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ABSTRACT

A needs assessment that addressed teacher candidates, education faculty, and mentor teachers led to a funded initiative in the Preparing Tomorrow's Teachers in Technology (PT3) program. This PT3 Project established a Collaborative Community of Learners as the social context for K-12 mentor and student teachers and university faculty to plan, develop, and integrate technology-based projects to enhance classroom instruction. The Community included project support staff who facilitated the creation of learning environments to support technology in meaningful ways. Support staff provided support, teaching, and resources as teachers acquired skills and developed understandings in the context of collaborative learning. This paper reviews the PT3 Project learning context, activities, support provided, and sources of data. Case studies were chosen as one form by which to represent the first year PT3 experiences and those of the teachers whom were supported. This paper discusses studies of first-year obstacles and successes which preserve the distinct flavor of each teacher's experiences expressed in their own voice. Across these studies, five common themes emerged: Affect, Community, Obstacles, Lessons Learned, and Thinking about Technology. Also elaborated are themes that did not emerge and implications for future research and professional development. (Contains 67 references.) (Author/MES)

"Here, I'm not afraid to admit what I don't know:" Case Stories from a Collaborative Community of Learners Preparing Teachers to Use Technology.

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"Here, I'm not afraid to admit what I don't know:" Case Stories from a Collaborative Community of Learners Preparing Teachers to Use Technology[1]

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Abstract: This PT3 Project established a Collaborative Community of Learners as the social context for K12 mentor and student teachers and University faculty to plan, develop, and integrate technology–based projects to enhance classroom instruction. The Community included project support staff who facilitated the creation of learning environments to support technology in meaningful ways. Support staff provided support, teaching, and resources as teachers acquired skills and developed understandings in the context of collaborative learning. This paper reviews the PT3 Project learning context, activities, support provided, and sources of data. Case Studies were chosen as one form by which to represent our first-year PT3 experiences and those of the teachers whom we supported. This paper discusses studies of first-year obstacles and successes which preserve the distinct flavor of each Teacher's experiences expressed in their own voice. Across these studies, five common themes emerged: Affect, Community, Obstacles, Lessons Learned, and Thinking about Technology. Also elaborated are themes that did not emerge and implications for future research and professional development.

At our institutions, teacher candidates send many messages about problems in integrating technologies during their professional development program. Common messages include: "I can't use technology because my mentor won't let me." "There is no one to help me." "I don't believe in using technology to teach." Teacher candidates need to experience integration of technology. They also need the opportunity to plan, enact, and reflect upon technology enhanced educational activities in their field placement classrooms. Ideally, teacher candidates' mentor teachers would model exemplary applications of technology tools to enhance and support student learning. At minimum, the mentor teachers would be prepared to support pre-service teachers who are eager to implement educational technology they have learned in their certification program. The collected comments of the teacher candidates indicate that at least some mentor teachers do not provide support and that there may be a need for professional development among mentor teachers in instructional technology.

A needs assessment that addressed teacher candidates, education faculty, and mentor teachers(Seels, 1999) led to a funded initiative in the Preparing Tomorrow's Teachers in Technology (PT3) program from the U.S. Department of Education (P342A00076)). Our PT3 program simultaneously addressed three areas of development: authentic integration of instructional technology into the teacher preparation program, improving the technology integration skills of university faculty, and improving the technology skills of the cooperating mentor teachers in the field. Central to our PT3 Program was the creation of a "Collaborative Community of Learners" (CCOL) forged from our participating membership - teacher candidates, university faculty, mentor teachers, and expert partners. The CCOL supports the integration of technology in teaching and learning.

Research about how teachers adopt technology and telecommunications and use it to enrich teaching and learning is ongoing (Sherry, Billig, Tavalin, & Gibson, 2000). At the same time, knowledge about how to support the emergence of professional learning communities is rudimentary (Wald & Castleberry, 2000). This paper tells the stories of the

mentor teachers in the PT3 Collaborative Community of Learners to illuminate essential elements of these processes.

Conceptual Framework

One major element in promoting the effective use of instructional technology is to find ways to support faculty and teachers as they change from information transmission models of teaching to constructivist models of instruction which stress students' transformation of ideas. Much of the theoretical grounding that underlies our program is reflected in the name we chose for the main thrust of our grant, "Collaborative Communities of Learners." The model, based on CEER (Soloway, Krajcik , Blumenfeld, & Marx, 1996), relies on cycles of collaboration, enactment, and reflection that extend over time. The theoretical foundation for the project includes a rationale for learning in social contexts and project work, a discussion of learning community theory in education, and literature on levels of technology integration in the curriculum.

Teachers, like their students, construct their knowledge by integrating new learning with prior knowledge and beliefs, applying ideas to practice, and evaluating and reflecting on the results (Brown, et al.,1989; Fenstermacher & Richardson, 1993; Hargreaves & Fullan, 1992; Jenlink & Kinnucan-Welsch, 2001; Lampert & Ball, 1990; McCotter, 2001; Prawat, 1992; Sarason, 1993; Soloway, Krajcik, et al., 1996). Learning advances through collaborative social interaction and the social construction of knowledge (Brown, Collins, & Duguid, 1989). Understanding is facilitated when educators collaborate and when they work on authentic problems in a manner that requires them to justify their practices in light of emerging understandings of theory (Fenstermacher & Richardson, 1993). Social collaboration then was seen as essential to the success of the grant as educators at each of the partner institutions sought to use instructional technology in their teaching.

The Collaborative Community of Learners (CCOL) provides the social context where teacher-learners interact with modes of knowing and thinking represented and practiced in a community, and draw on other group members' expertise. Educational literature is full of references to community, including "community of learners" (Brown, Ash, Rutherford, Nakagawa, Gordon, & Campione, 1993; Brown & Campione, 1994; Crawford, 1996; ACOT, 1999) , "community of practice"(Palincsar, Magnusson, Marano, Ford, & Brown, 1998; Roup, Gal, Drayton, & Pfister, 1992), "community of professionals" (Seels & Richey, 1994) and "professional learning community" (Dufour & Eaker, 1998; Hord, 1997; Morrissey, 2000; Sarason, 1996; Sergiovanni, 1994; Wald & Castleberry, 2000). A learning community is a collaborative where participants contribute equally, exhibit parity, and focus on continual reflection and inquiry (Hord, 1997). According to Apple Classrooms of Tomorrow (ACOT, 1999), a community of learners consisting of mentor teachers, faculty, integration experts, and content area specialists provides the best opportunities for pre-service teachers and for K-12 students to learn in environments that include technology in meaningful ways.

The term "learner" in our Collaborative Community of Learners was chosen intentionally over that of "practice" or "professional" for several reasons. First, "learning" suggests ongoing action and perpetual curiosity (Dufour & Eaker, 1998). In addition, "learner" indicates that each member of the collaborative, i.e., student teacher, faculty member, mentor teacher, school administrator, expert partner is in the position of both learning *with* and learning *from* other members of the community (Sergiovanni, 1994). Morrissey (2000, p. 3) claims, "teacher learning is more complex, deeper, and more fruitful in a social setting, where the participants can interact, test their ideas, challenge their inferences and interpretations, and process new information with each other." Third,

"learner" communicates the need for ongoing, lifelong learning or professional development. Wald & Castleberry (2000) describe an emergent model of professional development...where learning becomes a way of life for educators as well as children.

Fenstermacher and Richardson (1993) have noted that knowledgeable others help to promote change. Hence, embedded in our notion of a collaborative community was Brown, Collins & Duguid's (1989) cognitive apprenticeship approach. Cognitive apprenticeships enculturate learners into authentic practices through activity and social interaction (Brown et al. 1989). The cognitive apprenticeship approach suggests the paradigm of situated modeling, coaching, and fading whereby teachers (viz. project staff) promote learning, first by making explicit their tacit knowledge or by modeling their strategies for learners in authentic activity. Then, teachers and colleagues support learners' attempts at doing the task. Finally they empower the learners to continue independently.

In our CCOL, more expert users of instructional technology shared their knowledge and modeled their strategies for the other learners. Each learner then selected a project to complete during the school year. CCOL members that have more expertise in that form of instructional technology help the learner plan the project, acquire the necessary skills to complete the technology component, and coach the learner through classroom implementation.

The types of instructional technology promoted in our PT3 CCOLs were based on the models presented in National Educational Technology Standards for Students (ISTE, 2000a) and Teachers (ISTE, 2000b). Technology integration was judged by the "stages of instructional evolution" from the Apple Classrooms of Tomorrow program (Sandholtz, Rinstaff, & Dwyer, 1997) and the "Stages of Progress" from the Milken Exchange on Education Technology (Coughlin & Lemke, 1999). At the entry stage, educators and learners are aware of the possibilities, yet learning and teaching remain relatively unchanged by technology (Coughlin & Lemke, 1999). At the adaptation stage, technology in thoroughly integrated into the classroom in support of existing practice. When technology becomes a catalyst for significant changes in learning practice and new learning opportunities are possible through the creative application of technology, the transformation stage has been reached (Coughlin & Lemke, 1999).

Reflection was a critical component of professional development in this context. As Mattingly (1991, p. 237) notes, "Experience is obviously an inconstant teacher; it is perfectly possible to live through something and not learn much as a result." For change in beliefs and knowledge to occur, educators must try complex innovations in their classrooms and reflect upon the outcomes before they understand their full implications. Essentially, knowledge about teaching is embedded in the act of teaching (Schön 1987; Marx et al., 1994; Soloway et al., 1996). Reflection through journaling and through narrative helps teachers extract from the experience the knowledge that leads to improved practice (Beattie, 1995; Dewey, 1933; Knowles & Holt-Reynolds, 1991; Mattingly, 1991; Schön, 1987; Zulich, Bean, & Herrick, 1992).

The descriptions of PT3 participants' experiences in their journaling and their story telling within the community revealed aspects of the PT3 project that were not otherwise readily assessable. These stories led to a decision to represent the PT3 experiences in the form of "Case Stories". Case stories are a relatively new genre of qualitative research combines the imagery and contextual richness of narratives with the discipline of case creation (Jenlink & Kinnucan-Welsch, 2001). Examples of narrative studies and the methods used to construct the narrative text are widely found in the educational research literature (Barone, 1995; Beattie, 1995; Carter, 1993; Casey, 1995-96; Ceglowski, 1997; Clandinin & Connelly, 1986; Connelly & Clandinin, 1990; Mitchell, 1981; Phillips, 1997;

Richardson, 1994). Case studies and their methods of development from triangulating data are likewise well documented (Briscoe, 1991; Caracelli & Greene, 1993; Cohen, 1990; Eisenhart, Borko, Underhill, Brown, Jones, & Agard, 1993; Hunsaker & Johnston, 1992; Lacey & Merseth, 1993; Lampert, 1985; Shaw & Etchberger, 1993; Smith & Anderson, 1984; Spector, 1984; Tobin & Fraser, 1990). In general, case studies are the preferred strategy when how or why questions are being posed, when the investigator has little control over events, or when the focus is on a contemporary phenomenon within some real-life context (Yin, 1994). Case studies draw upon both narrative and case study frameworks to develop evolving descriptions of the experiences of the members and their reflections on those experiences. The different components of this PT3@pitt project that support collaboration, community, learning and reflection are elaborated in the next section.

The PT3@pitt Project Context.

The PT3@pitt project context included the many partners and participants in the grant, the types of project activities that were offered, and the types of supports that were made available.

Partners

The PT3@pitt Collaborative Community of Learners (CCOL) included teacher candidates, university faculty, mentor teachers, and expert partners in a consortium of 14 partner institutions (university, public school districts, private schools, non-profit and corporate partners) to support effective uses of technology.

The university partner is a large, urban research university in the Ohio River Basin. The teacher certification program in the School of Education is an intensive comprehensive post baccalaureate program committed to preparing teachers for K-12 education including certifications in early childhood education, elementary and secondary education, foreign language education, special education, and reading specialist. Three hundred candidates are accepted into the program annually.

The certification programs are heavily field-based, with extended, comprehensive field placements and strong collaborations in 29 school districts in the greater metropolitan area. The School of Education partners with the City's Public Schools to prepare cohorts of new teachers committed to the complexities and challenges of urban education and to work in diverse and inclusive settings. Partner districts in the PT3 grant include the City's Public Schools, six suburban districts, a private laboratory school affiliated with the university, and a school for deaf students. The school districts span the range of economic affluence and technology readiness, including one of the state's digital districts.

Teachers from these schools were recruited based on their interest in mentoring teacher candidates from local universities and interest in improving technology integration in their classroom instruction. A few were "volunteered" by their administrators. During the capacity building year of the grant (1999-2000) nine teachers from three city schools (elementary, middle and high) were involved in a small learning community with university faculty members. During the 2000-2001 school year, 106 teachers from 11 local educational agencies joined the Collaborative Community of Learners at PT3. Fourteen of these teachers were mentoring teacher candidates at the time while 75% of the teachers are on the mentor list. However they came to PT3, the teacher-learners were engaged in a number of different activities as described in the next section.

Activities

The PT3@pitt project sponsored a number of different activities to support teachers in integrating technology in their classrooms and in developing a Collaborative Community of Learners. These activities include: Summer Camp, CCOL meetings, skill workshops, projects, and Summer Celebration. Each of these activities is elaborated upon in the following paragraphs.

The PT3 CCOL was initiated during "summer camp" experiences. Summer camp was held for three days on campus. During camp participants were oriented to the PT3 program, participated in several get acquainted exercises, selected technology workshops to attend, collaborated in professional development exercises such as the *"Diffusion of innovations in education simulation"* (UCIDT, 1970), and *"Who moved my cheese?"* (Johnson, 1998), and started to plan a technology project for the coming year. Camp participants all received PT3 shirts. At least two sessions of Summer Camp were held during July and a make-up camp session was held in conjunction with the first CCOL meeting of the fall.

During the 2000-2001 school year, PT3 reconvened the CCOL for monthly meetings. Participants could select to attend either a school night meeting or a Saturday morning meeting. Each monthly meeting opened with a welcome and sharing opportunity. Most meetings then used breakout sessions to address technology integration, innovations, or specific skills. Each meeting included 3 hours of professional development plus an additional 30 minutes for refreshments and socializing/networking. For example, the November 2000 CCOL included a whole group introductions and project sharing time, and a PowerPoint presentation on constructivist classrooms and technology. Then participants elected one break session which included: basic desktop experience; compacting files, storage & hardware; Netscape Composer for beginners; Microsoft Front Page for those with some web page design experiences; and VMRL & Virtual Reality. At the end of the meeting, members were reconvened in the main meeting room for journaling, meeting evaluations and other paperwork.

In addition to the monthly meetings, PT3 sponsored more than 50 technology workshops throughout the year. These workshops generally focused on a specific software application (e.g. Microsoft® Word or PowerPoint, Inspiration®, HyperStudio®) or type of technology (e.g. digital cameras, scanning images and text, using the Internet). Workshops generally were one and a half to two hours in duration scheduled for evenings and weekends, offered at beginning, intermediate and advanced levels, and available on MAC or PC platforms.

Participants in PT3 were asked to select, plan, implement, reflect upon, and present a technology project over the course of the school year. Project requirements were deliberately left vague so participants could design projects that met their needs and interests. There were two basic requirements; the project had to involve a technology that was new to the participant, and the project had to be connected to teaching and/or learning. Examples of projects during the 2000-2001 school year include: school web sites, course web sites, video yearbooks and HyperStudio stacks.

At the end of the school year, each participant (or team of participants) was required to make a 20-minute presentation of their project at the end of year Summer Celebration. Each participant was given presentation guidelines that included suggestions for sharing the successes and obstacles they faced during the development of their projects. The Summer Celebration spanned two days with three to four presentations occurring simultaneously in

different rooms. School administrators were also invited to attend in order to become aware of the progress and confidence gained by individual teachers.

Support

PT3 On-Site Support Staff (OS^3 or CUBEs) met with CCOL members between the monthly meetings in their classrooms, laboratories, and/or offices. CUBEs are a diverse and complementary group comprised of undergraduate and graduate students in education, instructional design and information science, former teachers, school administrators, and trained technology specialists. Individual CUBEs have various levels of technological skill and interests. CUBEs are assigned to work with specific teachers in individual schools; frequently CUBEs work together when one CUBE has the technology knowledge and skills that are needed in a specific school environment.

CUBEs provide training and support and facilitate school level community building. Often the on-site meetings focus on specific skill acquisitions, and CUBEs conduct workshops and practice application sessions. CUBEs support teachers in the development of plans and organization for their projects and classroom integration. CUBEs also meet with school administration in liaison roles and keep administrators up-to-date on the progress and changing needs of teachers.

Learners in the PT3 CCOL also have access to an online technology support environment (http://dil.sched.pitt.edu/pt3/). This website provides information to the general public about the grant, recommended technology resources, workshop handouts, and the calendar of activities. Members of the CCOL can log into the site and access a searchable directory of participants, discussion board, survey instruments, mini-grant applications, and an on-line journaling environment. Members can also post technology recommendations that then appear on the resources page.

Data Sources and Analysis

The case stories (Jenlink & Kinnucan-Welsch, 2001) were constructed from case materials (Shulman, 1992), capturing the imagery and contextual richness of narratives with qualitative and quantitative date used to develop the more disciplined, or case study, part of the case stories. The materials used in the construction of these case stories included: members' journals, members' written narratives, staff journals, field notes and observations, surveys of technology skills and usage, teachers beliefs and attitudes about instructional technology, preferences and interests for PT3 activities; feedback and evaluation forms from CCOL meetings and workshops, and videotapes of members' presentations at the Summer Celebration (Table 1).

A matrix was created to represent the different grade levels of participants in the PT3 CCOL and the levels of technology integration they demonstrated in their projects(Table 1). The matrix was used for purposeful sampling to select (pursue if necessary) and direct the development of the members' case stories to ensure a range of experiences.

Table 1: Matrix of developing case stories. Highlighted names are case stories profiled in this paper.

Integration Level PT3 Participant	Entry	Adaption	Transformation
K-2 Primary	Jacquelin S; **Lily W,**	Jana S.;Emily B	
3-5 Elementary	**Karen B**, Barry B,		
6-8 Middle School	**Derek K, Dee K,**	**Clare B**	
9-12 High School	Lola A. Juanita H.	Bertha D	
Other Educators: Librarians, Tech coordinators, etc.	Jennifer S , Bonnie B	Hannah K	

Below is a description of each data source and how it was used in constructing the case stories.

Narratives

During Summer Camp 2001, year-one participants were invited to write their PT3 stories to share with other PT3 programs as part of the project's commitment to dissemination. Participants were invited to write about what kinds of instructional technology they were using prior to joining PT3, how they became involved in PT3, what they've been doing with PT3, and any "ah ha's" or critical moments that they've had in the program. The request for autobiographical PT3 stories was reiterated during the fall at the CCOL meetings and by CUBEs during on-site visits. Narratives generated in this way formed the core of the evolving case stories.

Journals

Participants were asked to keep journals for each time they met with PT3, their CUBEs or others in the project, and, ideally, each time they used technology in their classrooms. However, the actual number of journal entries was much less for most participants. PT3 teachers kept either handwritten journals or on-line journals. Handwritten journals were photocopied and then typed into the on-line environment. In this study, the Journal entries were used to corroborate and expand teachers' narratives. Corroboration occurred when an event described in the narrative also appeared in a journal entry. Journal entries are denoted by the letter "J" and the date.

Cube Notes & Summaries

The CUBE who worked most closely with a particular teacher was asked to write a few paragraphs to describe that teacher's situation, their perceptions of the teacher's involvement in PT3, and the types of activities they were doing with teachers during the weekly school visits. These summaries were used to situate the narrative within the larger context of the PT3 project.

Project Presentations

At the end of the school year, all participating teachers presented their completed technology-based projects to other members of the CCOL at a two-day Summer

Celebration of Success. Project staff kept notes on each presentation to characterize the type of project and the type of technology used. The presentations were also videotaped. These notes and tapes were reviewed information relevant to the case stories. Comments from project presentations are denoted by the code "PP 06/01".

Survey information

Participants in PT3 were asked to complete several survey instruments during summer camp and again at the end of each project year. During the first year, these consisted of pencil and paper instruments. In year two, the surveys were available on-line at the project website.

The technology skill survey was designed by faculty to assist teacher candidates in designing individual education plans to meet certification requirements. This same survey was used for PT3 mentor teachers and faculty members to help design IEP's for each participant. The instrument consists of 96 Likert-scale questions that can be divided into 5 subscales: (1) Data Entry, word processing and spreadsheets, (2) Multimedia (i.e. downloading and editing images, sounds, or video clips, etc.) (3). Remote access (i.e. Internet skills, search engines, etc.) (4) desktop skills (i.e. saving files to a disk, creating sub-directories, etc.) and (5) safety issues (i.e. computer ergonomics, computer viruses, etc.). PT3 participants were asked to rate themselves for each skill on a four-point scale: "I can do this, " "I probably can do this," "I don't do this well," and "I can't do this."

The scores of the technology skills instrument were used in this study to characterize subject's tech skills as high (scoring in the top quartile); average (2nd and 3rd quartiles) or low (bottom quartile). The quartile analysis included all completed instruments (PT3 participant teachers, faculty, and all certification students). The technology skill instrument has not been subjected to psychometric analysis but does seem to consistently differentiate between the certification students, mentor teachers and school of education faculty, with the certification students consistently producing higher pre-assessment scores and higher gain scores than either faculty or mentor teachers.

The attitude instrument consists of 28 items adapted from Knezek & Christensen's *Survey of Teachers' Attitudes Toward Computers* (1997). Items use a five-point type-type scale asking participants if they "strongly disagree" to "strongly agree" with statements about technology such as: (2) "I am tired of using a computer," (7) "I know that computers give me opportunities to learn many new things," and (19) "Computers will improve education." As with the technology skills instrument, scores from the attitude instrument were used to classify the subjects of this study as having a strong positive attitude toward instructional technology, generally positive, somewhat negative, or strong negative.

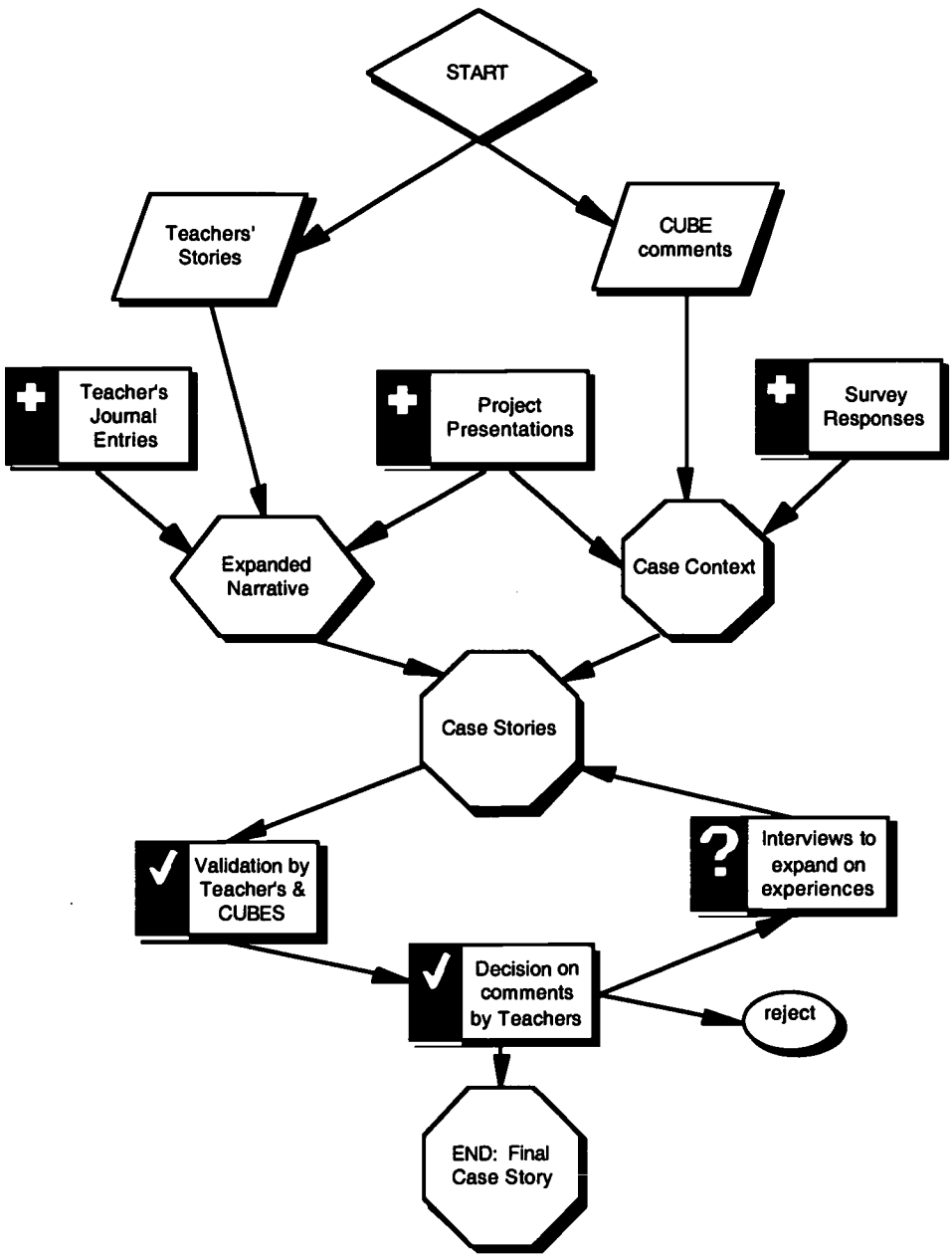
After the 2000-2001 project years, participants were also asked to complete a survey of 16 items specific to the grant. Eleven items were 4-point Likert-scales asking what was most helpful about the project for building community and technology skills; (#4) how helpful has meeting with your CUBE been at building technological skills...to a great extent, to some extent, very little, not at all. Each item had additional space for comments. Open-ended items asked what was most helpful (#13), or most challenging (#12) about the PT3 program. This study looked most closely at the teacher's comments on the instrument for evidence supporting or disagreeing with statements in the narratives. Comments from surveys are indicated by the letter "S" and the year of the survey.

Case Story Development and Analysis

The data from each of these data sources was analyzed and triangulated with the member's narratives to support the case story development in a reiterative process (Figure 1). The authors took the stories and CUBE comments and expanded and elaborated upon the PT3 experiences using journal entries, survey responses, and videotapes from the celebration events. These expanded narratives were crafted in the first person to preserve the richness and flavor of the members' experiences in the PT3 CCOL. Pseudonyms were substituted throughout the narratives.

CUBEs took the expanded stories back to the teachers for validation. Responses from the teachers were considered by the authors and either incorporated into the case stories or returned to the teachers for clarification or elaboration. CUBEs were also asked to review the evolving stories.

Figure 1: The process by which case materials were used to construct the case stories.



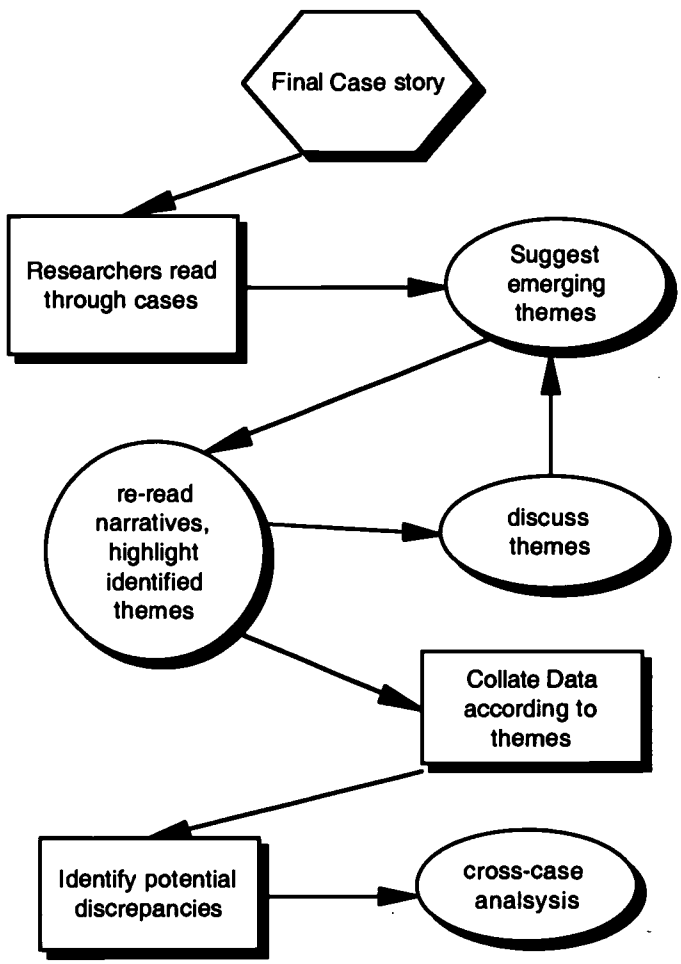
After the stories had been developed, the authors read through all the cases. We then suggested themes that seemed to appear in the different cases (Figure 2). We went back and highlighted evidence of each theme in the cases. We then discussed the themes and asked if each theme was unique or an instance of a larger theme. For instance, we had initially identified a theme we called "confidence" which was eventually combined with other themes relating to feelings or emotions, e.g. fear and frustration, into a theme we now call "affect." The theme that we call "community" contains elements of feelings of belonging, an emotion that could also be classified under the larger heading of affect. However, since community is a predominant goal of the PT3 project and because there seemed to be a good array of evidence in the different cases that spoke directly of

community, we kept community as a distinct theme. We also look for other themes that had been missed in the first round. Our theme "thinking about technology" where the teacher-learners reflects upon whether a piece of technology would be advantageous or not to their instruction or students' learning, emerged in the second round of readings.

After all the themes had been highlighted, the highlight text was extracted from each case story and collated according to themes. All the supporting evidence for each theme was reexamined for potential discrepancies in the way the theme was defined and characterized. The cross-case analysis, which is ongoing, looked for additional patterns in the data such as themes that appeared to be more salient at particular grade levels (Figure 2)

Then, because of the length of the case stories, we re-read all the case stories and selected one case that seemed to represent a particular theme. The five identified themes and their representative case stories are presented in the next section. Although a specific case has been selected to represent a theme, all five case stories show evidence of at least four of the five themes. The full text of the case stories can be found by following the hyperlinks.

Figure 2: Analysis process to identify emerging themes across the case stories.



Themes that emerged from the Case Stories

Across the case stories, five themes emerged: Affect, Community, Obstacles, Lessons Learned, and Thinking about Technology. Each of these themes will be elaborated in the context of a representative case.

Affect and Lily W.

Lily is a veteran teacher with 11-15 years of teaching experience (S 6/00). She teaches language arts to first and second graders at a private primary school. When Lily joined the project, she was a technology novice (S 9/00), had rarely even used a mouse, and was skeptical that technology could add anything to her classroom.

> I am a language arts teacher in a private, elementary laboratory school. When I came to Summer Camp, I anticipated being totally overwhelmed by the experience. For some time, I have avoided deepening my knowledge about computers because of my feelings of inadequacy. I felt that I was considerably behind the average teacher/person regarding technology (J 9/22/00). I was pleasantly surprised to discover that I am not alone, and I have been very encouraged by the prospects of learning through the PT3 Project. All too often, I have attended a fast moving workshop and left feeling overwhelmed. My real break through came in February. My CUBE is about my age and admitted to me that just a few years she also knew very little about technology. She understood my fears. We had some one-on-one meetings and I put together a little PowerPoint presentation. That was exciting! Soon, I started to take the school laptop home at night to practice and work on my project. Still, I sometimes felt that I was moving at a snail's pace. I get frustrated, because I feel so behind everyone else. It wasn't until April that I really began to make progress on my presentation, thanks to my CUBE's help. In just two weeks, I made a lot of progress. I began to feel more confident that I would finish my project by June. Although frustrating, PT3 has empowered me a great deal (J 03/13/2001).

Lily's case contains several elements of affect that we saw in the stories of the PT3 teacher-learners. These feeling include those of being lost, of having low self efficacy relative to technology, of being overwhelmed. Lily's case also shows how her confidence grew as she began to experience success with the support of her CUBE and as she discovered more and more CCOL members who also struggled with technology,. The growing levels of confidence are most evident when the teacher-learners describe their projects that they completed with pride and accomplishment. In his story, Derek claims, "I celebrated my success by creating my website." Likewise, after successfully creating a classroom poster on her home computer, Danielle wrote, "This was a BIG break through... It was easy. I realize that my apprehensions always result in my realization that I should not be apprehensive. (J 12/07/2000)"

Community and Clare B.

Clare comes to the classroom after a career in the business sector. When employed in an office, she taught herself to use a computer. Her technology skills carried into her new career as a middle school science teacher, even more so now that her school district has been awarded one of the State's digital districts. That Clare is a lifetime learner is evident by her current enrollment in a doctoral program at a neighboring university.

> As my resume hints, my technology background was strong prior to this program. It is in light of this that I am enamored to an even greater degree with the PT3 program. It differentiates. It addresses the needs of the teacher learners in a collaborative, constructivist fashion.
>
> At the monthly CCOL meetings, I had the opportunity to interact with teachers from several other local school districts. This is the first time in my life as an educator that I have experienced continuity in learning with educators from districts other than my own in a staff development experience. From hearing about implementation snafus, student idiosyncrasies, personalities and ego interaction between the faculties at the other schools, etc. the impact of this instructional learning opportunity on me has been tremendous. At a CCOL meeting at a secondary school site, the tour of the facilities and the "behind the scenes" technology insight gained as a result of the setting provided perspective as well as a springboard for growth for me. Opening one's doors to others is such a simple yet strong means for promoting collaboration rather than either competition or apathy.
>
> I have also grown remarkably as a result of my interaction with my CUBE and with the leaders of the PT3 program. For example, my CUBE always had an encouraging comment and smile and would always supply grant source materials and CD-ROMs for me to experiment with for classroom use. The leadership of PT3 has provided many shared ideas and perspectives. This past summer, the opportunity for grant money for collaborative projects was opened up to the PT3 participants. At the time, I had been researching field experiences and teacher education. The gears in my mind started spinning and I put together a proposal for a collaborative action research project that involves six preservice teachers, myself as an in-service teacher, the assistant superintendent, and a university professor.

For Clare, with her strong technology skills (she scored 370/380 on the tech survey), it was the interaction with other teachers, her CUBE and other members of the CCOL on an ongoing basis that became the most salient feature of her PT3 experience. Karen, another teacher with above average technology skills, wrote, "One of the most important parts of the project for me was the opportunity to talk with other teachers during the CCOL meetings and to share ideas." Others related that as they met with their CUBEs and as project teams, the sense of community that developed at the building level became a critical element of the PT3 experience. For Lily, it wasn't until the February CCOL where she was grouped with people from other schools that were working on similar projects, that

she began to have a sense of community. At that time she reflected, "It was helpful to learn that people are at various stages on their projects. Although some have completed their projects, others are still working, and others, like me, are closer to the beginning phases of learning to use the technology (J 02/13/2000). It also took this long for Lily to develop a relationship with her CUBE to where she felt comfortable confiding her lack of technology skills. For Lily, the sense of community became stronger at the next CCOL. "The experience at the March meetings was a good one... For the first time, I felt people began to really share ideas and expertise (J 03/13/2000)"

Obstacles and Karen B.

Karen is a fourth grade teacher with a class of 20 students in a very affluent district. The residents are primarily professionals and business leaders. While there are computer laboratories in every building and Internet access in some classrooms and all libraries, access to these resources tends to be tightly controlled.

In my first journal entry, I wrote, "I love using technology, but I am very frustrated by my district's lack of tools (J 9/22/2000)." I have two computers in my classroom, old computers that were donated by my husband's company. Our computer lab has 14 machines, which only seem to be working 50-60% of the time. Last fall, the entire lab was not working because of a problem with the file server (J 9/22/2000). Throughout the fall, problems with the computer lab kept my level of frustration high (J 11/14/2000). The availability of the computer lab in our school has been less than adequate. We are scheduled once a week. When we are in the lab, undoubtedly 2-3 of the 14 computers are not functioning properly. Either a mouse, monitor or entire system is on the fritz. Then there was the printer--it didn't work all fall! So those 14 of my 20 students who were lucky enough to get on a working computer, could not print any of the work they have done (J 11/14/2000). It's frustrating enough to try to figure out ways to incorporate technology in the classroom. We don't need the added frustration of inadequate equipment that is not being maintained properly (J 11/14/2000).

Another frustration is not finding enough time to work on our project. The two teachers and I, who are working together, don't have common planning time. We have tried to come up with some meeting times. Our computer lab is not available at lunchtime because the PTA holds keyboarding classes in there. Many days the custodian locks the lab door before school is out. And I just don't have the time in the mornings. With our current contract negotiations, we are supposed to be "working to the rule". We are not supposed to go into work early or leave late. Our daily planning times are too short to accomplish all we need to do. It's ridiculous. In a district with our reputation, we should have computers in each and every classroom with Internet access (J 2/28/2001). There's no excuse.

Karen's frustrations with access to technology and the lack of time reverberate throughout the stories of the CCOL. Lily's and Danielle's cases also speak of access to computers and time as "hurdles" they had to deal with during the year. Other obstacles and challenges that members of the CCOL had to overcome included: virus infections of an entire school district's computer system, loss of internet access; incompatible software purchases, firewalls and other forms of computer "protection," limited access to computers, and especially the lack of time. No member of the project was immune to problems. Even the CCOL meetings provided ample opportunity for staff to demonstrate flexibility and problem solving on the fly as unstable Internet connections, incorrect IP address and crashing servers interrupted the flow. Having a venue to vent frustrations among an empathetic community helped all of us to cope with the many barriers to technology integration.

Lessons Learned and Derek K.

Derek is another veteran teacher with almost 30 years of experience, four at his current school in the city where he teachers middle school science. His interest in instructional technology dates back to 1977 when he took the very first graduate course offered at a regional university called "Computers in Education." He was recruited by the head of the school's tech team as an "advanced" technology user to join the first, capacity building, year of the PT3 grant.

At the time I began with PT3, I could use Microsoft word, do some PowerPoint and use Excel to create tables. One of the first things that I learned to do was to use a digital camera (J 1/27/2000). I had heard about this technology, but had not had any experience with it. My CUBE helped me to further develop my skills with the digital camera by having me practice taking pictures and downloading them to the hard drive (J 2/17/2000). For my project, I had to learn how to paste and copy pictures from websites that I could use in the PowerPoint presentation. I was thrilled when I learned this skill. It took awhile, but after practice with my CUBE, I could do it on my own. During the pilot experience, I learned how to evaluate software, do a concept map, search on websites, worked with Kid Pix, and PIVIT. I was really impressed when we had a workshop on HyperStudio®. I would now be able to do a program and add animation to it. My CUBE also helped me to make charts and graphs on the computer (J 2/3/2000).

For my second year project, I used a commercial website (http://communities.msn.com) to create my science homepage by using a template. The website had everything on it that I had hoped to accomplish. I now had the skills to download pictures from a digital camera to it. I also was able to copy and paste animations for my website. I had a place for visitors to sign in and learned how to place a counter on my website that let me know how many visitors that I had. The guest book that I created was neat because the visitor could put their name and a message. Students were able to check for their assignments, see what was new in science, and know what field trips were coming up. The skills that I had acquired through PT3 were being put to good use.

That year I also was excited to learn about other technologies. I got to work with a palm pilot and was enthralled by it. I was also introduced to

probes that could be used in science classes (7/17/2001). Webwacker® was another piece of software that I was introduced to that year. I was fortunate enough to buy it and download websites that could be used for computer lab instruction without Internet access. I told some of the other teachers in the grant about this software (J 3/17/2001). One of the topics that interested me was webquests. I went to a workshop that gave us some information about webquests and tools you could use to create one (J 7/10/2001). I liked the idea since I was now using modules to teach upper grade science. I thought that this could possibly my project for the next year.

For Derek, all the different technology skills that he learned defined the essence of his PT3 experience. If fact, while he claims to generally enjoy the food and talking to others at the CCOL meetings, "The meetings where I can get hands-on and learn something new are best and most productive to me (J 11/14/2000)." This sentiment is echoed by Danielle in her case and others in the meeting evaluation forms. Throughout the cases are vignettes on how teacher-learners learned technology shortcuts, new software applications, and how to generate teaching materials with the computer. Teachers reported that they learned how to support students creating technology projects that employed several different tools (and often learning from the students). Even Clare, among the most technologically sophisticated members of the CCOL, reported learning how to use iMovie with her students in addition to her evolving understandings of professional development. Teachers learned that even the "experts" on the PT3 staff don't know lots of things about technology. Discovery and learning were a pervasive theme throughout the case stories.

Thinking about Technology and Danielle K.

Danielle has been teaching at the intermediate level for over 20 years. She is trained as a reading specialist and has worked most of her career with special needs students in various urban environments. Danielle has made some progress in instructional technology under the auspices of the grant. She comes to meetings dutifully and absorbs content, but without time to work individually on skills and new lesson plans, she has found it difficult to do more than fantasize about how technology might help motivate her students. In these "fantasies" and her reflections, she exemplifies the theme we came to call "thinking about technology" in terms of the possibilities technology can bring to learning or the relative advantages and disadvantages of using technology instead of an old tried and true method.

I decided to have my eighth period social studies class create PowerPoint presentations. We have a new Social Studies curriculum this year. I intend to have my students present their PowerPoint presentations at the year-end parents evening. I first had to talk to Ms. G. (our librarian) about the schedule for using the computer lab with my students in the afternoons (J 9/16/2000). We worked it out so that my Social Studies children can use the Library's Computer Lab once a week. Most of them don't have the Internet or a computer at home. I want to take total advantage of this opportunity for them. I know what computer knowledge may mean to them in the next 10 years (J 10/20/2000).

However, I waited until I felt more comfortable with the computer before taking my morning kids to the library computer lab. We went for the

first time in early November. They LOVED it. I would love to take them every day. The next time we went we began an Encarta search with the help of Ms. G., our librarian. She is excellent with my students... very patient and gracious. The assignment requires my children to search several articles on unusual animals to answer questions in a five-page packet. Although they often struggle with print, I've noticed their ability to use the worksheets to search for a particular word on the computer (J 11/18/2000).

These students love the Scholastic 180 Reading Program computer time they experience daily in my classroom. My children love the relationship with the computer program because it is private and safe. Their interactions are not available to anyone. They are alone to learn at their own pace. As a reading specialist I can see this becoming the future of education for children with cognitive differences. (J 01/08/2001).

I enjoyed the vender show PT3 held at the Union in January. It was a learning experience. The most impressive piece of technology was the voice-activated computer. This could be a real answer for children with learning disabilities. I was amazed at the presentation. I would love to show it to my students. Many of my children have fine-motor issues. Writing, printing, and the keyboard are difficult adventures. This technology could prove priceless (J 01/20/2001).

Like the reflections in Danielle's case, most of the instances of thinking about technology looked at the possibilities a specific technology for promoting learning. Clare described how the Blackboard platform, augmenting a traditional face-to-face class, can provide additional opportunities for interactions and collaboration. Nothing would make Karen happier than to have all of her students work through the entire writing process on a computer (J 9/22/2000).

In a few cases, teachers claim that their old ways are better. One teacher who historically took Polaroid pictures of her students on the first day of class experimented with the digital camera instead. But because of the configuration of technology resources in her school, hard copies of the photos had to wait until she had time to go to the computer lab, download the pictures, resize them, and print them out. Instead of immediate Polaroid pictures, the digital photos were delayed several weeks before they could be printed. Jacqueline, a kindergarten teacher, described her reaction when someone suggested she test her students on color using the computer, "I just use a box of crayons, what could be simpler?"

Implications for Future Research and Professional Development

The experiences of teacher-learners in the PT3 provide corroborating evidence to the findings of other professional development efforts. The teacher case studies and supplementary documentation indicate that common teacher needs and patterns are emerging within the PT3 collaborative learning environment. Most teachers reported that the opportunity for the collaborative learning teams to discover, develop, and share their findings about technology with supportive teacher colleagues helped solidify that knowledge and spread the newly developed expertise throughout the school. This theme is

consistent with the patterns described by Wald and Castleberry (2000) in their professional learning communities.

The teacher-learners also expressed concerns about factors that inhibited the building of a collaborative learning community in their school and yet they expressed their desire to continue within the evolving community to learn more skills and, to a lesser extent, technology integration. Teacher-learners reported that they experienced considerable difficulty finding consistent and adequate time to learn and practice new skills and plan and develop new technology classroom projects. Often, when they found the time, school computer labs, hardware and software equipment were not available. In spite of frequent time constraints, participating teacher-learners continued to want more time to learn about technology and discuss what they were learning with PT3 peers.

Among the five themes that emerged from the teachers' case stories, two pairs seem to be linked. First, teachers' feelings or affect seemed to be affected by their experiences of community. And the second two are learning about technology and thinking about technology.

The atmosphere produced in the PT3 CCOL is one which allows members to feel safe about critically reflecting on their experiences and looking for new ways to consider teaching and learning with technology. The fear and low-self efficacy that characterized Lily's early attempts at learning new technology skills changed as she found peers in the CCOL that shared her feelings. With the support of her CUBE and fellow teachers, Lily began to experience small successes with her technology project, and she became more open in sharing her thoughts at the CCOL meetings. Other professional development efforts have also found that external efforts, like PT3, can serve as significant catalysts in the development of professional collaborative learning communities. Morrissey (2000) described external efforts such as the establishment of a partnership with a university or the reorganization of a school or district and supported a change of focus and development of community in four of the five schools studied. The type of culture that has developed in the PT3 CCOLs has been called various names, including "sacred space" (Richardson, 1997), "connected-knowing groups" (Belenky, Clinchy, Goldberger, & Tarule 1986) and "educative communities" (Bullough & Gitlin, 1991).

By whatever name it is known, the PT3 CCOL is developing the important features of meaningful dialogue, support, critique, collaboration, and reflection. Yet the development of community, collaboration, and change in education remain slow processes. The very developmental nature of community and collaboration indicated a need for prolonged, on-going professional development.

In the second instance of linked themes, it appears that teachers need to learn basic computer skills before they start thinking about technology in instruction. Fundamentally, PT3@pitt is not about technology. It's about what teacher-learners are doing with the technology to extend their intellectual capabilities and better understand the world around them (Lemke & Coughlin, 1998). But in order to leverage the teacher-learners' thought processes from an orientation of learning to use the tool to using the tool to learn teachers need basic computer skills. Core technology skills addresses the baseline technology skills that educators need to function in technology-rich classrooms (Coughlin & Lemke, 1999). While many of these competencies have been described as short-term and fairly mechanical (Means, 1995), they are nonetheless crucial to establishing the comfort level necessary for educators before they can begin to consider issues related to curriculum and instruction.

For instance, Karen wrote about her vision of students using the computer for the entire writing process. For many teachers, having students use computers to write means having students use basic word processing. Yet, introducing computers into language arts won't have much of an effect if all students do is word processing of compositions. The real value comes in engaging students in a writing process through which the technology enables students to more coherently plan their composition through outlines, get feedback from peers and experts across networks, introduce visual imagery, icons and animation to more effectively communicate ideas, access a wider range of source material for background information, use databases to better organize such materials and then, publish to the world (Lemke & Coughlin, 1998). As Karen learned about power of certain technologies like Inspiration® to support the writing process, her conceptions of using technology to support student writing changed.

Missing Theme

In addition to the five themes that emerged from the case stories, it is interesting to note what did not emerge. For example, a fundamental characteristic of effective, sustainable learning communities is a shared vision or goal (Dufour & Eaker, 1998; Morrissey, 2000; Wald & Castleberry, 2000). In all the materials used to develop the case stories, there is no evidence of a shared goal or vision; nor a goal grounded in K-12 students learning with more motivation and greater understandings; nor a goal of teacher candidates planning and enacting technology enhanced lessons fluently, flexibly, and thoughtfully. Rather, when goals are articulated, they seem to operate on a micro and individual level, e.g. to learn a particular software package or how to use a peripheral like digital cameras and scanners.

The implication for PT3@pitt and other professional development efforts is that we need to do a better job of communicating mission and vision. An effective vision statement articulates a vivid picture of the organization's future that is so compelling that members will be motivated to work together to make it a reality (Dufour & Eaker, 1998). A clearly articulated and shared vision motivates and energizes people; creates a proactive orientation; gives direction to people within the organization; establishes specific standards of excellence; and creates a clear agenda for action (Dufour & Eaker, 1998).

Educators are the key to the effective use of technology in schools. It is only through change in classroom and school practices that the positive benefits of technology to learning will be realized (Lemke & Coughlin, 1998). Educators who capitalize on the relationship between technology and education reform will help all students to develop higher order skills and function effectively in the world beyond the classroom. Achieving such fundamental change, however, requires a transformation of the underlying pedagogy (basic assumptions about the teaching and learning process) (Means, 1997). While many educators are embracing the use of education technology, many also have a healthy skepticism about the benefits and tradeoffs of technology in schools. Teachers need visions of how technology can enhance and enrich learning opportunities for students that were never before possible on a large scale - and they need time to explore these new approaches (Lemke & Coughlin, 1998). A CCOL that wrestles with the challenges of technology-enhanced instruction can help support such changes.

Theories of levels of integration (Lemke & Coughlin, 1998; ACOT 1999) and stages in diffusion (Rogers, 1995) indicate that it can take a long period to see substantial change in technology integration and community development. However, these evolving

case stories show that this process has already begun and that membership in the PT3 CCOL facilitates beneficial professional development, which can help teachers transition to technology enhanced teaching practices.

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