*Survey*)	Accelerated Reader; Microsoft Office applications; Internet searches; "Time" simulations; Digital grade book; Technology integration; PowerPoint; Digital camera; Computer maintenance	Integrating technology into existing curriculum (*Lots of progress*)
5th grade (Elementary)	None (*Survey*); Was one of the first teachers to use computers (PRS-80) and programming	PowerPoint; Computer maintenance; Database; E-mail attachments	Developing additional PowerPoint "stories" (*Lots of progress*); Computer scanner (*No progress*)
Exceptional children (Elementary)	E-mail; Internet (*Survey*); Video; Comfortable in "creating classroom materials in the form of worksheets and student aids."	Web pages; Troubleshooting computers; Internet searches; Accelerated Reader; E-mail attachments; Digital camera and movies	Learn more about Dell computer (*Lots of progress*); Generally learning more about "new" technologies (*Some progress*)

Table 2 (continued)
Examples of Teacher-Coach Activity

Teacher and examples of corresponding coach activity

Exceptional children

- *Skills* – "I explained and demonstrated the choices of editing, positioning and playing the movies."

- *Resources* – "I also gave, described and discussed a resource disk of very high quality resources that showcased award winning classroom sites and FrontPage resource links."

- *Technical* – Showed how to clean teacher's printers and computers.

- *Projects* – We then discussed the [PowerPoint] presentation I am helping them create, it is to showcase the students and the activities they participate in her classroom. We worked side by side for over 25 minutes."

Science

- *Skills* – "We installed and created shortcuts for easy use in his third period class studying the periodic table."

- *Technical* – [Teacher] and I tried to assign class folders and files to collect student data as they used the software...."

- *Resources* – Created a web page for teacher to organize his teacher materials.

- *Projects* – "During this meeting time, [teacher] and I worked on a calculator experiment concerning Henry's Law that he planned to use in the class that same day."

Social Studies

- *Skills* – "After it was installed, I explained the FrontPage environment."

- *Technical* – Tony and teacher worked on getting information for web pages in order to set up FrontPage server space.

- *Resources* – "I produced a disk with FrontPage resource links and web page creation documents."

- *Projects* – "We talked of Dazzle, i-Movie and other capabilities and utilities of digitizing media" for possible future projects.

Special Education

- *Skills* – "I showed [teacher] the ability   to copy cell data and transfer it to other cells replacing the important data in a quick step."

- *Technical* – "I have provided [teacher] with a number of hard copies of the basic uses of Word, and the essentials of the Word environment and as such he had many questions and directions that we went over during this time."

- *Resources* – I accumulated 100 hyperlinks that [teacher] and I will sort to locate listservs, collaborations, and discussion boards in the areas of his professional interests.

coach project: a web page. Since the teachers proposed these technology coach projects, this gives insights into the types of technology projects that teachers are consciously interested in. Almost all of the participating teachers[4] had similar technology needs. It is apparent that a majority of teachers do not want to be trained about the latest and sophisticated instructional technologies, but need guidance on seemingly, commonplace technology skills (e.g., changing a printer's cartridge, creating a PowerPoint presentation, using a digital camera, etc.). These teachers may not be aware of the latest technologies (e.g., DVD's, virtual reality) or may possibly be interested in common technologies and equipment that serves an actual need in their respective classrooms.

Technology Coach Roles

This emphasis on basic technology needs is reflective in the roles that Tony played during his technology coach sessions. One of these roles hearkens back to a an audio-visual educator (Finn, 1996). This role includes conventional duties to assist public school teachers in integrating technology in their classroom. Tony assisted all of the participating teachers in procedural activity (e.g., registering a new e-mail account, finding a missing shortcut on a computer, formatting and editing scanned pictures, etc.). Though they are not "glamorous," audiovisual educator skills are necessary to provide teachers technical support and to teach them prerequisite skills to implementing specific technology applications.

Tony also assumed the role of the current definition of an instructional technologist. These competencies are fully described in Richey, Fields, and Foxon's (2001) book on instructional design competencies and found in Instructional Design and Technology graduate program curriculums. These skills included instructional design, needs analysis, media selection, etc. Tony utilized and implemented these skills with a majority of the teachers in completing their respective projects, providing necessary curricular support and instructing teachers about various technology applications (e.g., spreadsheets, PowerPoint, web page design, etc.).

For most of the participating teachers, Tony provided "just-in-time" information throughout his interactions with the technology coach participants. Several times, teachers presented him with unexpected computer maintenance tasks during their coaching sessions. He was expected to fix the problem and to provide immediate technical assistance. At times, Tony anticipated potential technical problems and provided the respective teachers

with technical support resources. The teachers admired Tony's "just-in time" skills and gave credence to having a technology coach. The Special Education teacher remarked: "I really found him very beneficial and indeed he did bail me out." One of his students' was unable to locate her word-processing file. Tony debugged this situation. The Special Education teacher noted: "it was definitely a rescue operation."

Another important role that Tony played was the role of a collaborator. The technology coach and teacher relationship was not hierarchical, but more equalitarian. His interactions with the Science teacher and 3rd grade teacher exemplified this role. The Science teacher noted, "From the things that I didn't know, we sat down and kind of learned together" and the 3rd grade teacher concurred, by stating, "I mean we did it together. He did not just come in and do it we did it together." Tony also played the similar role of a *cheerleader* for those *Encouragement* teachers (i.e., Special Education teacher and Kindergarten teacher), who need a technology confidence boost. This collaborator role enabled teachers to complete their individual projects, as well as receive curricular support.

To be an effective technology coach, Tony had to interpret the particular teacher's needs and context. With this interpretation, he needed to exhibit a particular roles (e.g., collaborator, audiovisual educator) or a combination of these roles. When asked about what he learned from his technology coaching experience, he commented, "I also learned that research and the complexities of professional development are based on choices not on skill levels or depth of the integration of technology into the teaching/learning environment." Depending of a teacher's "choice" and particular current need, a coach must be able to blend his skill set and propose an appropriate intervention. Kariuki, Franklin, and Duran (2001) and Cole, Simkins, and Penul (2002) also observed that a technology coach must be flexible to be successful.

DISCUSSION AND IMPLICATIONS

Does every teacher need a technology coach? This technology coach model appears to be more appropriate for certain teachers, as opposed to other teachers. Some innovative teachers, who already have specific technology skills, may not necessarily need to have an assigned technology coach. On the other hand, a technology coach may be a remedy for those teachers who are initially reluctant and skeptical to adopt new technologies in their classroom. They need the extra confidence boost and cajoling from their technology coach to feel confident to start using the particular technology. They are not ready to learn the necessary skills; they need to have empathetic patience from the particular technology coach to proceed.

The Special Education teacher's experience in the technology coach program is an excellent example of an initially, reluctant teacher. His participation in this program illustrates his growing confidence in his technology skills. Though he was reluctant, the Special Education teacher agreed to participate in the technology coach project with Tony. The Special Education teacher commented on his reluctance. He stated, "my major concern was time expenditure and whether there would be a payoff. I guess that's mostly why I have some reservation." After his first meeting with the Special Education teacher, Tony also noted:

> [The Special Education teacher] was interested in my role and wondered if I could help with his new e-mail account. I said I would and then we discussed his desires for our time spent together. He explained that others have always aided him in technology tools. His experience is limited to word processing via Microsoft Works and has had recent difficulty with Microsoft Word in creating documents.

Apparently, the Special Education teacher had limited technology skills and relied on others to aid him. However, there appeared to be a transformation during the four-month period. Reflecting on his experiences, the Special Education teacher observed:

> I'm much more comfortable with Microsoft Works and for my limited faculties and needs, it seemed adequate. But I really do want to be more literate in Word, and I do have it loaded at home. I think that a lot of the confidence that I acquired in our meetings really helped me to do a lot of events, technical stuff. One of the things that when I tried to get into the Internet on this new computer, it said that, it did not recognize a modem. I tried all sorts of ways to get around that, and I knew it had a modem because it had a jack for an internal modem. I knew there had to be one lurking in there somewhere. Finally in rummaging in a drawer that all their things in it I found a restoration disk. And some of my reading through manuals and "How To" books, I found that a restoration disk might work. But when I got the CD to the disk restoration in there were both software and hardware sections, and you could pick just the sections that you wanted to reinstall. Indeed there was in the hardware thing a modem section, and I just hit that and followed directions, and sure enough I had a wonderful modem at 56K. So it's that kind of thing that I've been doing. I don't think I would have tackled those kinds of things. I would have waited until the husband of this computer owner found his way [to my classroom] and do it for me.

Participating in a technology coach program and developing an effective relationship with a technology coach can help these teachers to overcome this type of obstacles. In summarizing her experience with the technology coach program, the Kindergarten teacher stated:

> I feel that by having been a part of this program, I am able to better use the computers in my room. By having someone who could take me through the process of, for example, creating a PowerPoint presentation step-by-step, repeating steps if necessary, and answering questions. I may have been hesitant to ask in a group; I was really able to understand and learn. I think many teachers would feel more comfortable with computers if they had the chance to work one-on-one with a "coach."

However, this relationship with a technology coach was not the case with the "maverick," Social Studies teacher. Though the Social Studies teacher was supportive of a technology coach and stated that he would use a technology coach in the future, he remarked:

> At this point I don't think [Tony] has pushed me to do anything new. But then again I don't know a whole lot you can do with a traditional classroom past having the kids do a web page, digital photography, or upgrade pictures of themselves. I'm sure he would make that easier for me to do, but, I don't think that it's something I wouldn't have gotten to eventually without him, and the reason for that I think is because I have always kind of been looking for different/new ways to do something.

These teachers' experiences with a technology coach point to the fact that a teacher-coach relationship will be unique to each teacher. Working with a technology coach appeared to help those reluctant and skeptical teachers overcome obstacles in learning instructional technologies and who may need a technology confidence boost. However, a technology coach program does not seem to be a universal remedy for all teachers. More future research on technology coach programs should focus on initially, reluctant and skeptical teachers towards technology, as well as what Rogers (1995) labels as resistant, "laggard" teachers.

Situated professional development for technology training appears to be an excellent alternative to traditional, inservice technology workshops. Each of the respondents mentioned the value of being trained on his or her particular classroom technologies, as well as being able to ask specific questions. Technology training that directly corresponds to teachers' contextualized environment is the key to promoting effective technology integration. Cole,

Simkins, and Penul (2002) concurred, by noting, "onsite [training] is best" (p. 443). Situated professional development also supports and advocates teachers' autonomy in making their own technology decisions. This authority breeds self-confidence. The role of technology coach is to support and maintain teachers' confidence in learning and using new technologies. Thus, situated professional development not only focuses on situated cognition, but also endorses the importance of understanding teachers' particular cognitive and affective relationship to technology. As exemplified with the participating teachers' experience and approach with Tony, new cognitive information about a particular technology or equipment only is part of the equation to successful technology integration. Developing an affective relationship with teachers appears to be the remaining component of this technology integration puzzle. The experience of the two "Encouragement" teachers (Special Education and Kindergarten) provides evidence of the importance of this relationship, as well as the Science teacher's experience. In describing his experience with Tony, the Science teacher notes that they "learned together" during assigned coaching sessions. I would term this phenomenon as "situated affection" or "situated empathy."

To train future instructional technologists or future technology coaches to collaborate with public school teachers, we should consider reexamining our respective instructional design curricula and competencies. Since teachers' beliefs appear to be a critical factor in effective technology adoption and integration process (Ertmer, et al., 1999), instructional technologists need to assume a new set of "situated empathy" skills. These skills would be geared towards facilitating positive beliefs towards current and emerging technologies among educators. Instructional technologists need to espouse a technology coach's motto: *be empathetic and responsive*. Current instructional design and technology programs should evaluate how well they prepare their graduates to follow this empathetic and responsive motto. Quite possibly, these programs can observe how school counseling graduate programs (e.g., Schmidt, 1999) prepare their graduates and adopt their existing teaching practices. In addition to this assessment, current instructional design competencies should be evaluated to see if additional "situated empathy" competencies should be adopted or not.

CONCLUSION

Individualistic inservice technology training and situated professional development for teachers are essential factors for successful technology integration. If we are going to train teachers to effectively use technology in

their classroom, it is imperative that this training is focused on the individual teacher's technology skills and classroom environment. It not only should address teacher's technology skills, but also their confidence (or lack of) in using these technology skills. A technology coach or mentor program can provide this individualistic attention and apparently can be successful in helping teachers overcome initial obstacles in learning these technologies. This individualized relationship between coach and teachers also examines the overall role of an instructional technologist. Based upon the results of this study and other similar studies, not only must instructional technologists provide the proper amount of technology content and skills for teachers, but instructional technologists must provide an inviting, empathetic, and patient environment for teachers to learn and adopt new technologies. Without this set of affective domain skills, some teachers will remain reluctant and will still feel unprepared to integrate technology in their classrooms. Adopting this new set of skills into the instructional technology discipline is essential and encouraged.

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Acknowledgement

Notes

1. A "technology coach" and a "technology mentor" are synonymous. For this article, I use the term, "technology coach."
2. This is a pseudonym.
3. The Social Studies teacher did not complete this survey.
4. The Social Studies teacher was in the minority.