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TEACHER LEARNING ABOUT AND WITH TECHNOLOGY: SHARING, SUPPORT, AND STRETCHING THROUGH A PROFESSIONAL LEARNING COMMUNITY

By

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ABSTRACT

TEACHER LEARNING ABOUT AND WITH TECHNOLOGY:
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The push for technology integration in K-12 schools and the lack of professional development opportunities for teachers create serious challenges to learn to integrate technology. Most work that is pushing for the infusion of technology in a subject area and exhorting learning communities as an alternative model for teacher professional development is often written theoretically and normatively without an empirical basis. This study examines the role of a voluntary teacher learning community as an alternative means of professional development. It examines teachers' learning to integrate technology in support of writing instruction from teachers' perspectives.

Five elementary-school teachers and a professional development specialist participated in this technology integration project, from which I chose three teachers as the focal cases of my research. I employed an embedded multiple-case qualitative research design (Yin, 1994), which examined teacher learning about and with technology from teachers' perspectives. This study shows what technology integration looks like in practice and how a professional learning community supports teachers' learning.

This study concludes that teachers need to gain more than technical competencies in order to integrate technology in support of writing instruction. In addition, they depend on various learning opportunities in both social and individual planes for their learning

and changes. The boundary between these two planes is blurred rather than clear-cut. Many cultural and structural conditions, such as sharing, various forms of support, leadership, and resources, are necessary to attract them to join this professional learning community and to sustain their learning with each other.

DEDICATION

This study is dedicated to my passed away grandmother, Ruiyun (my Lucky Cloud), who instilled in me a thirst for learning and the pursuit for truth. This study is dedicated to my husband, Changhong (my Rainbow), who has been loyal in supporting me in the pursuit of this doctoral degree. This study is also dedicated to my son, Ray (my Sunshine), who is a continuing source of inspiration and encouragement in my down times. May my accomplishment serve as an example of persistence for you in the pursuit of your dreams throughout your life. Finally, this work is dedicated to God, without whom, none of these is possible.

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Chapter 1

Introduction

Background

Over the past decade, calls for a commitment to teacher professional development for teaching improvement have been concurrent with various strands of educational reform in the United States including new curriculum standards, national tests, multiculturalism, technology integration, and school restructuring for student learning. The rationale is that any effort to improve education ultimately rests on teachers. Reformers have seen professional development as the key to any and all educational reforms (Wilson & Berne, 1999; Ball & Cohen, 1999; Sykes, 1996). Take the current push for technology infusion in K-12 education as an example. Despite schools having increased numbers of computers and Internet access, research has shown teachers lack professional development opportunities for technology integration. According to Cattagni and Farris (Cattagni & Farris, 2001), the student/computer ratio in American public schools has decreased from six students per computer in 1999 to five students per computer in 2000, and the ratio of students to instructional computers connected to the Internet has dropped from nine students per computer in 1999 to seven students per computer in 2000. However, fewer than half of American schools provided teachers with training on basic computer skills, let alone professional development opportunities for integrating computers into teaching and learning activities (the Office of Technology Assessment (OTA), 1995). From the third annual report of *Education Week* on education technology, Fatemi (1999) identifies that only 29 percent of all teachers with computer

technology access report that they have had more than five hours of technology training in curriculum integration in the previous year. It thus is not a surprise that the majority of teachers do not use technology regularly in their teaching (Becker, 1999; Cuban, 2001).

Moreover, despite the potentials of technology in assisting the process of human cognition (Pea, 1993), such as functioning as useful instructional tools to enhance student performances (Salomon, 1993) and promoting constructive learning (PCAST, 1997), education historian Larry Cuban (1986) warned that simply introducing technology into classrooms might not transform existing educational practice and improve students learning outcomes. Beyond learning technology per se, teachers need professional development opportunities to integrate technology in teaching (The CEO Forum on Education and Technology, 1999). In short, educational reforms in general and the press for technology integration in teaching specifically all call for attention to teacher professional development.

However, the dominant training model of teachers' professional development has been criticized as ineffective. Little (1993) points out that the training model of professional development, which primarily focuses on expanding well-defined skills and practices, is inadequate for the ambitious visions of teaching and learning embedded in current reforms. For example, the new curriculum standards of the National Council of Teachers of Mathematics (NCTM) require teachers to depart from a conventional view of textbook-centered teaching to a new, ambitious view of teaching for student understanding. In a case study of how a math teacher, Mrs. Oublier, integrated the new math curriculum standards in her teaching, Cohen (1990) found a mismatch between Mrs. Oublier's teaching and the vision of teaching embedded in the curriculum standards.

Contrary to what Mrs. Oublier thought, that she had successfully revolutionized her teaching, the researcher noticed that the innovation in Mrs. Oublier's math teaching was still filtered through a traditional approach to teaching math due to her limited knowledge of mathematics and the nature of training she received to implement the new curriculum standards. The workshops organized by the department of education only offered Mrs. O standard teaching strategies rather than help her deepen her mathematics understanding. Therefore, Mrs. O still taught "new" math in a traditional pedagogy. This mismatch between Mrs. Oublier's teaching and the vision of teaching embedded in the curriculum reform suggests a learning problem for teachers. If there are no agreed-on teaching strategies at the heart of a reform vision of teaching, what learning opportunities do teachers need?

Reformers advocate alternative means of professional development for teachers such as teacher collaboration and professional communities to facilitate teachers' on-going inquiry about their practice in light of new visions of teaching and learning embedded in educational reforms (Little, 1987; Wilson & Berne, 1999). Ball and Cohen (1999) point out that teaching envisioned in these reforms is complex, and there is no agreed-upon content knowledge or teaching strategies. They advocate an inquiry-based, practice-oriented model of professional education, in which teachers engage in substantial professional discourse about teaching practice through communities of practice. From the points of view of situated and social cognition, Putnam and Borko suggest, "Teachers need to construct their complex new roles and ways of thinking about teaching practice within the context of supportive learning communities" (Putnam & Borko, 1997, p.1247). Little (1988 in Wilson & Berne, 2000, p. 175) nominates that

effective professional development should contain the following features: (a) it ensures collaboration adequate to produce shared understanding, shared investment, thoughtful development, and a fair, rigorous test of selected ideas; (b) it requires collective participation in training and implementation; (c) it focuses on crucial problems of curriculum and instruction; (d) it is conducted often enough and long enough to ensure progressive gain in knowledge, skills, and confidence; and (e) it is congruent with and contributes to professional habits and norms of collegiality and experiment.

Given the persistent private culture of teaching in the U. S. (Little, 1990), teacher collaboration and/or professional communities do not occur spontaneously. Teacher collaborations and professional communities in the literature tend to be either associated with school restructuring reforms or with the partnerships with universities/research institutions. Hargreaves (1992) reminds us of the problem of contrived collegiality where teachers engage in superficial learning when they are asked to work on an administration-imposed agenda. If the problem of contrived collegiality is solved, will a voluntary community of teachers facilitate teacher learning?

In addition, like the lack of empirical evidence about teacher learning in traditional professional development activities (Wilson & Berne, 2000), the work that is exhorting alternative means of professional development typically is written theoretically and normatively without an empirical basis. Therefore it is important to know empirically what new images of professional development look like. Moreover, if teachers are the most important agents of instructional policy (Cohen, 1990; Lipsky, 1980), their voices on whether and how the new means of professional development work for them should be heard by reformers and policy makers. In traditional professional development

workshops, teachers are treated as recipients of knowledge. In new visions of professional development, teachers are seen as active learners who construct their knowledge through interaction with others. However, most work exhorting new visions of professional development is typically written by reformers and policy makers. It is important to hear teachers' voices on whether and how a teacher learning community works for teachers' learning.

The purpose of this study therefore is to examine the role of a voluntary teacher learning community on teacher learning about and with technology to improve writing instruction from teachers' perspectives. Teacher learning means the changes in what a teacher knows, what s/he believes, how s/he thinks and acts and how s/he thinks of herself/himself as a professional (Borko & Putnam, 1996). In 1998, seven elementary school teachers from five school districts attached to a large Midwest intermediate school district (ISD) joined a technology support group for writing instruction facilitated by the ISD professional development coordinator. After working with and supporting each other for three years, these teachers integrated technology into their teaching, enhanced or transformed their practice of teaching writing, and gained new professional identities. Through describing and analyzing what these teachers learned and how they changed through this voluntary professional learning community for technology integration, I intend to examine the relationship between a professional community and teachers' learning in the context of technology integration from the points of views of these teachers. In the remainder of this chapter, I will discuss how the literature in the following three fields sheds lights on my dissertation investigation: a) teacher learning

communities as alternative means for professional development; b) research on teacher learning to teach with technology; c) shifting theoretical lenses on teacher learning.

Teacher learning communities as alternative means for professional development

Despite the fact that most teaching in the U.S. is individualistic (Lortie, 1975; Little, 1990), there is a growing interest in teacher learning communities as alternative means to foster and support teacher learning. Studies show that teacher professional communities have contributed to decreasing teacher isolation (Little, 1982); facilitating teacher discourse to develop authentic pedagogy for authentic student achievement (Newmann and associates, 1996); and providing opportunities for teachers to learn with each other about subject matter knowledge, teaching, and student learning (Wilson and Berne, 1999).

Little (1993) pointed out that professional development should take into account the particularities of teaching contexts and teachers' experience. Professional communities differ in their purposes, relationship, social norms and functions and consist of people with different personal qualities. These differences shape teacher learning opportunities and outcomes. When examining teacher learning, we need to pay attention to conditions that influence teacher learning.

Conditions/factors that influence teacher learning through professional communities

Newman and associates (1996) argued that cultural and structural conditions are important for forming and developing professional communities to foster teacher learning. Cultural conditions refer to shared visions, beliefs and values among

community members. Structural conditions refer to goals, time, resources, administrators' roles and so forth that community members have. Little (1990, 1999) helps us think about how cultural conditions impact teacher learning experience through her distinction of "strong ties" and "weak ties" relationships among teachers in academic departments she studied. In communities of "strong ties," teachers work collaboratively on matters of curriculum and instruction and develop shared understanding and collective autonomy. Teachers are interdependent rather than independent. In communities of "weak ties," teachers engage in casual interaction and individual autonomy remains. McLaughlin and Talbert (2001) further distinguish traditional communities from learning communities. While learning communities support teachers' on-going inquiries and develop their professional knowledge collaboratively, traditional communities only reinforce teachers' existing knowledge rather than foster shared work and learning.

Lieberman (1992) recognized four conditions that are shared by successful networks that foster teacher learning: focus, variety, discourse community, and leadership opportunity. *Focus* refers to a professional community establishing a focus of activity beyond the "generic" one. This focus enables those who join the community to establish a sense of identity through participating in the activities related to their common goals and objectives. *Variety* means a network provides opportunities to sustain commitment of teachers by blending personal and professional interests and network-related activities. This helps to establish a trust environment for teachers to interact and communicate with each other. *Discourse community* encourages teachers to participate in knowledge construction out of their daily practices. Teachers gain ownership of the knowledge through intellectually and emotionally inspired conversation. *Leadership opportunity*

refers to teachers taking the leadership to experiment with new ideas and to continue inquiry about their practice.

According to Newman and associates (1996), both cultural and structural conditions depend on each other to foster professional communities and sustain teacher professional inquiry and risk taking. For example, departmentalization is the dominant form of culture of high schools, where teachers' individual autonomy/freedom is valued. Finding a time within the school day for teachers to dialogue with each other across departments is a useful structural intervention to break the cultural limitation of high schools. Unless the decision-makers negotiate a time for planning and analysis together, it is hard for teachers to find a common time to work together in their busy schedule even if they want to work together. However, merely structural support itself is not enough. Persistent privacy is a problem of teaching culture in the U.S. (Little, 1990). Provided time, teachers may be asked to work on administrative mandated projects or just work conservatively to reinforce traditional practice rather than deal with the new visions of teaching and learning embedded in educational reforms. When teachers are asked to work on an administration-imposed agenda, they may engage in superficial learning (Hargreaves, 1992). Hargreaves argued that the culture of teaching should be the focus of change because it shapes the kind of collegial relationship formed. Thus, both cultural and structural supports are needed to shape and complement each other to build effective professional communities that support teacher learning.

Smylie (1995) cautions that merely stressing the importance of work place conditions may not lead to desired teacher learning outcome. He wrote:

To simply identify workplace conditions conductive to teacher learning is not the

same thing as understanding in greater depth the complex, potentially interactive functional relationships of those conditions to learning. It does not shed light on interactions between the work environment and individual cognitive and psychological states in the learning process. Nor does identification help us understand or accomplish the complex and difficult task of redesigning schools to establish these workplace conditions (p. 107).

Barnes (1992) argues that professional development needs to work on shaping individual teachers' interpretive frames because the "frames" of teachers influence how they perceive education problems and solutions and affect their actions. In a case study of teacher collaboration among three high school math teachers for implementing a new algebra curriculum, Cheng (2000) found that the curriculum innovation only provides a context for teacher learning. It was individual teacher's beliefs about math curriculum, pedagogy, and the role of being a professional that drove the collaborative work of teachers in pursuing instructional changes in math teaching.

In short, teachers' learning experiences vary in different types of communities depending on cultural and structural conditions as well as personal qualities. In those communities where teachers are required to implement administrators' agenda, teachers may only engage in superficial learning instead of inquiry about their existing knowledge and beliefs and their teaching practices. In the communities where a trust relationship is established, teachers are likely to open their practices and engage in collaborative inquiry about their practices (Rosaen, 1995; Cheng, 2000). If the problem of contrived collegiality is solved, will a voluntary teacher learning community support authentic teacher learning? Since most teaching is individualistic and teacher collaboration seldom

occurs spontaneously, why does a person in an individualistic teaching environment choose to be in a group? This, then, becomes my first research question.

This review of the literature suggests that different factors/conditions influence teacher-learning experiences in different professional communities. Therefore, there is not a "one fits all" approach to foster and develop professional communities to support teacher learning as Calderwood (2000) states: "Community, however, is a slippery state of social relations. It is not a commodity easily obtained. There is no storehouse stocking tempting varieties and flavors of ready-made community, nor is there a warehouse filled with the ingredients that, when properly arranged, transform into community" (p.2). Any particular community is contingent upon the agency of its members and work place cultural and structural conditions. This study explores teacher-learning experience in a voluntary learning community with a focus on different factors that contribute or hinder teacher learning. I hope to see how much these factors affecting the learning community of this study reflect and add to the discussion of the factors identified in the literature of professional learning communities. Thus, my second research question is: What factors stand out necessarily for teacher learning in this voluntary teacher learning community?

Content and forms of teacher learning in professional communities

Despite cultural and structural conditions that influence teacher learning experience, Ball and Cohen (1999) call for attention to the curriculum and pedagogy of professional development to foster teacher learning. "To affect what teachers might learn, one must consider the curriculum and pedagogy of professional development: what teachers would have opportunity to learn and how they would be taught" (p. 6). Ball and

Cohen argue that for authentic teacher learning to occur, the content of professional development needs to be rooted in teaching practice. On the one hand, focusing on practice makes it immediate enough to compel teachers to learn, something missing in the training model of professional development. On the other hand, studying teaching practice also makes it distant enough for teachers to reflect on their actions and examine knowledge and beliefs they hold.

Much of professional development either is not about teaching practice or merely provides theories/principles and/or techniques for teachers to apply. Given the complex and ambiguous nature of current education reforms (Little, 1993), new visions of teaching and learning embedded in reforms do not entail a set of agreed-upon content and processes. This requires a different kind of professional development. Cochran-Smith and Lytle (1999), like Ball and Cohen, argue the authentic approach for professional development is the one that will engage teachers in inquiry about their teaching practice, learning theories and research-based ideas with professionals from various education communities. This is what they call the "knowledge-of-practice" version of professional development. Such a vision of professional development is not just about providing technical solutions, or simple recipes to technical problems. The practice itself becomes the substantive focus of teacher learning.

In a review of contemporary professional development, Wilson and Berne (1999) find that high-quality professional development programs involve communities of learners that are redefining teaching practice. In a teacher collaborative project (Cheche Konnen Project) on science learning they reviewed, the researchers found that teachers were able to explore the meaning of scientific terms beyond merely learning the words

per se. Instead, teachers embedded their learning in the discourse and practice associated with those words and constructed their understanding socially. As a result, teachers in this conversation group developed their own "canonical cases" to refer to in their examination of their own practice. This case illustrates that when you have practice as the substantive focus of learning, it allows learning more than scientific terms. This case also shows that conversation is an important form to construct knowledge and shared understanding socially.

Research about teachers' collaborative work suggests it can take many forms for teachers to engage in learning with each other: talking about teaching, sharing planning and preparation, observing each other's class and critiquing each other's practice, discussing videotapes about teaching, working together to design curriculum, participating in on-going study and research, training each other, sharing insights with a wider audience, and forming subject matter collaboratives, networks and professional communities for instructional improvement (Little, 1982, 1987; Rosaen, 1995; Newmann & Associate, 1996; Cheng, 2000; Lieberman, 2000).

Among all forms of teacher collaborative work, conversation and sharing appear to be key components underlying these activities. Conversation helps teachers to develop a common ground or shared language. Little (1982) commented on the importance of shared language in changing teaching practice:

> By such talk, teachers build up a shared language adequate to the complexity of teaching, are capable of distinguishing one practice and its virtues from another, and are capable of integrating large bodies of practice into a distinct and sensible perspective of business of teaching. Other things being equal, the utility of

collegial work and rigor of experimentation with teaching is a direct function of the concreteness, precision, and coherence of the shared language (p.331).

Sharing is another key factor that keeps teachers' practices open and increases the interdependence among each other. Through many forms of shared work, teachers expand their repertoire of teaching, achieve the coherence of the program, and reduce the individual burden for planning and preparation (Little, 1987). Both conversations and sharing are important for teachers to ask questions, exchange ideas, and develop shared language.

However, conversation and sharing do not always result in shared language or common understanding among teachers. Lortie (1975) finds teachers' sporadic staff room conversation is typically about sharing "tricks of the trade" of teaching. Ball and Cohen (1999) see that one problem associated with teachers' talk is that teachers often talk past and around each other. Careless and occasional sharing of curriculum materials and information about students is unlikely to open teachers' practices for scrutiny and lead to changes in teaching (Little, 1990; Hargreaves, 1992).

Thus, some researchers emphasize the importance of critical colleagueship, in which disequilibrium is encouraged through debating and distinguishing differences among teaching beliefs and practices (Lord, 1994; Ball & Cohen, 1999). In a study of collaboration among three high school math teachers, Cheng (2000) found that critical colleagueship, which was characterized by colleagues debating with each other their different stances toward the content and pedagogies of mathematics teaching, challenged teachers' deeply held beliefs. As a result, one of the teachers changed her teaching strategies from delivering knowledge to students to encouraging students to discover

knowledge over the time.

Given the importance of conversation and sharing that prior research about teacher learning through professional communities has claimed, it is important to know empirically what these forms of community work make possible and what the substance of teachers' conversation and sharing in a subject specific collaboration that involves technology entails. This leads to another two research questions: what did these teachers learn, and how did they learn and change through a voluntary learning community?

Learning to teach with technology

Since the content of teacher learning in this study is technology integration, I will discuss in this section what we know about teacher professional development for technology integration. Various approaches have been taken to understand teacher learning for technology integration. As technology still remains largely unused or more underused than expected (Becker & Anderson, 1999; Cuban 1986; Cuban 2001), many studies have looked at the technology uses of so-called "early adopters" or "exemplary technology-using teachers". Zhao et al (2001) examined the technology uses of those early adopters in a Midwest state and found these teachers not only were fairly technologically competent but also felt positively toward technology uses and were more likely to use technology to promote student-centered higher-order thinking activities. After reviewing the data of the 1998 National Survey of Teaching, Learning, and Computing, Becker (2000) found valuable uses of computers in teaching had emerged and were influenced by factors such as time offered by schools, availability of equipments, teachers' computer competencies, and teacher personal philosophy on

teaching and learning. These studies summarize the traits and characteristics of technology-using teachers and provide an overview of factors that may influence teacher technology uses. However, this line of research is mainly based on survey data, providing few insights on what and how teachers learn to teach with technology.

The Apple Classroom of Tomorrow (ACOT) project (Sandholtz, Ringstaff, & Dwyer, 1997) revealed the process of teacher technology learning and uses in teaching. The researchers found teachers went through five stages for learning to integrate technology in teaching: entry, adoption, adaptation, appropriation, and invention. However, even with rich resources and support, less than 50 percent of teachers reached the third stage of technology learning. In other words, the majority of teachers still use technology primarily in supporting their existing practice.

Prior professional development approaches that focus on technical skills have been ineffective (Little, 1993). Research finds the most frequent professional uses of computers are associated with teachers' day-to-day work such as making handouts and keeping records rather than instructional uses (Becker, Ravitz & Wong, 1999). Many workshops that prepare teachers to integrate technology pay little attention to the connection with subject areas (Survey on professional development and training in U.S. public schools, 2000; Zhao, 2002).

The review of the research of technology integration suggests that teachers' technology plans or technology uses in teaching are often influenced by teachers' existing knowledge and beliefs (Dwyer, Ringstaff & Sandholtz, 1991; Topper, 1998; Hughes, 2000). Hughes (2000) identified a learning path that four English teachers went through for technology integration in teaching. In this model, individual knowledge and belief as

well as personal experience are major factors that shape teachers' learning to teach with technology. This study provided opportunities to understand teacher technology learning experience at an individual level. Little is known, however, about whether and how learning experience beyond personal experience may impact teacher learning to integrate technology in teaching.

Topper (1998) examined teachers' technology learning and technology uses through a teacher technology support group. This study found teachers' plans for technology uses in teaching were mediated by their existing knowledge and beliefs. Though teachers learned to integrate technology through a technology support group, it was individual teachers' knowledge and beliefs which shaped and were shaped by their technology plans. This study seems to reinforce the claim that teachers are independent rather than interdependent (Little, 1990) in their technology planning even with a technology support group. In addition, teachers in this technology support group mainly discussed their technology plans. We still do not know what technology integration looks like in practice. Moreover, this group discussed in Topper's study has an additional factor for consideration as it was formed by a university researcher. Little is known about the effect of a voluntary teacher learning community on teacher learning to teach with technology. For the focus of this dissertation, the community is not set up by the researcher but an ISD professional development specialist.

In short, researchers have started to look at the processes through which teachers learn to teach with technology by either looking at the stages that individual teachers go through or at personal knowledge and experiences that shape teacher learning. Given the potential of professional communities to foster on-going teacher learning, will a learning

community, especially a voluntary teacher learning community, facilitate teachers' learning to teach writing with technology? Little is known about whether and how a teacher voluntary learning community might support teachers' learning to integrate technology in writing as well as cultural and structural conditions associated with a voluntary learning community that might impact teachers' learning to integrate technology.

Moreover, in current efforts of professional development in teacher technology learning, technical skills, technology potential and good attitudes of teachers were emphasized. Many workshops for teacher technology learning paid little attention to the connection between technology and curriculum and teaching (Zhao, 2002). As a good teacher needs to know more than the subject matter to teach effectively, merely "training" teachers to use technologies is not sufficient for them to know how to teach effectively with technology (Becker, 2000). However, education and research communities still lack knowledge on what technology integration with a subject-specific focus looks like in practice and what teachers need to know in order to teach effectively with new technologies. As it is important to attend to both content and forms of professional development (Ball & Cohen, 1999; Wilson & Berne, 1999) for effective teacher learning and teaching, it is also important to understand what teachers need to know to integrate technology in a subject area and how they might have learned it through a voluntary teacher learning community.

Shifting theoretical lenses for teacher learning

Current attention to professional communities as places for teacher learning reflects a historical shift in the conceptualization of teacher learning. Education reforms call for teacher change, and teacher learning opportunities are important to facilitate the change processes. When behaviorism was the dominant force of influence in 1950s, educators believed that teacher learning should focus on modifying behaviors and skills of teachers to improve students' learning outcomes (Clark, 1989). Focusing on changing teachers' classroom behavior ignores teachers' thought processes that drive their actions. Therefore, teachers are seen as the targets of changes through passively implementing programs designed by others. Richardson (1990) comments, "the teacher-change literature focuses on teacher behaviors, and specifically on behaviors identified within a particular program. Thus the question of what teachers do and whether they change are addressed within an evaluation framework of pre-and-post program or mandated implementation" (p.12).

The focus on teacher learning has shifted from teachers' behaviors to teachers' thought processes. This is influenced by Piaget's cognitive theories, which argue that psychological development involves changes in the structure of thoughts. The assumption is that changes in behavior must be accompanied by changes in cognitions (Piaget in Miller, 1993). Under this perspective, individual teachers' knowledge, beliefs, and mental processes rather than their behaviors are the target areas for teachers' learning and changes (Richardson, 1996; Borko & Putnam, 1996). This body of literature provides evidence that teachers' experiences and personal biographies shape and are shaped by what and how they learn to teach. However, research on individual teachers' thought processes often leads to an idiosyncratic view of teachers, one that assumes teachers

teach based on who they are (Richardson, 1990; Putnam & Borko, 1997). Due to the limitation of the idiosyncratic view of teacher learning, Richardson argues that a new framework is needed to look at teacher learning, in which "practices and ways of thinking outside an individual teacher's own experiences should be introduced into the dialogue" (p.14). Recent attention to Vygotsky's sociocultural theory (1978) provides an alternative perspective to view teacher learning. Under this perspective, others, especially experienced others, play important roles in learning and development of an individual.

In the Vygotsky's sociocultural perspective, knowledge is not considered as individual property but is distributed and constructed through social interaction in a "community of practice" (Lave & Wenger, 1991; Cobb, 1994). The view of knowledge as distributed, situated and socially constructed highlights the importance of others (Vygotsky, 1978) as well as social and cultural context in the process of learning (Brown, Collins & Duguid, 1989). According to Vygotsky, any higher psychological function in cultural development "appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological), and then inside the child (intrapsychological)" (p.57). An experienced other plays a vital role in development of the less experienced. Learning, therefore, is a process of participation and enculturation to discourse and practice of a particular community. "A community of practice is an intrinsic condition for the existence of knowledge ...Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning" (Lave and Wenger, 1991. P.98). In a study of high school teaching, McLaughlin and Talbert (2001) found teacher professional communities served as psychological tools that mediated teachers' thoughts and practices through enculturating them into knowledge,

values and social norms of the community of teaching practice.

Cognitive and sociocultural perspectives are two major theoretical lenses scholars employ to explain learning and development. The cognitive perspective emphasizes how individuals make sense of the world in a specific social context while the sociocultural perspective stresses the importance of the influence of social and cultural contexts in the learning experience of individuals. These two perspectives may be complementary to each other in explaining learning and development (Cobb, 1994). Rogoff (1995) further classifies learning that occurs at the sociocultural level into learning at community/institutional, interpersonal, and personal planes. To avoid dichotomizing learning as social versus individual, she argues that learning at different planes is interdependent and consists of the whole socialcultural activity instead of separate practice. "It is incomplete to focus only on the relationship of individual development and social interaction without concern for the cultural activity in which personal and interpersonal actions take place" (p.141).

With the regards of teacher learning to integrate technology in teaching, many have explored the impact of teachers' knowledge and beliefs on their attitudes toward technology as well as their uses of technology in teaching. Little is known about teacher learning to integrate technology in a subject area through a voluntary teacher learning community. This study therefore focuses on understanding teachers' learning experience especially through their interaction with other teachers.

However, I do not ignore the influence that teachers' beliefs and personal experience with technology may have on their learning to teach with new computer technologies and how they make sense of new ideas about teaching and student learning

because the sociocultural and cognitive perspectives that I employed here may be complementary to each other. Thus, this study will attend to learning opportunities occurring at both individual and social planes to account for teacher learning. Learning opportunities at social planes include a) chances to learn through interacting with teachers in this professional community as well as b) chances to learn through interacting with other professionals in a broader education community. Learning opportunities at individual planes refer to learning opportunities that occur when a teacher a) makes new senses of teaching and learning by his/herself without interacting with other teachers and professionals, or b) appropriates what they have learned in social planes. Therefore, my research question "how have teachers learned? " in other words, is "what learning opportunities, at social and individual planes, of this professional community have affected teacher learning experience?"

Research questions

Literature on teacher learning reviewed so far addresses the importance of learning communities as alternative means for teacher learning and development and calls for the attention to content and processes of social interaction as well as cultural and structural conditions that foster social interaction for the purpose of teacher learning.

In the domain of teacher professional development for technology integration, most of these studies focus on the influence of teachers' knowledge and beliefs as well as their personal experience on their learning to teach with technology. Little is known about how teacher learning experiences, especially through a voluntary learning community, might impact teacher learning to teach with technology, and the cultural and structural

conditions that affect the formation and development of this voluntary teacher learning community. In terms of the content of teacher learning to integrate technology, technical skills are the typical focus of teacher learning in a workshop model of professional development (Little, 1993). However, technology itself is not a subject of learning in this study. Teachers were asked to integrate technology in writing instruction. Technology integration in this study refers to the use of computer technologies in the teaching and learning processes of subject areas, in this case writing. What teachers need to learn to integrate technology beyond learning technical skills has not received attention. If technology is instrumental instead of the substantive thing to learn, what is important for us to consider about the content of teacher learning to integrate technology? Just as the work that exhorts alternative means of teacher learning is written theoretically and normatively without an empirical basis, research that is calling for connecting technology, curriculum and teaching (Zhao, 2002) for teacher learning does not provide images of how such connected technology integration looks in practice. So it is important to explore what teacher learning to integrate technology in a subject area through a voluntary teacher learning community may look like in reality. Moreover, this study does not try to evaluate the effectiveness of this voluntary teacher learning community, but to understand the role of a voluntary teacher learning community on teacher learning about and with technology from teachers' own perspectives. Therefore, I developed four research questions to examine how teachers account for their learning experience around learning:

1. Why did teachers come to learn to integrate technology through this voluntary teacher learning community?

2. What did teachers learn? In other words, what were the substances of learning for teachers to integrate technology in writing? And what were the learning outcomes of these teachers through this voluntary teacher learning community?
3. How did they learn and change? In other words, what learning opportunities, at social and individual planes, of this learning community affected teacher learning about and with technology?
4. What factors stood out as necessary for teachers' learning about and with technology through this voluntary professional learning community?

A teacher learning community for technology integration

In order to understand the role of a professional learning community on teacher learning to teach with technology, I conducted a qualitative study involving five elementary teachers from five school districts and a professional development developer from the Intermediate School District (ISD). These teachers formed a technology support group under the leadership of Nancy, the ISD professional development developer.

The group was started in 1998 when Nancy won the Tomorrow Technology Innovation Grant, a grant that encouraged teachers to integrate technology in teaching. Nancy's project was called "Young Authors Embrace Technology in Writing." Nancy called for participants from the school districts that the ISD served to implement this technology integration grant. Seven elementary teachers were selected from a pool of 25 teachers who were the winners of Goal 2000 Internet Computer in the previous year. Three, who came from the same school, worked together in a multiage group of first and second graders. The other four teachers came from four other school districts. Two of

them were fourth grade teachers, and the other two were first grade teachers. The five teachers I interviewed represent the five districts that the ISD served. The teachers received hardware, like scanners and digital cameras, and KidPix software as part of the Nancy's Tomorrow Technology grant. They all knew Nancy through various ISD activities but they did not know each other well until they worked together on Nancy's project. These teachers became friends after meeting and working with each other for three years. In the first year, these teachers recalled that they met five to six times during the academic year to figure out how to integrate technology in student writing. In the second year, they were asked to present their projects at professional conferences and workshops. They buddied with each other and met occasionally either with the buddy or with the group to prepare for the presentations. In the third year, they were actively involved in training other teachers to integrate technology in teaching either in their own school districts or at the ISD.

When I first met this group of teachers during the presentation time in a summer workshop of technology professional development at the end of the second year (2000), it appeared to be the kind of teacher learning community that I had been seeking. These teachers told me they had come together voluntarily to learn to integrate multimedia in writing. Moreover, this group seems like a learning community based on the criteria given by Wenger (1998). Wenger identifies three criteria to decide if a collection of people would be recognized as a community: if they involve a) mutual engagement, b) a joint enterprise, and c. a shared repertoire. Mutual engagement refers to an aggregate of people who engage in actions and negotiate the meaning of actions with one another. Joint enterprise means the process to carry out the goal of mutual engagement is

determined by the negotiation of the participants. A shared repertoire refers to a repertoire of resources and practices that is shared among participants through the joint enterprise toward the common goal. Based on these criteria, this teacher technology support group is a learning community because participants of this group engage in a joint enterprise of learning to integrate technology in writing instruction, and they share a repertoire of ideas and resources as they work collaboratively to integrate multimedia in writing in addition to a shared repertoire of teaching practices as elementary teachers. Since the focus of this learning community is on learning to teach with technology, I call it a teacher technology support group or a teacher professional/learning community.

While these teachers formed a learning community, they each brought their learning needs and experience to this group in ways that affected their learning and their identities in the group. Jenny, Becky, and Sandy became the main characters of chapters in this dissertation. In addition, Lucy and Margaret were participants of this group. I draw on their experience to identify patterns and themes on teacher learning in this learning community. Kathy and Betsy, the two co-teachers of Jenny's multiage group, only participated in the group for the first year and were not available for my study. However, they were frequently referred to by the teachers in this learning community. Nancy, the coordinator of this teacher technology support group, served as a resource person for me to understand the background as well as the activities of this learning community.

The structure of this dissertation

This dissertation consists of six chapters. In this first chapter, Introduction, I combine the problem statement and literature review together to lay out the background

of my investigation. In the second chapter, Methodology, I describe the methods and strategies I employed to do the research. The following three chapters are cases of three teachers. In addition to discussing the content of their learning, I use each case to highlight the themes of how teachers had learned. These themes are both individual and collective views. Chapter 3, "Jenny's learning," explains why sharing is important for these teachers. Chapter 4, "Becky's Learning," discusses why "support" is important and analyzes many different forms of support. Chapter 5, "Sandy's Learning," accounts for why "stepping out of comfort zones" is a prevailing outcome of learning in addition to changed beliefs and behavior through this professional learning community. In the last chapter, I draw conclusions and discuss the implications of this research for education theory and practice.

Chapter 2

Methodology

Research design

My goal in this study was to examine teachers' experience of learning about and with technology through a voluntary learning community. I studied five teachers and a professional development specialist, who were working together to integrate technology in a literacy project for students. To understand the role of a voluntary learning community on teacher+ learning to teach with technology, I developed four research questions to guide my investigation: 1.Why did these teachers come to learn to integrate technology through this voluntary teacher learning community? 2. What did teachers learn? In other words, what were the substances of learning for teachers to integrate technology in writing? And what were the learning outcomes of these teachers through this voluntary teacher learning community? 3. How did they learn and change? In other words, what learning opportunities, at social and individual planes, of this professional community affected teacher learning about and with technology? 4. What factors stood out as necessary for teachers' learning about and with technology through this voluntary teacher learning community? In this chapter, I will discuss the rationale of my design, the kind of data I collected, the methods of data analysis, my choice of specific teachers who became focus cases, and how I organize the presentation of each case.

My focus on understanding teacher learning through this voluntary learning community from their own perspectives was influenced by particular theoretical underpinnings. I adopted both sociocultural and cognitive perspectives to understand

teacher learning. Social perspectives of learning view learners as active makers of knowledge through interaction with others in social and cultural contexts (Putnam & Borko, 1997). Such visions of teacher learning are missing in traditional professional development programs, where teachers are viewed as passive recipients of theories and techniques from outside experts (Little, 1993) and are evaluated in pre-and-post programs (Richardson, 1990). So it was very important to understand what sense these teachers made of their learning, mediated by their participating in this voluntary learning community, rather than imposing my interpretation of what they have learned. I wanted to understand teachers' views. Qualitative methods, which focus on understanding the meaning-making from participants' own perspectives (Erickson, 1986), were the most direct way for me to elicit the views of the insiders.

I see a cognitive perspective as complementary to a sociocultural perspective of learning because of the roles that knowledge and beliefs play in the process of learning. Teachers' prior knowledge and beliefs impact their learning to teach (Borko & Putnam, 1996). As teachers' knowledge and beliefs are inseparable from experience (Lortie, 1975) and personal biography (Clandinin & Connelly, 1986), I also recognize the importance of teachers' experience and personal biographies in learning to teach. So I care about who these teachers are as people with a history, people who draw on their experiences and prior knowledge to act and make sense of the world. Thus, in each case chapter, I will introduce biographical backgrounds of these teachers because their backgrounds are important to understand why they had the kind of learning experiences they had. I begin each case chapter with a description of each teacher's history of learning to teach with

technology. I believe that who they are and what their experiences are will help me understand their learning experience through this voluntary learning community.

Data collection

I wanted to understand the teachers' decision to join this voluntary learning community, their biographical background, and what and how they learned. In qualitative research, interviews are more direct methods than observation to elicit people's views (Bogdan & Biklen, 1992). I interviewed five teachers (Becky, Jenny, Lucy, Margaret, and Sandy) and Nancy, the ISD professional development specialist. Kate and Betsy were team teachers in Jenny's multiage group. Though they were not the participants of this study, the teachers I interviewed often referred to them.

I conducted three interviews with each of the four teachers and with Nancy. Each interview was designed to attain different goals. I employed the strategy of a semi-structured interview in which I asked open-ended questions (see Appendix 1) to elicit participants' views. The first interview was designed to get the background information of these teachers because I recognized the roles teachers' experiences, including their prior knowledge and beliefs, play in their learning to teach. When learning about their biographies, I specifically asked their stories on learning to use technology in teaching, because technology is the initial subject of learning of this teacher learning community.

The second interview was focused on getting the teachers' views on their learning experiences through this voluntary learning community. In this interview, I paid close attention to their accounts of what the group made possible: in other words, what they learned through this group. I also tried to discern different sources that impact their

learning, such as other teachers in the group, Nancy, other professionals, and so forth. The third interview was a follow-up interview in which I asked teachers to clarify some points that were unclear from the first two interviews. I also used the interview analysis strategy re-interview (Kavle, 1996) to have the subjects confirm or disconfirm what they thought about my interpretations of their learning. Though each interview was designed to get different information, questions in each interview were not mutually exclusive. I repeated questions so that I could check for the consistency of the answers from the interviewees.

I observed the activities of this voluntary learning community three times before I started interviews in order to get myself familiar with the setting and the teachers and to develop interview questions. When I visited these teachers, it was the third year that they had worked with each other. The primary goal of their meeting had shifted from learning to integrate technology in students' writing in the first year, to training other teachers to integrate technology in teaching in the third year. From my sociocultural perspective, I wanted to learn how teachers interact with and learn from each other in a voluntary community. However, full participant observation (Hammersley & Atkinson, 1998), which means the opportunity to observe how these teachers interacted with and learned from each other to integrate technology in writing, was not possible because I did not meet them until they had already completed that phase of the work. When I came to visit them, it was the third year of their meeting when they helped Nancy to train other teachers of ISD to integrate technology. The data from the observations of the group activities I was able to do served as a source for the development of my interview questions as well as crosschecking the patterns of themes I identified across these

teachers (Yin, 1994). These visits also helped me to familiarize myself with these teachers' work and develop rapport with them.

The data from interviews were complemented by three one-time classroom observations in the classrooms of Jenny, Betsy and Lucy. Classroom observation at Sandy's class was not possible because she had gone on to teach in a middle school by the time I conducted classroom observations. The purpose of classroom observation was to get multiple sources of evidence and to crosscheck the patterns and themes each teacher identified in the interviews (Yin, 1994). The classroom observation was done before the third interview to clarify and verify what each teacher told me during the first two interviews. For example, Becky claimed that one way she integrated technology into her teaching was using a big TV monitor to display "the problem of the day" to her students. So in my observation, I looked for the ways through which Becky used the big TV to demonstrate what she said in the interviews. The observation also helped me understand what she meant by "the problem of the day." The problem of the day during my visit was: "Six ducks swim in a tank. Five ducks sink. How many ducks still swim?" In the second interview, Becky also talked about how she enhanced her writing instruction by appropriating the strategy "conference with students individually" from Kate and Betsy, two colleagues of Jenny. In her class, I observed two different ways Becky conferenced with students individually. So the observation provided concrete images of the meaning of "conferencing with students individually."

Data analysis

Data analysis occurred throughout the period in which I conducted interviews.

I employed several interview analysis strategies described by Kavle (1996). "On-the-line interpretation" was the strategy that I used in all these interviews to confirm or disconfirm my interpretations of the meaning the subjects describe during the interviews. "Re-interview" was another strategy that I employed in the third interview after I transcribed the first two interviews. I gave back my interpretations of the first two interviews to the interviewees for their comments on my interpretation of the patterns and themes that I identified from the interviews.

Since my inquiry was guided by both a sociocultural perspective and a cognitive perspective of learning, I attended to how teachers account for their learning from different sources in each interview. For learning that occurred at social planes, I gave the teachers probes to discern the source from which they learned. When they told me they learned from the group about how to figure out technical troubleshooting, I asked them who (the leader, the teachers, the tech guides, etc.) helped them to learn. When they told me they learned the idea from their own teaching, I tried to figure out if they got this idea through reflection or by appropriating the ideas they got from other teachers in the group.

After each interview, I transcribed and then coded the data. Instead of bringing preconceived coding categories to the data, I coded the interviews of Becky, Jenny, Sandy and Lucy with categories and modes of perception emerging from the data, because I thought finding out teachers' perspectives was important. I think qualitative methods are the most suitable ways to analyze data because qualitative methods aim at discovering categories and modes of perceptions of those being studied (Singer, 1995). I employed the strategies of "meaning condensation" and "meaning categorization" (Kalve, 1996) to identify a list of categories from the data. Then I clustered the initial list

of codes such as "student writing strategies" "student thinking process in writing" "student writing outcomes" into a larger category of "student learning". I first coded the data of each teacher to identify the patterns and themes within this teacher. Then I put the clustered codes of each teacher together to identify the patterns and themes across teachers.

To control my subjective bias, I gave my interpretations to subjects for their responses. Also I shared some of my coding and interpretation with my dissertation committee members through individual meetings and two committee meetings during the course of my analysis. So the coding categories and meaning interpretation were revised continuously. At the committee meetings, we debated the meaning of some categories that I had difficulties distinguishing from one another like the meaning of "learning opportunities" and "learning". The committee meeting helped me to achieve an agreed-on meaning of certain codes like "learning opportunities" and "learning". Here "learning opportunities" refers to chances to gain new knowledge and skills, which do not necessarily occur at the mental level. "Learning" means that learners not only gain new knowledge and skills but also experienced changes at the mental level. By getting comments on some of my coding and interpretations from multiple interpreters, I achieved intersubjective agreement for some coding categories and interpretations (Kalve, 1996).

I employed an embedded multiple-case research design because evidence from multiple cases is considered more robust than the evidence from a single case (Yin, 1994). In this study, I focus on describing the learning experiences of three teachers though I interviewed five teachers and Nancy. I decided which teachers to choose for the

case studies only after data analysis was completed. I chose Becky, Jenny and Sandy because each represented salient themes I identified from data analysis. Though I transcribed and coded Lucy's interviews, the initial data analysis showed that Lucy's case would produce similar rather than contrasting results after I wrote up three cases. So I did not include Lucy's case as a full chapter because three cases are sufficient to check if replication of results has occurred (Yin, 1994). Margaret, the fifth teacher I interviewed, did not become another case because I only interviewed her once, on September 11, 2001. Due to the tragic events of September 11, it was hard to focus on interview questions completely without being distracted. However, Lucy and Margaret were valuable sources who informed my interpretation. I still drew on the data from Lucy and Margaret to confirm and disconfirm the patterns and themes that I identified (Erickson, 1986).

All five participants in this study were elementary school teachers from five rural school districts in a Midwest state. These were not affluent schools. Each school had more than 40 percent of students that were qualified for free or reduced lunch. Though these teachers became technology leaders in their school districts when I interviewed them, they did not teach in a technology-rich or resource rich school context. Table 2.1 summarizes the characteristics of the participants and the context in which they taught.

Table 2.1 Participants and Context Characteristics (School Year 2001-2002)

Teacher; Grade Level	Years of teaching	Percentage of students for free or reduced lunch	Numbers of Computers in classroom	Availability of computer lab
Becky 1st grade	10 years	47.8%	4	Yes
Jenny 3rd and 4th multiage	10 years	41.9%	3	Yes

Lucy 4th grade	10 years	54.3%	2	No
Margaret 1st grade	N/A	32.1%	2	Yes
Sandy 4th grade	22 years	43.7%	N/A	Yes

Nancy, my initial contact, was a valuable resource for me to understand teacher learning through a voluntary community. I interviewed her three times. I treated her not as a subject of inquiry but as a crucial part of this teacher learning community. She is an extraordinary leader and she plays an important role in teachers' learning experiences. But I conceptualized this study as what ordinary teachers can learn in a professional learning community from the perspectives of learners, so I did not document her role as an independent case. Instead, I documented her role as it was understood by the teachers, and I used her as a source of information. Just as the data from Lucy and Margaret, I treated the data from Nancy as a valuable resource in supplementing data, confirming and disconfirming patterns I discovered.

How My Personal Experience Influences This Study

As a qualitative researcher, I do not claim to hold a neutral position when I started this inquiry. My pursuit of the role of teacher learning community on teacher learning and development was rooted in my past experience as an EFL (English as a Foreign Language) teacher in China and in my intellectual struggle with the issues of teacher learning through a group/community format. Being a reform-minded English teacher in a centralized educational system, like many other reform-minded teachers in China, I struggled to find ways to voice my concerns in teaching. My five-year teaching

experience told me that novice teachers could hardly voice their concerns over teaching and student learning let alone make changes in traditional text-based grammar-centered teaching methods. My graduate learning and inquiry at MSU did not provide me with solutions to the problems that I used to have, but rather complicated my original concerns. While mandated curriculum and occupational hierarchy (based on seniority) impede teachers in China from taking initiatives in teaching reforms, the egalitarian status and teaching autonomy that many Chinese teachers have strived for seem as problematic in the teaching culture in the U.S. Collaboration, as an organizational structure of practice, is often taken for granted in China (Paine and Ma, 1993) while collaboration and professional communities are seen in the U.S. as reform initiatives to deprivatize teacher practice, benefit instruction and student learning, and enhance teacher professional growth (Little, 1982 & 1987, Newmann & associates, 1996). My intellectual struggle and personal experience led to my skeptical stance toward the role of a teacher professional community on teacher learning, and prompted me to conduct a careful investigation to figure out whether and how a teacher voluntary learning community would impact on teacher learning and development.

As I discussed in the section on data analysis, I employed various strategies to control my bias. I asked open-ended questions in the interviews to open myself to what these teachers had to say. I tape-recorded interviews. I gave my interpretations to these subjects for their responses. Also I collected data from multiple sources and shared my findings with multiple interpreters to reach intersubjective agreement and explictly document the process of data analysis (Kavlve, 1996). In short, I tried systemetically to diminish my personal bias in this research.

In the next three chapters, I present case studies of three teachers. Though I intend to examine the role of a voluntary teacher learning community on teacher learning to integrate technology in writing, I also recognize the importance of teachers' experiences on their learning. Given the conceptual framework I draw on, I start each chapter with a background portrait of these teachers focusing on their prior experiences, their perspectives on technology and teaching, how they entered the group, and how they thought they learned from it. I wanted to see these three teachers individually as well as collectively. So the organizational structure of each case is the same structure but I highlight those dimensions that are important to each teacher as an individual.

Chapter 3

Jenny's Learning: A Case of Sharing

In this chapter, I describe what learning opportunities Jenny had as well as learning and changes that Jenny had experienced. I also identify the factors that sustained Jenny's participation in this teacher learning community. To understand Jenny's learning, I begin with a background portrait of Jenny's teaching and learning, focusing on her teaching style and history of her experience with technology in teaching. I then describe and explain what learning opportunities Jenny had as well as what she learned and how she changed through participating in this teacher learning community. Though my first research question is why Jenny came to learn with this teacher learning community, I discuss the reasons for Jenny's participation in this teacher learning community in the section on conditions that stand out in her learning because it is difficult to separate her reasons to join the group from the conditiolns that were necessary for Jenny's learning in this setting. Many times, reasons teachers gave were the conditions for teachers' participation in this teacher learning community.

Jenny' background

Jenny, an elementary school teacher with 10 years teaching experience, now teaches a multiage group of 3rd and 4th graders at Red Cedar Elementary (pseudonym). When she first joined Nancy's technology support group three years ago, she was a special education teacher of a multi-age group of 1st and 2nd graders.

When I first visited Jenny's classroom one afternoon in November, Jenny was introducing the concept of paragraph indention to a group of students in the reading corner of the classroom. She demonstrated a text with a few paragraphs through an overhead projector and asked students to figure out the rule to start each paragraph. After one student shouted aloud his notice of spacing at the beginning of each paragraph, Jenny gave the official name of the term used by this student as "indented paragraph."

This episode reminded me of what Jenny told me, that she was a traditional teacher who was a "textbook–oriented " person. When she first started to teach, Jenny thought a teacher would play a central role in teaching: "At that time, I had a very traditional view of education: teachers taught and students learned. I (have) changed a lot since then."

Now Jenny is more aware of students' active roles in learning process. She tries to do "project-based" learning and to be a guide for student learning: "I knew kids all learn differently, but my mindset is still a textbook-oriented person. I am getting away from that now and trying to do the project-based learning, with individual goals, knowing this student may not be achieving the same rate as other students." She said she was more flexible with student learning, especially in reading and writing process. That afternoon, I observed how Jenny helped students edit their papers. After she gave back writing assignments to her students, she went around students listening to each student's questions and gave individual suggestions. I also observed a lesson of social studies with a writing component indicating that she was trying out what she called project-based learning. During the social studies period, students were working on an American President project. They were asked to locate information about American presidents

according to the questions in a template that Jenny and her co-teacher gave them: the dates of the president, the state of his birth, and the historical events in that president's life. Students were divided into two groups. One group of students led by Jenny's colleague learned to find information from an encyclopedia. The other group of students, led by Jenny, went to the computer lab to find information on the Internet. This project of combining social studies and writing (which required students to develop skills of being selective, sense making, summarizing and reporting) may be an instance of what she meant from "text-based" to "project-based" teaching.

According to Jenny, these changes in her teaching were inseparable from her learning to integrate technology in students' writing through participating in the technology support group. Since technology integration was the major content of learning of this technology support group, it is helpful to review Jenny's experience of learning to teach with technology to better understand the learning and changes she experienced.

Jenny was afraid of computers and never thought about using a computer as an integral part of teaching when she first joined Nancy's project "Young Authors Embrace Technology in Writing" in 1998. At that time, she saw computers only for the purposes of games as well as drills and practices. She felt "panic" about using them in teaching.

> Originally stuff was just for the purpose of drill and practice. ...I think I viewed computers as important tools to practice what they need to practice. It was fun to do things with computers but I did not see it as an integral thing in education.

In addition, she worried computers would hinder the interaction among children. She thought they still needed the human teachers to interact with them.

I was not sure about the importance of education technology especially for elementary students. I thought they still needed a human teacher. They needed interaction with each other rather than the computer.

Even though Jenny had learned technology like the Internet from the classes offered at the ISD, she did not integrate it into her teaching because she did not have the confidence nor the ideas of how to use computers in teaching. She said, "Nancy taught those Internet classes. I was still a coward. I just did not have confidence to do it, or to know what use I could make of it in my classroom."

After working with Nancy's technology support group for three years, Jenny incorporated computer technology in her teaching in various ways. In writing, Jenny had her students create their writing with KidPix or PowerPoint through participation in the "Young Authors Embrace Technology in Writing" project. In reading, students were provided with software that could check their reading comprehension. In my visit to her class that afternoon, I saw two pairs of students work together in the two computers in Jenny's classroom, trying to figure out the answers to those true or false questions about the story they read. During social studies, Jenny asked her students to find out information about each American president either from the Internet or an encyclopedia. In short, Jenny changed from a teacher who was afraid of computers to a teacher who uses computers to aid teaching and students' learning in classroom.

Besides learning more about computers, Jenny gained new views of teaching and student learning and understood herself as a teacher better, which will be discussed in the following section of this chapter. Jenny attributed all her learning and changes that occurred to her in the past three years to this teacher technology support group. She said,

"By meeting with this group, it is the bridge (between) the class I took and the (technology) incorporation in my classroom."

Learning opportunities

Jenny valued various activities that she engaged in through this teacher learning community in the past three years, which provided her with ample opportunities to learn. These activities include opportunities to share technology skills, teaching ideas, and each other's integration projects; the opportunities to try out technology in teaching; the opportunities to attend computer classes and workshops offered by ISD; the opportunities to train other teachers to integrate technology in teaching; the opportunities to attend and present at professional conferences; and the opportunities to interact with each other through computer mediated communication (CMC) tools like email, yahoo instant message and list serves. Among all instances of learning opportunities and learning that I coded in the first two interviews, Jenny seemed to refer to some activities more frequently than others. Table 3.2 is a list of activities that provided Jenny opportunities to learn, and the frequencies that Jenny referred to them throughout the interviews.

Table 3.1 Learning activities and their frequencies

	Activities	Frequencies
A	Interacting with group members through talking, sharing and presenting projects to each other.	17
B	Trying out technology in practice.	3
C	Attending technology classes and workshops offered by ISD.	2
D	Training other teaches to integrate technology.	2
E	Attending conferences and making presentations	2
F	CMC communications	1

The frequency here denotes the number of occasions that Jenny talked about these activities rather than the frequency of these phrases. Take Jenny's learning the idea of an informational, non-fiction book from Becky's sharing of her Road Rabbit Project as an example. This is counted as one occasion of sharing even though she may use phrases like "talk" or "present" several times to describe this occasion of sharing. However, Jenny would talk about this event again later in the same interview or in another interview. Then I count it as another occasion of sharing in the places when this event was mentioned again. So the frequency of an activity means the number of occasions that this activity was discussed instead of the occurrences of the phases that described this activity. Though Jenny talked about each activity at different frequencies, the order of frequencies does not necessarily imply the order of preference that Jenny chose to learn.

For the strategy that Jenny referred to the most frequently, though she used different words like "talk", "share" and "present" to describe the strategy she chose to learn, the central theme of this activity is the sharing of ideas. Jenny said, "It was a kind of informal type of thing, it was not an actual presentation. It was just she started to talk about what she was doing. So it was kind of informal sharing of ideas".

Among all these opportunities, Jenny relied on them differently in different phases of the project. According to Jenny, sharing project ideas and tips for technical problem solving as well as trying out technology in practice were the two major activities that provided opportunities for Jenny to learn in the first year. In the second year, presenting her technology integration project at different professional conferences

became the emphasis. In the third year, training other teachers to integrate technology in their classroom became the central activity of that year.

Jenny reported that she was exposed to a wide range of topics through these activities. Table 3.1 shows a list of the topics that Jenny got a chance to talk about and think about:

Table 3.2 Topics exposed

Topics	Examples
Computer equipment	Computer, scanner, and digital camera.
Software	KidPix, PowerPoint, Yahoo instant message, and listserve.
Technical trouble shooting	a. How to load the software and run it right. b. Talking about technical problems and getting suggestions to solve them.
Instructional use of technology	a. How KidPix can be used in student writing. b. Learning the use of Yahoo Instant Message system to do a live weather chat about hurricane from Becky.
Teaching Ideas	a. Getting ideas on 4th grade teaching from Lucy and Sandy. b. MEAP preparation and different ways to do writing for MEAP.
Young Authors Project ideas	a. Learning the Road Rabbit project[1] from Becky. b. Getting the idea of students' group work in writing from Lucy. c. Getting the idea of doing a class book with KidPix from Margaret.
Teaching resources on the internet	Learning Mark Polo website, a good resource for teaching
Classroom management ideas	Ideas on classroom management for 4th grade.
Ideas on conference presentation	Brainstorm ideas for conference presentation with Kathy and Betsy.
Ideas on training other teachers	Brainstorm ideas of training teachers to integrate technology with Nancy and others

Being exposed to a wide range of topics, Jenny had ample opportunities to learn. As a result, Jenny changed her views and practices in the areas of technology, student learning,

[1] The Road Rabbit project developed by Becky is a project-based learning activity in social studies and language arts that allows students to take a virtual field trip with their mascot, the Road Rabbit.

and teaching. At the same time, she gained confidence and self-awareness as a professional.

What had Jenny learned?

Technology

Jenny gained many technical skills regarding computer hardware and software because her original goal to join this learning community was to get and learn to use equipment like a scanner and a digital camera, and the software like KidPix, PowerPoint and the Internet. She said:

> A lot of learning that comes from there (the group) is trouble shooting in terms of using software or the computer itself. We would come together, you know. 'I am having the trouble with this. Does anybody know what to do?' You know we are kind of going through that together.

In addition to learning technical skills, Jenny also got ideas about instructional uses of technology. Jenny learned from Becky that students could live chat to obtain the most up-to-date hurricane information with someone like Becky's sister in Florida through Yahoo's instant message system. Jenny's ideas of integrating Internet in teaching also came from Becky's showcase of her Road Rabbit project, a multimedia social studies project. Jenny took Internet classes twice before she joined this technology support group. But she did not incorporate the Internet in her teaching because she did not have ideas and confidence to use it in teaching. After she saw how Becky incorporated the Internet, email and KidPix in her Road Rabbit project, a social study project to have students learn about different states in the U.S., Jenny created a similar social studies project called the "cruising Coyote" project, which helped students to get

familiar with different states in the U.S. through searching for information on the Internet and having students present their findings with multimedia:

> So her (Becky's) plan was just to send the Road Rabbit around, and then send the information back and create a multimedia presentation. That was one of her projects that helped us to see different possibilities of how technology could be used, even though the whole project could be done without technology. The use of Internet, email, and multimedia, just adds another facet to the project itself. And during that time, it helps the children to learn that computers are not just for playing games, they are actually tools. That, I think, that was just my goal to get away from just (doing) games.

As a result of participating in Nancy's project with this technology support group, Jenny changed her views about computer technology and the ways she used technology in teaching. When Jenny first used computer technology in 1991, she mainly used technology for the purpose of "practicing the facts that they need to know" such as using a program on the Apple IIe computer for kids to practice multiplication, and using another program to divide words into syllables. Now Jenny had students create their stories with KidPix and/or PowerPoint to incorporate graphics and music to illustrate their stories. She found technology was an alternative medium for students to present their stories. "It is motivation, and [it is] just a different view of computers not as toys, and not for games. But they actually are there for work, and they can present their work in another mode." Once Jenny was worried computers would impede communication among teachers and students. Now she found students actually were able to collaborate with each other when they composed their writing with computer programs like KidPix:

> I hate to see them waste their time on drills and practice type of software. To me it is just a waste of technology. I want them to create. In this way, when they are actively creating, you can watch two children work together to create something. (That was) much different than having them take turns to answer a math problem. They have to learn to come to a consensus about what background they are going to have, what stamps they are going to use. There are a lot of decisions they have to make and agree upon when they work together and teach each other. That is an interaction, recognizing and valuing the skills and information of other children, like we talk about respecting other people. That [using Kidpix to create] brings it in.

With the opportunity to apply technology in teaching with this technology support group Jenny also found new ways to use computers in teaching. For example, Jenny figured out that PowerPoint could afford writers to write more than one ending for their stories so the readers could select their own endings for the stories. She presented this function of PowerPoint to her students, and allowed them more flexibility in writing their story endings:

> So when you use PowerPoint, you have a little bit more flexibility in (what) you can do. This year we presented the possibility to the children of doing the books where you actually made some selections on what page to go to the next. ...I presented to them the idea of selecting your own ending for the story, just showing them what PowerPoint could do. Because (with) KidPix, you could not do that. It was just illustrating.

As a result, two girls in her class created a riddle about a famous woman with PowerPoint so that they could ask readers to make a right or wrong choice. Another two boys created two different endings for their adventure story with PowerPoint.

In short, Jenny changed her views on technology in teaching as well as the ways she incorporated technology in her teaching through participating in this technology support group. The success of integrating technology in student writing allowed Jenny to see the potentials of technology in other curriculum areas:

> Getting to use the computer to create projects or to actually produce the end products, you see much potential in using it throughout the curriculum. ...It influences what we teachers see as a potential, how can we use computers in social studies, how can we use computers in science. What can we do in other areas and make great use of technology.

Student learning

Jenny was once a traditional teacher who viewed the teacher as playing the central role in teaching; now she sees students as active writers after participation in the Young Authors Embrace Technology in Writing project with this technology support group. Nancy's project not only required teachers to learn computer hardware and software but also asked teachers to integrate computer technologies in a student writing project of the ISD. When students wrote in a multimedia environment, their writing processes were visible to teachers. Jenny noticed a child in her class who previously had difficulties in writing but who now could illustrate her ideas with the graphics tools in KidPix. She found her students could create complex stories when they were able to

create multiple endings for their stories with PowerPoint. Jenny noticed her students' different learning styles when she saw how they wrote with KidPix or PowerPoint. She revised her assumptions that students were passive receivers of knowledge and started to pay more attention to individual students' learning styles and needs:

> ...My individual goal has changed. I know my mindset has changed. I knew kids all learn differently, but my mind set is still (that of) a textbook-oriented person. I am getting away from that now and trying to do the project-based learning and individual goals, knowing this student may not be achieving at the same rate as other students. There have been a lot of changes in my teaching style for whatever process and experience.

When Jenny thought about student learning differently, she changed her instructional strategies from text-based learning to project-based learning focusing on individual students' needs. For example, she gave students more options in writing their stories as I discussed in the early section.

Instruction

For Jenny, this technology support group served as a source of instructional ideas. In the third year she worked with this group, Jenny changed from a 1st and 2nd grade multiage special education teacher to a 3rd and 4th grade multiage teacher. She needed ideas on 4th grade teaching badly, but she had no access to 4th grade teachers in her building because she taught in a K-3 building. Since Lucy and Sandy were both 4th grade teachers, Jenny relied on them for ideas for 4th grade teachers. Through talking and

sharing with Lucy and Sandy, Jenny got a lot of general curriculum ideas about 4th grade teaching:

> The last few times we met, since I knew potentially I was going to be changed to the 3rd and 4th grade from 1st and 2nd grade, I talked to Lucy and Sandy 'OK, what would 4th graders do? What do you teach in 4th grade? How do you present this?' So we got away from the Young Authors (project) and just on general curriculum like 'how do you arrange a day? What kind of field trip do you take kids on?' This type of stuff was really important to me.

Jenny also learned new writing strategies from this group because Nancy's technology project was embedded in the context of writing instruction. Jenny got the idea of informational non-fiction books from Becky's showcase of her Road Rabbit project in a meeting where teachers were asked to share their projects with each other. According to Becky, the Road Rabbit was a project-based learning activity combining writing with social studies through which students could learn about different communities in the United States with a Road Rabbit, the mascot of her class, touring around the country. Becky had her students compile a travel book by incorporating KidPix Deluxe software, a digital camera and a scanner to report the information that they had learned from the Road Rabbit for the Young Authors project. After hearing and seeing what Becky did with the Road Rabbit project, Jenny contacted Becky for the detailed procedures of this project. Becky talked a little bit more about the project, and referred Jenny to the website and to the CD of the Road Rabbit project because it was submitted for the contest of "the best teaching practices." Enlightened by the idea of informational non-fiction type of writing from Becky's Road Rabbit project, Jenny created a similar project named the

Cruising Coyote project, which intended to increase her students' knowledge about different communities in the U.S. by sending the Cruising Coyote, the mascot of her school, around the country to collect information:

> ...She had submitted this project on a CD for the 'best teaching practice'. She also talked about it during some of our meetings. She talked about (how she was) doing it. I contacted her when we decided we wanted to do something similar. ...She said a little bit more, but actually directed us to her website. I think it was her website. But I know it was on a CD, too. It was a lesson plan of the whole project. So everything was spelled out really clearly. So we just looked what she had done, and used it from there.

Another strategy that Jenny incorporated in writing was having students create group products for the Young Authors writing project. Students used to create individual fiction books for the Young Authors writing project. In a group meeting, Jenny leaned from Lucy about the idea of using students' group work to create multimedia books. Jenny took Lucy's idea of group work and applied it in her own teaching. Sometimes Jenny asked her students to write together in groups instead of working on their writing individually.

As a result, Jenny incorporated the ideas of informational non-fiction books and group work into her students' Young Authors writing project:

> So we changed this year a little bit and did some more groups. Some of Young Author books were [done in] groups. Some were non-fictions. I think just thinking about getting into non-fiction area with technology, and using Young Authors as a

form for getting into non-fiction, helped us, helped me to start thinking other ways we could do, these other things we could do.

Besides, Jenny also extended her evaluation strategies because she had more clues about the quality of students' work when they wrote with multimedia. She gave students options to submit regular books or multimedia books and started to look at the multimedia piece that students incorporated in their writing in her evaluation:

> It is a different way of looking at, assessing what students have learned because they have the extra technology part we can look at and assess as well. It is a project, some of the kids do book reports, written book reports, and some of our kids do picture book reports. There are a lot of ways of doing book reports. There are a lot of different ways of doing projects, too. And technology (with a) computer is one way.

In short, this technology support group became a resource of instructional strategies for Jenny. She not only learned general instructional ideas about 4th grade teaching but also incorporated different writing strategies such as group work, and non-fictions books that she learned from other teachers in her teaching process. As a result, Jenny was more flexible with the ways that students did their projects and allowed them to work in groups to create their writing products. According to Jenny, "there have been a lot of changes" in her "teaching style". She transformed herself from "text-oriented teaching" to "project-based learning" as she paid more attention to students' individual needs and allowed them to express freely through giving them more options in writing their stories and story endings.

New professional roles

After Jenny integrated technology into the student writing process in her classroom, she was asked to take on two new professional roles. In the second year, Jenny was asked to present her project at a professional conference. She had never presented to a professional group and felt scared to present in front of other professionals. "Actually presenting to other adults is not very exciting." "It is kind of scary." In the third year, Jenny engaged in training other teachers at the ISD to integrate technology in teaching, a role that she never had before. With the enthusiasm the group generated, Jenny was able to take on these new roles and gained professional confidence:

> The enthusiasm I think that the group generated for what happened or what we could do in a presentation helped you to get over the fear level a little bit. And I think the same thing for training the teachers. You feel more confident when someone else is saying the same thing you were thinking. They agree with you. Then you feel more confident presenting it.

In sum, Jenny reported that she experienced tremendous growth through interacting with other teachers in this teacher learning community over the past three years. She came to learn technology, but ended up with learning a range of things more than technology. She said: "The first year I think 'how to use this stuff [technologies]'. Now I think about how to incorporate this stuff [technologies] and how to expand learning through technology. That is growth." She not only expanded her repertoire of technology use in teaching but also revised her assumptions on student learning and changed her writing pedagogy from a traditional textbook-oriented teacher to a teacher

who paid more attention to individual students' needs in their writing process. She also gained confidence in teaching and took on new professional roles.

How had Jenny changed?

Sharing is the key for Jenny's learning

From Jenny's account of her learning about technology, teaching and student learning, sharing is the key for her learning and changes not only in terms of the numbers of occasions she talked about it but also in the depth with which she described it. Looking across the cases, it was not only Jenny who valued sharing so much. Everyone in this learning community highly values sharing as an important means for learning. There are three aspects of sharing that the teachers valued in their learning: the sharing of technology skills, the sharing of ideas and materials for integration and instruction, and the sharing of personal aspects. In this section, I will not only discuss the role of sharing in Jenny's learning but also highlight the dimensions of sharing that other teachers valued in their learning so that a spectrum of meanings about sharing across cases will be revealed.

According to Jenny, they shared a lot of technical skills and technical trouble shooting because technology was the original content of learning of this technology support group.

> A lot of learning that comes from there is trouble shooting in terms of using software or the computer itself. You know 'I am having the trouble with this. Does anybody know what to do?' . . .You know we kind go through that together.

However, Jenny would not integrate technology in teaching if she only learned technical skills. As a teacher, what she needed were the ideas for integrating technology into her teaching:

> A lot of them just came from talking with the group about possibilities, you know, 'how can you incorporate it in this area?' To me that is what I need. I become familiar with how to use the equipment. I passed the need to learn 'how to use the equipment'. Now I need to get more ideas or how to use these equipment as teaching tools or as presentation [tools], that type of thing.

From sharing each other's projects, Jenny got concrete ideas about technology integration and got started on her own project.

> I think the sharing of ideas about what we were doing in different projects the first year was very important. That was why we got together for this new group, to share ideas, because when you first started into the project, you were just kind of overwhelmed. You did not know what was expected of you, and what direction you could go. Usually, when you got the project idea in mind, then you can get started on it.

Not only were the sharing of ideas important for Jenny's learning but also the sharing of materials. Ideas are often abstract, which leave much room for interpretation. Materials sometimes can instantiate the ideas. Teachers in this group always shared with each other the materials they created. Becky shared her lesson plans forthe Road Rabbit project stored on the Internet and CD. Jenny was able to see what and how Becky did the project, which was very important for Jenny's creation of the Cruising Coyote project. Unlike some researchers who criticize the negative role of informal sharing among

teachers for teacher learning (Lorti, 1975; Hargreaves, 1992), Jenny valued sharing with teachers in this learning community. Computer technologies are new instruments to facilitate teaching and learning, which many teachers have not experienced before. When the content of learning (technology integration in writing in this case) is so new, sharing seemed to be of vital importance for learners to get ideas and strategies. It was through sharing that Jenny got the concrete ideas and strategies to integrate multimedia into the Young Authors writing project.

Besides the sharing for technology integration, Becky especially valued the sharing of writing strategies. Becky learned strategies like "setting up the goal," "conferencing with students individually," and "doing kid's journal" from the group and implemented them in her own teaching. The sharing among teachers in the group expanded Becky's repertoire of writing strategies.

Sandy valued the sharing of personal aspects with each other in addition to the sharing of technical skills and instructional ideas because she experienced personal growth through sharing:

> I do enjoy it [the group]. We share other things, not just technology. We share our music, we share our... 'Oh, what are you doing? How is your family?' not just technology. There are a lot of personal things there, a lot personal growth, too.

The sharing of personal aspects also helped to build friendship among teachers, which motivated Sandy to keep coming to learn with the group. She said, "As we became friends, as we became support for each other, I guess we noticed the value of having that support for each other. We thought 'we should keep this going, we should not stop.' "

Like Sandy, Jenny also thought it was "fun" to learn with friends. Friendship was another possible reason for these teachers to continue to meet with this group.

Learning is a cyclical process

Though sharing is the key for Jenny's learning, Jenny always depends on a set of activities for her learning and changes. Take Jenny's creation of "Cruising Coyote" project as an example. The birth of the "Cruising Coyote" project, Jenny's project, was a result of a series of actions: talking, sharing, imitating, applying in practice, reflecting, and revising. In a group meeting in the first year, Jenny got the idea of creating multimedia non-fiction books through Becky's presentation of her Road Rabbit project to the group. After seeing Becky's presentation, Jenny contacted Becky for detailed ideas and procedures on how to do the Road Rabbit Project. Becky showed the lesson plan on her website to Jenny and Jenny's colleagues and also provided them with her Road Rabbit lesson plan in a CD.

Jenny did not stop with the idea she got from Becky. She took the idea and the materials back and created a Cruising Coyote project incorporating email, Internet and KidPix. From getting the project idea from Becky during the time of sharing to trying out a similar product in her classroom, Jenny's engagement in various activities of this technology group helped her to appropriate the idea of multimedia non-fiction books (Rogoff, 1995).

Moreover, Jenny's Cruising Coyote project was not simply a replica of Becky's Road Rabbit project. Jenny framed the Cruising Coyote project as a project to promote student skills in reading, writing, math and science (See Appendix II), while Becky used

the Road Rabbit project to promote student skills in reading, writing, geography and the Internet (See Appendix II). Jenny told me she intended to do the Cruising Coyote project again next year through adapting Becky's lesson plan to include learning math and science skills. Reflecting is another important step in Jenny's creation of Cruising Coyote project. It is a process of adjusting and modifying Becky's project based on the situations in Jenny's classroom. She said,

> Anybody can just take someone else's lesson plan and bring it into the classroom. But it does not mean it is going to work as well as if the other teacher did. So you get that from some of the experience, from knowing the kids in your class and knowing the resources that you have available, and adjusting, modifying and maybe enhancing whatever was done before. I think, the opportunity here is to take the basic idea, and not use word for word, but be able to think about it yourself, and continue from there. I think you learn through the start process by taking a second look at your classroom, your resources and your own teaching style. It may or may not be different from the person who created the lesson plan. So, anytime you have to just reflect, I think it is a valuable learning opportunity. You do not always come up with things from scratch; but you do have to think about what it is and what you want kids to learn. Your focus might be different from someone else's same project.

Jenny's reflection on the process of her appropriating Becky's project is constructive reflection (Schon, 1987), which is an important step in professional education. "When practitioners respond to the indeterminate zones of practice by holding a reflective conversation with the materials of their situations, they remake a part of their practice

world and thereby reveal the usually tacit process of world making that underlie all of their practice" (p36). From this view, Jenny makes senses of her own teaching through reflecting how she adjusted and modified Becky's lesson plans in her instruction. Therefore, the process of Jenny's learning to create Cruising Coyote project seems non-linear. As teachers were frequently required to share their projects with each other during the group meetings, Jenny kept learning about Becky's project in different meetings. Thus, Jenny's learning seemed to be an iterative or cyclical process in learning, doing, reflecting, more learning, and more doing, and more reflecting.

Conditions for learning and changes

Jenny integrated technology in teaching and transformed herself from a traditional textbook-oriented teacher to incorporating project-based learning in her teaching through her engagement in various activities of this learning community. From Jenny's learning and changes, it seems that incentives, a common goal, various opportunities to learn, and the support from the leader and the peers are necessary conditions for her sustained participation in this teacher learning community.

Incentives

Incentives were necessary to attract Jenny's participation in Nancy's Young Authors Embrace Technology in Writing project. According to Jenny, she was first attracted to Nancy's project to get a scanner and a digital camera and learn to use the equipment: "At that time, I did not think 'integration ideas' but (wanted to get) more

knowledge on using software, using the scanner and using the digital camera, maybe the technical part, 'how do you do this?' "

However merely being offered equipment and provided with technical support were not sufficient for Jenny's technology integration in teaching. Software like KidPix provided Jenny a graphic program. It does not specify what educational problems it will solve. If Jenny had only been provided with generic technologies, it is unlikely she would integrate technology in her teaching. For example, Jenny reported that she attended the Internet class twice before she joined the Young Authors Embrace Technology in Writing project. But she did not use Internet in teaching until she saw how other teachers like Becky used Internet in teaching, and this was also true for Jenny's integration of KidPix and PowerPoint in students' writing:

> I took the Internet class twice. I still was not comfortable with it. I still did not incorporate Internet in my classroom or even my own research until I met with this group periodically and got confidence and some informal ideas saying 'yes we just did this'. I think by meeting with this group, it is the bridge [between] the class I take and [the] incorporation in my classroom.

In short, getting incentives like computer equipment was necessary for Jenny' participation in learning to integrate technology, but not sufficient for her technology integration in teaching. Jenny needed concrete ideas and examples about technology integration from other teachers than merely getting equipment and learning technical skills. This is why the workshop model of professional development which focuses on delivering general technical skills has been ineffective for teachers because it does not address teachers' practical needs (Little, 1989).

A common project

Creating a multimedia project in writing was the common goal set up by Nancy for this technology group. This project created a need for Jenny to learn: "It is always more valuable to learn when you have a project to use it on. We were offered a project, multimedia books for young authors, so we had a need to learn."

Being offered a common project to implement, teachers were compelled to share ideas and learn from each other. Through sharing, Jenny got the concrete ideas and strategies from other teachers to create her own Young Authors writing project: "We have the projects. I like the ideas that they come up with when we meet, a lot of good ideas about what other teachers are doing." This in turn helped her identify her new learning needs, which sustained Jenny's participation in this professional learning community. As a result, Jenny learned things that she did not expect at the beginning.

> I: What makes you learn something you did not intend to learn?
>
> J: I think the more you get into it (the project), the more you want to learn. The more you get into a project, you come to a point that says 'I need more information. I need some help here'. Then you go on to learn something else you did not expect at the beginning.

Situated learning

However, merely being provided with a common goal was not sufficient for Jenny's learning. The nature of the project affected what Jenny learned. Nancy's Young Authors Embrace Technology in Writing project was a writing project. It situated teachers' technology learning in a subject area and asks teachers to come up with

authentic student products, so writing and technology integration in writing rather than general technical skills were the content of learning. Recent social learning theories show that teacher knowledge is contextulized, therefore their learning needs to be linked to their practices (Putnam and Borko, 2000). However, researchers have noticed that prior professional development approaches to helping teachers to integrate technology paid little attention to subject areas (Survey on professional development and training in U.S. public schools, 2000; Zhao, 2002), that was why traditional professional development programs were not effective for teachers.

In Jenny's case, she started to use PowerPoint as a tool to facilitate student-writing process through pushing them to think about an alternative ending of their stories rather than its typical use as a presentation tool (Bruce & Levin, 1997) defined by the manufacturer. Since technology integration was situated in writing, Jenny also changed her writing instruction. She was once a text-oriented teacher who used to put great emphasis on textbooks. Now she allows students to express themselves more freely by giving them more options in writing their stories, such as allowing them write multiple endings of their stories with the capacities of PowerPoint. By providing students more options in writing, attending to individual needs, doing project-based writing like writing for the Cruising Coyote project, Jenny transformed herself from a "textbook-oriented person" to a teacher who wanted to do more "project-based" learning. Situating teacher technology learning in a subject area will be more likely to compel teachers to learn, because their learning is connected to their day-to-day practices (Ball & Cohen, 1999).

Opportunities to engage in various activities

Merely being provided with equipment and a common writing project is not sufficient for Jenny's learning. From Jenny's learning, she seems to depend on a full set of experiences for the learning and change that occurred in her. Among various activities that contribute to her learning, sharing is the key. Conference presentation and training other teachers to use technology help Jenny gain new professional identity: she was a classroom teacher, and now she took on the role of training other teachers to use technology in teaching.

Support

Besides being offered incentives and provided with a common project that situated in a subject area, the support from Nancy, the leader, and other teachers in this technology support group is of vital importance for Jenny's learning. When I asked Jenny what she got out of this technology support group, I expected to hear about the content of learning that she had gained from this group. To my surprise, she told me the support from the group was the most important thing she got.

I: What did you get out of it (the group)?

J: I really did not think much of it. What I get out of it, I think just a lot of supportiveness that I feel from other people. I am not in this by myself. I have people I can turn to. Even we do not meet often. If I really have a problem, I can call them or email one of them and see if they can give me some advice. Basically, I think, just knowing I am not in it by myself. I probably would not start this project if it had not been for being part of this group. I would not have

used KidPix for Young authors, nor done multimedia books. It is a long way to go. I was kicked to start it and jumped in. 'We did not know it'. 'We're going to learn this'. That is Ok because we have others who are doing the same thing. I think it helped integrate technology. We could get a computer, a digital camera and not know what to do with it. But through this group in the project, we get started. Then you can see the possibilities, see what other teachers do with this, and (see) what we can take from something else.

It seems that the professional support from peers was the most important for Jenny to implement the technology innovation because she could rely on other teachers for ideas instead of being an independent artisan who teaches in isolation (Lortie, 1975).

Nancy was another important source of support for Jenny's learning. According to Jenny, Nancy was "instrumental in setting up this group" and provided technical, professional, and resource support. Jenny got the equipment from Nancy and learned technology such as Internet, KidPix and PowerPoint from the classes taught by Nancy. In addition, Nancy was also a source of ideas for learning integration.

I: From which source you got help for your learning?

J: I depend on Nancy, most on equipment and software. Nancy will be the first person I depend on. She has offered so many classes. She is very knowledgeable on equipment and software we have been using. She always has a lot of ideas on how to incorporate technology in what you are already doing, too.

In short, the technical, professional and resource support from her colleagues and the group leader was indispensable for Jenny's learning and change.

Conclusion

Jenny came to this group to get technology equipment, but ended up with learning and changes in the areas of technology, instruction, and student learning. She took on new professional roles and established new professional identity. According to Jenny, her success in learning about and with technology was mediated by various activities of this professional learning community. Incentives, a common goal, various learning opportunities, the embeddedness of her learning in a subject area, and the professional support from her peers and the leader attracted and sustained Jenny's participation in this professional learning community.

Chapter 4

Becky's Learning: A Case of Support

Background of Becky

Becky is a first grade teacher at Willow Tree Elementary who has been teaching for 10 years at different grade levels: kindergarten, first grade and fifth grade.

As a first grade teacher, Becky is flexible and encouraging. To Becky, the 1st graders are at a developmental stage in which they might easily get frustrated by something they do not know, such as the spelling of a word. She believes a good teacher will encourage kids to try new things and overcome the fear of making mistakes. In writing, Becky always encourages kids to write down their ideas without getting stuck on their spelling.

According to Becky, it is impossible for a teacher to know everything because the development of technology has led to an information explosion. Brenda sees that a good teacher is someone who teaches kids how to learn and discover answers by themselves.

> Because of technology, and how new ideas are introduced constantly, I do not think it is possible for a person to know all the answers, or to understand all knowledge. So we become the people who teach children how to learn and continue to be learners. Teach them to seek out knowledge on their own, because we are not there to find out answers for them.

Becky reported that she enhanced the ways she taught writing in terms of teaching strategies, delivery methods, and writing products after participating in this teacher learning community. She used to use centers a lot in writing where students worked on their own. Now she models frequently for kids. She always gives mini lessons to kids

first, and then has them practice what they have learned in groups. She also integrates technology in her writing instruction. She incorporates a computer and a TV monitor to demonstrate Venn Diagrams and Story Webs for student writing. She has students publish their writing in multimedia environments with KidPix and PowerPoint.

According to Becky, the enhancement in her writing instruction was inseparable from her learning experience in Nancy's technology support group for the Young Authors Embrace Technology in Writing Project. This group helped her to think of ways to integrate technology in teaching, which was very different from her initial uses. When Becky first utilized computer technology in teaching in 1992. She used a record-keeping program to track kids' assignments and a multiplication program for practicing math skills. Now she uses technology to deliver lessons and facilitate students' writing processes by having them visualize their thinking processes and produce written products.

Learning opportunities

Becky valued many activities in which she participated through this technology support group, such as talking to the other participants regarding technical trouble-shooting, presenting to each other technology integration projects, sharing instructional ideas, trying out technology in teaching and attending technology training classes. She also trained other teachers to integrate technology in teaching, presented at professional conferences, and posted questions and answers in the electronic listserve of this group. These activities provided ample learning opportunities for Becky. Table 4.1 shows a list of activities that Becky engaged in in this technology support group and the frequencies

that Becky refers to these activities in her interviews. Like Jenny's case, the order of frequencies does not imply the order of Becky's preferences.

Table 4.1 Learning activities and their frequencies

	Activities	Frequencies
A	Interacting with group members through talking, sharing and presenting to each other	9
B	Trying out technology in practice	9
C	Attending classes and workshops offered by ISD	3
D	Training other teachers	3
E	Attending conferences and making presentations	2
F	Communicating through computer mediated communication	2
H.	Hands-on experience with equipment	1

Through these activities, Becky was exposed to a wide range of learning topics. Activities provided Becky ample opportunities to learn. As a result, she changed her views and practices in the areas of technology, student learning, and teaching. At the same time, she stretched herself by taking on new professional roles as a teacher of other teachers. Table 4.2 shows a range of topics as well as the examples of each topic that she got a chance to think or talk about.

Table 4.2 Topics of learning

Topics		Examples
Technology	Computer equipment	Computer, scanner, digital camera, etc.
	Software	KidPix, PowerPoint, and Inspiration
	Technical trouble-shooting	Different ways to solve the same technical problem
Instructional use of technology		a. Using KidPix to create Bar Graph b. Using computer and big TV monitor to create Venn diagram c. Delivering lessons in a different medium

Student learning	Using graphic tools in student writing
Teaching Ideas	a. Conferencing with individual student
Young Authors Project ideas	a. The Road Rabbit project
Teaching resources on the internet	Instructional uses of KidPix in various subjects like math, literacy, etc.
Classroom management ideas	a. Parental involvement b. How to manage technology in the classroom.
Conference presentation	Presentation to the Board of Education
Ideas on training teachers to use technology	a. How to use one's own experience to teach other to integrate technology b. How to teach technology integration in a distance education setting.

What had Becky learned and how had she changed through participating in this teacher learning community?

In this section, I combine the discussion of what Becky had learned and how she had changed because it is difficult to separate the description of how Becky learned from what she learned.

Technology

Unlike Jenny, who was nervous about computers at the beginning, Becky joined Nancy's technology project because she intended to carry out the Road Rabbit project in teaching that she had developed in a computer class she had attended. To Becky, technology was the intended content of learning that she expected from this technology support group. By participating in this group and using hands-on experiences, she learned to use hardware like scanners and digital cameras, as well as software such as the Internet, KidPix, PowerPoint, and Inspiration. She also gained a lot of troubleshooting skills associated with the hardware and software. Part of these skills was gained through

hands-on experience with the group by sharing tips with each other on technical trouble-shooting:

> When we met together, we had a group getting [along] so well. We could say 'Man, I am having trouble recording a voice/sound'. Somebody would say 'I have the same trouble'. Then, somebody might say, 'I did, but this is what I did and fixed it'.

Some of the skills were acquired when Becky was asked to conduct technology training workshops with Nancy and other teachers:

> We got a lot of technical support from each other, the skills. A lot of time, we found we do the same thing; the two of us do it completely in different ways. I think we learn a lot from that. We often laugh a lot at ourselves because Nancy would get into the front and say: 'that is how Becky does it, but that is how I do it.' Once a while, that was a comment. We find there is more than one way to get the same answer. And I think we were surprised at each other, like 'oh, I never thought you could do that way.'

Moreover, Becky did not learn the technology for the sake of technology. She learned and used technology for the purpose of integration. To Becky, integration means "You try to take something you already do in your classroom and just enhance it with technology in a different way maybe." She added, "You worked into a project that would be meaningful, would be something to work into all your curricular areas, like the bar graph".

The idea of technology integration that Becky has now is very different from how she used to use technology in teaching. When she first incorporated computers in

teaching in 1992, she used them to keep track of students' assignments and had students practice multiplication. At that time, Becky saw a computer as only a tool for record keeping and practicing skills. After participating in Nancy's Young Authors Embrace Technology in Writing project, Becky integrated technology in teaching in various ways. She incorporated the Internet for students to find information about different states for the Road Rabbit project. This was a project-based learning activity in social studies and language arts that allowed students to take a virtual field trip with their mascot, the Road Rabbit. She also incorporated emails to communicate with people whom the Road Rabbit visited. "We incorporated emails with the people we sent post cards to, and incorporated the Internet to do the research." Another creative use of KidPix was to have students keep track of their favorite colors by creating a bar graph using KidPix. Becky found it was more efficient for students to create bar graphs using the computer than to cut and paste with paper. Becky thought she could "write up quicker [with a computer] than on the chalkboard".

In writing, she used the computer and a large monitor to display Venn diagrams because she thought, "it is easy for me to write with the computer and present on a large monitor. I can make the writing more organized. I can keep kids' attention." She further described how she kept students' attention when she created a Venn diagram using these methods:

> They [the kids] can see the left and right progression, they can see their ideas going up to text, and they love to watch the computer screen. I can do that faster on a computer screen than on a chalkboard. So it helps me keep the attention of the kids in the focus.

Besides using the computer to present information, Becky had students create their stories in KidPix and PowerPoint. Creating a story with technology does not mean simply transferring what students wrote on paper to a computer program. When students write with KidPix, they can express themselves in multiple means by incorporating graphics with the words. Getting ideas expressed in graphics is part of the writing process Becky used for her student writing. Becky found technology provided more options for students to express themselves:

> When kids come into my classroom at the beginning of the year, they mainly work with pictures. But I like that because that was the start of the story process. We just move on to the text from that. So they can see all the options that technology gives them.

Through observing students writing in multimedia, Becky realized that computers are useful tools for communication, which was different from what she previously believed: computers were only tools for record keeping and practicing skills. Becky found that a mentally impaired student, who could neither speak nor write, could convey her ideas to other students through using the different tools of KidPix:

> I had a little girl who can neither speak nor write, she had a disease and she is very mentally handicapped. But she can work on Kidpix. She can try to communicate what she did to the other kids. One of the early projects we did, we would put up one picture each kid made using whatever tool on that software program they could. And kids were amazed at her picture. They would say to her 'How did you do that?'. She would go to the computer and she would point at what she used, what tools. I do not know if that would happen if we did not have

a tool like that, I do not know if that kind of communication would have happened between our kids."

In sum, Becky changed her views of the role of computer technology in students' learning. She integrated technology in the process of instruction as a result of participating in Nancy's project: "So it was not just (learning) hardware and software, but it was learning how to integrate it, manage it in my classroom."

Student learning

By having students using KidPix to create their writing, Becky was able to see the affordances of technology in students' writing processes. This, in turn, provided Becky with opportunities to make sense of student mental processes in writing:

> I see my kids' minds go in 50 directions. I see my kids have more options in writing. They see 'oh, I can create a picture with this'. They see their stories more in 3 dimensional fashion. They see their story really happening. I think it means more to them because they can picture it.

Unlike Jenny, who was a very traditional teacher and did not pay much attention to the individual needs of students, Becky believed students learn in different ways. She always elicits students' ideas for their own stories by using Story Web or Venn diagrams. However, before her participation in this group, she did not pay much attention to how they applied different strategies in their writing processes. Observing students drafting their writing with KidPix, Becky noticed that some pictured their stories first in their mind and then wrote them down in paper. This helped Becky to understand that some students would first construct their stories visually with pictures, then the text followed:

> I know for myself, I am not a good writer. I can draw a good picture before I wrote. For someone like me, I think because of this project in particular, I think it helps those children know 'it is Ok if you draw a picture, and then write a story'. I suppose that could have been accomplished without technology, but I think technology brought that to the forefront. I think it made us to pay attention to that a little more, ... to the fact that it is OK for kids to draw a picture before the story comes. You do not always just write the story. Part of the thinking processes, what do you picture in your head, can you get it on paper or can you get it on the screen?

Being aware of her students' thinking process, Becky provided more options in their writing process. As Becky thought about each student's learning differently, she then changed her writing instruction.

Instruction

According to Becky, participating in Nancy's project provided her ample opportunities to gain and revise her general instructional strategies, as well as subject specific strategies. For example, she got the idea of using 4th graders as "buddies" to help her 1st graders to accomplish the Young Authors books from Nancy and other teachers in a meeting when they shared parental involvement strategies for the Young Authors books:

> For example, we go to a meeting on how to get parents involved. So we need to talk about how could you make it different for those of you who do not have parents involved. That was a con because I do not have enough parents to work

with. ...What can I do? With Nancy and group, because I am using the buddy group anyway, Nancy said that "look, let us bring over 4th graders and train them". You know we just all sat there and talked about together. Nancy was there to support that both financially and with ideas.

In addition to learning general instructional strategies, Becky learned new writing strategies. She got the idea of conferencing with students individually in their writing processes from Kate and Betsy, the two co-teachers of Jenny's 1st and 2nd grade multi-age group. This occurred in an area teacher meeting when teachers shared their experiences with the Young Authors Embrace Technology in Writing project:

> After we did a workshop for the area teachers at ISD, and we showed our projects, Kate and Becky stood up and talked about how they do writing process in their classroom. That was the first time I got to sit down and listen how they did in their classroom. ...What I took from that, what I realized was how important it is to conference with my students individually. So everyday, I conference with my kids in writing [individually].

Becky used to use a writing center approach in which students read and wrote independently. Seeing what Kate, Betsy and Jenny did with their students, Becky realized the importance of giving students individual feedback. She began to conduct conferences with students individually about their writing processes everyday, which is a strategy of doing writing workshop (Calkins, 1994). In the writing workshop model, a teacher will break the writing process down to several components such as mini-lessons, work time for writing, peer conferencing and/or response group, share sessions and publication

celebrations (Calkins, 1994). By incorporating the teaching strategy of Jenny's team, Becky enhanced her writing instruction.

Besides learning about general pedagogy and pedagogical content knowledge (Schulman, 1987), Becky also changed the way she delivered instruction. Becky now uses a big TV monitor to display information such as 'the problem of the day', the bar graph and Venn diagrams. Becky thought she had more choices for her to deliver lessons: "especially with me using the larger monitor and the computer, I have more options to deliver the lesson."

Having different devices to deliver lessons also forced Becky to think more deliberately in her planning:

> So my delivery method is different. So when I write my lesson plan, sometimes I have the options to think about 'Do I want to do it on chalkboard? Do I want to do it on overhead? Do I want to do it in computer with a large monitor?' Depends on what we are doing, it changes my teaching in that.

Therefore, Becky wrote lesson plans differently when she could deliver lessons in an alternative mode instead of lecturing:

> I think I have a good start. I think when I write my lesson plans, it definitely makes me think about writing my lesson plans differently because I think about how I can present something differently instead of standing in front of a group and talking.

However, Becky put a limit on using the computer and the monitor to deliver lessons. She had to be selective about the options that technology afforded in her teaching because of the characteristics of her 1st graders:

> It also changed my teaching that my kids have more options. They do not need to write stories and hand in their stories. They have the option of doing it in multimedia. So I have to decide what we want to be included. So it has changed my teaching because I have different things to think about and I have different options to think about in delivering myself, and my kids have different options. Sometimes I have to limit those options because they are too much for the 1st grades. So I have to limit them for them.

Learning entails "going out of comfort zones"

According to Becky, one unexpected outcome of her learning with this technology support group is that she achieved a new sense of self-awareness through making her project public. She used phrases describing how they "went out on our limbs", "expanded ourselves", and "went out of comfort zones" to describe the experience such as presenting her project at the professional conferences and training other teachers to use technology. Like Jenny, who was afraid of her work being evaluated by other professionals, Becky had not been confident enough about her knowledge on technology integration. She emphasized that she would not even have joined the group if she had been told at the very beginning that she was expected to present her work at professional conferences. But with the support of Nancy and the group, Becky presented her project at the MACUL conference:

> I would not present at MACAUL if she (Nancy) told us at the beginning that we were going to present at MACAUL some day. I would say 'no way'. We do not

know enough, I will never know enough. I will never be at that knowledge thing, and I still am not.

The success of Becky's presentation of her technology integration project at professional conferences enabled her to take on a new professional role, which is to train other teachers to use technology. In the third year of this group meeting, Becky was asked to train other teachers in her school district to integrate KidPix in student writing. Becky reported that she was able to take on this role because she had experienced "pros and cons", "some of the successes and some of the failures in our classroom", in her own learning to integrate technology with this technology support group. For example, Becky shared how she turned a pitfall, not having sufficient parental support in her classroom, into an advantage of using students as buddies to attain the curriculum goal, thanks to consulting with Nancy and other teachers of the group. Due to these pitfalls and successes, Becky felt she was able to take on this new professional role:

> Now [the third year] it [Becky's responsibility] changes to how to get other teachers involved in our projects. That is how the project was changed. The last project for which Nancy wrote the grant was specifically for that. That was a natural next step for us. We feel comfortable when we use [technology].... We had gone through a lot of pros and cons in our learning and supporting each other. The next natural step was how we could get others on board.

Through taking on these new professional roles with the support of the group, Becky gained a new sense of confidence and self-awareness:

> So we really went out on our limbs, and we went into doing a lot of things that we never thought we would ever do. We expanded ourselves. We went out of our

comfort zones. We would not have tried things like that. There is no way I would ever thought to present in a conference if I would not have been part of that group. But it just seemed like a natural next step to take, really.

In sum, with this teacher learning community, Becky experienced a wide range of learning and changes with this teacher learning community beyond merely gaining technology competencies. Like Jenny, Becky also depends upon a full set of experiences for her learning and changes, which include: attending technology workshops, trying out technology with her students in the classroom, sharing ideas and strategies with the group and other teachers, making her learning public through presenting her project at professional conferences and training others to use technology. Unlike Jenny, who depends on others for the ideas at the beginning for technology integration, Becky already had the integration ideas. She first tried out the integration project in her classroom, and then relied on others for the ideas and technical support to enhance her project. Take the development of the Road Rabbit project as an example. First, Becky got the Road Rabbit project idea from a teacher magazine. Then, she adapted it into a social studies and language arts project in an Internet class offered by Nancy in which teachers were asked to incorporate technology in a subject area. After she developed the Road Rabbit project in the class she took, she tried it out in her teaching. When Nancy called for participants for the Young Authors project, she applied because she could get the equipment and the Internet access that were necessary to implement this project in her classroom. However, merely getting the equipment was not enough for implementing Road Rabbit project. Becky depended upon Nancy and other teachers in the group for ideas and support to carry out the project, such as the idea of using of 4th grade buddies to

assist 1st grade students to present the findings of the Road Rabbit Project. She also depended upon other teachers for technical troubleshooting through communicating with each other in the meetings and the electronic listserve.

Meanwhile, having the opportunity to try out KidPix in student writing, Becky discovered that some students first pictured their stories, then wrote them down in paper. As a result, she gave students more options in writing. When the group was asked to share their integration projects in an area teacher meeting, Becky got new teaching ideas from seeing other teachers' projects and hearing them talk about their experience of integrating technology. Through sharing among teachers, Becky got the chance to hear Kate and Betsy talk about the writing process they used in their multiage classroom. Becky brought back the idea of conferencing with students individually in their writing and revised part of her old writing strategy of using centers. The experience of making public her multimedia project with this group pushed Becky to "go out of her comfort zones." This enabled her to take on new professional roles such as training other teachers to integrate technology, and presenting her technology integration project to the Board of Education to show what technology could afford for student learning.

Like Jenny, Becky's learning about and with technology through this technology support group is an iterative process of learning, doing, revising, and doing more through various group activities. This process includes attending class, trying out technology in the classroom, sharing with the group, and making learning public through presenting at the conferences and training other teachers to use technology.

I asked Becky if she could achieve her learning and changes just by merely trying technology herself, instead of participating in this group. She replied that I was playing

"the devils' advocate." To Becky, the group is the backbone that supports her innovation and learning.

> I: Without this group, with technology, you can do this, right?
>
> B: Oh no, I would not say that at all. You've been "the devils' advocate". Have you heard "the devils' advocate" before? That means you think the opposite side of the fence. No, I would not have done this without this group. Because number one, I would become frustrated easily, especially with the technology. ...I would not have someone to fall back on for support, for technical assistance if I would not have that [the group].

Becky's emphasis on the importance of the support of this technology group leads to the discussion of many conditions that enable Becky's learning and changes.

Conditions for learning and change

Despite learning opportunities Becky gained from her participation in various activities of this professional learning community, there are certain conditions other than those activities that enable her learning and sustain her participation in this professional learning community that are important.

A common goal

Having a common goal of technology integration was important for Becky to join this teacher learning community. As an early adopter of technology, Becky wanted to integrate technology into her teaching. But she could hardly find teachers in her school

who shared this interest with her. One attraction of Nancy's technology support group was that the teachers of this group shared the same goal and attitudes with her:

> I think what affects me going to the group is that we all share a common goal. And we shared a common attitude. We were there because we wanted to be there. We were there because we had similar goals and desires for our classrooms. I do not share some goals and desires with my neighbors down the hall. I may not. And they do not share the desires and goals with me.

To Becky, the common goal to integrate technology in teaching provided a common ground for these teachers who came from different schools and grade levels to learn from each other:

> We have a lot of similar goals. We teach a lot the same way, we come from different environments. We do feed off each other. We can brainstorm with each other. We are enough alike but we are enough different. It is kind of fun.

Situated in a subject area

In addition to the common goal, the situated nature of technology integration of this technology support group influenced Becky's motivation to learn and her learning outcome:

> A common goal in our group is how to integrate technology into a classroom curriculum. We all share this goal. We are really busy people, and we have to teach a lot. But how can we use it within whatever we are already teaching? We know we could not take it on as an additional subject. We could not teach the computer.

As a busy teacher, Becky already had many things to teach. She would not have time to teach an additional subject if technology was not integrated in a subject area:

> No one is in the position that they can add it on because our days are so full. We have reading, writing, math, science, social studies, going to recess, eating, talking over the problems, and teaching them how to walk in the hall. Our day is so full with required things. We have to learn how to integrate it. We all had that common goal.

Since technology integration was situated in writing, a lot of sharing among teachers was not only about technical troubleshooting but also about writing instruction. In a sense, the embeddedness of technology learning in writing shaped the content of the sharing Becky had. Becky learned more than technology competences. As a result, when she got the chance to talk about writing instruction, and when she got the chance to observe students' writing in multimedia environment, Becky thought about student learning differently and enhanced her writing instruction.

Ownership

Taking ownership is vital for Becky's learning about and with technology. There were many opportunities available to her to learn technology, but Becky felt it was difficult for her to engage in learning if the content of learning was not relevant to her teaching, and if she had no control over her learning:

> My time is precious. I want to put my time into the things that will move us forward. If I do not see the usefulness of something, I used to have a bad attitude about it. Although, I try to go and always have an attitude that there is something

from it that I know I can probably learn. But I am much more open-minded if I care about the subject, if I see it is relevant to what I am doing.

For example, Becky was asked to attend one technology workshop required by the superintendent of her school district. She found the content of the workshop was not about teaching but on budget issues. She just passed on the words she got from the workshop instead of applying what she learned from the workshop in her teaching. "Whatever we took back from the workshop, we just passed on the words. We really had no control over the issue." Becky's technology learning experience illustrates the common critiques of workshop model of professional development, which is ineffective for teachers because it offers decontextualized technical skills and treats teachers as passive recipients of learning (Little, 1989 & 1993).

However, Becky's learning experience with Nancy's technology support group was very different from her experience of learning technology in other technology workshops that she was required to attend. In this support group, Nancy and the teachers jointly decided the content and the schedule of learning.

I: How often did you meet for the first year? How did you decide how often to meet?

B: Right before we got the hardware and after we have been selected for the project, we met together and decided what it was we needed to learn. We did a brainstorm session with Nancy. We all talked to her about what we felt we needed as far as training. We set up a schedule from that.

Becky had control over the content of her own learning, and that was probably why she actively participated in many activities of this learning community. Becky's joint

decision-making for the learning agenda in this technology support group echoes what reformers call for: that teachers should be treated as professionals and active constructors of their own learning (Putnam & Borko, 1997). Becky was motivated to learn because she could make decisions about her own learning. As a result, she not only integrated technology in her teaching but also modified the ways with which she taught writing.

Leadership

Nancy's leadership started this technology integration project and sustained teachers' participation in this group. Nancy initiated the project through winning the Tomorrow Technology grant from the state and kept writing technology grants to sustain teachers' participation in this teacher learning community. However, she did not mandate the project. Instead, she coordinated resources and provided support for teachers to adapt the project to their own learning goals.

> So she was able to take our ideas, and listen to what we were saying. She could see where she could help and pull that stuff together, and make it happen. Otherwise, it would not happen.

Nancy's leadership was reflected in technical, professional and resource support she provided in Becky's learning. She played a "dynamic role" in support teacher learning.

> Nancy is a good person to keep us all pulling together. I do not know if it would work if we do not have someone as dynamic as her. She has done a good job to keep us together and focus on our goals.

One key part of Nancy' leadership was the support she provided to teachers.

Support

Technology innovation was new to teachers. To integrate technology in teaching, support seemed to be vital for Becky. According to Becky, she was motivated to join this group to "take advantage of the support" from Nancy, and to get necessary equipment to "learn how to integrate technology in my classroom". By participating in this technology support group for three years, Becky received technical support, professional support, and emotional support from her peers; technical, professional and resource support from Nancy and other ISD administrators.

It was not only Becky who felt supported. All four teachers unanimously talked about the importance of various forms of support in their teaching and new professional roles they adopted. Data analysis shows that support is the most salient feature of this group, though each teacher talks about support in a slightly different way. To Jenny, the support, which enabled her learning and changes, was an outcome of her participation in this group. Sandy felt that the support provided to her made her feel that she was treated like a professional. Becky intended to get support from Nancy but ended up with getting many forms of support from her peers in this technology support group. This support enabled her to implement the technology innovation in her teaching. That Becky and the group attached great importance to the role of support in their learning is consistent with the findings of professional development through professional development schools, where support for resources and intellectual and emotional support are necessary conditions to enable teacher learning (Rosaen, 1995).

Technical support

Like Jenny and Sandy, Becky's technology integration was inseparable from the technical assistance she got. Actually, Becky was attracted to Nancy's project to get equipment and technical assistance to implement the integration project she developed in a computer class in her classroom. Originally, Becky only expected to get technical assistance from Nancy. Yet she ended up getting a lot of tips on technical trouble-shooting from her peers when they shared how they integrated technology during the group meeting. She commented, "We were really a support group within ourselves."

In addition to technical support she gained when they met, Becky appreciated the questions and answers she received through an email listserve set up by Nancy in the third year of this group. Teachers in this group were from five different school districts, and they only met monthly or sometimes bi-monthly. So it was difficult for them to get immediate help from each other in person. The listserve became an important avenue for them to communicate with each other. To Becky, the listserve was not only a place to communicate questions and answers on technical troubleshooting, but also a place to learn the technical expertise each possessed. For example, she figured out Lucy was very good at using PowerPoint. By posting questions and answers on technical problem solving in the listserve, Becky got to know the strength of each teacher for her future reference.

> I think it was the last year, Nancy did start a list serve for our support group. We could post questions to other members of our group. We got to know who was stronger in what. Eventually, we realized who was strong in PowerPoint. Lucy

used PowerPoint a lot, so we knew she was very strong in PowerPoint. We used each other a lot.

Besides her peers, Nancy is another source for technical support. Before joining this group, Becky took several technology classes from Nancy through ISD. So, when Nancy got the technology grant, Becky applied for it because she thought she could take advantage of the technical support offered by Nancy. Nancy's accessibility made it easy for Becky to overcome the technical difficulties in the integration. "I felt I had a good chance to learn how to use it [hardware] because I can just call her [Nancy] and ask her questions. And we did a lot of that." Not only did Nancy provide technical assistance but she also coordinated technical support to meet teachers' instructional needs. When Becky tried to use a big TV monitor to deliver lessons, she encountered a technical problem linking her computer to the TV monitor. Nancy came to coordinate the technical support for Becky:

> For example, I really wanted to use that large TV monitor, and no one in our building was using that monitor. The librarian said 'Becky, you can use that'. So I took it, I wanted to connect it to the computer, but I did not know how. So Nancy contacted the tech coordinator from my district. He gave me the little scan converter to hook the computer with the monitor. I did not have to buy it, Nancy did give it to me, so...I could get help from anyone.

Sometimes, Becky even called the technical support she received "intellectual" because she figured out from Nancy and her peers alternative ways to solve the same technical problem when she took on the role of training other teachers to use technology.

In short, Becky's technology integration was inseparable from the technical support she got from Nancy and her peers.

Emotional support

Emotional support was another type of support these teachers valued, especially when they were anxious about technical problems they encountered. Technology integration was something that teachers had never experienced before. There might be a lot of things associated with technology integration that they did not know. According to Becky, she became "frustrated easily" with those technical problems she had. The good part of the group was that Becky was able to express concerns and questions freely with these teachers without worrying about being judged by others, which was very important emotional support for her learning and innovation.

> I think it [is] just emotional support, like what someone knew someone else did not know. That was OK because we were all in one place or another at a time. We were all at one time or another in a position of 'I do not know that at all. I did not learn it'. Somebody who sat next to me might say: 'I know how to do it, no problem.' 'Show me'. Or we might be in the boat of 'I know how to do that, I will show you.' Because all of us might have different experiences with using the software, we did not feel like any question would be a stupid question 'cause we had been there.

Professional support

Becky especially valued that Nancy and other ISD administrators treated her like a professional because it was crucial for her taking challenges to integrate technology in teaching. In the dominant workshop model of professional development, teachers were treated as passive recipients of knowledge delivered by experts (Little, 1993). Becky had similar experience in some technology professional development programs, where teachers were regarded as recipients of knowledge. In those programs, Becky took a passive role in the learning and just passed on the information she got.

According to Becky, teachers were not always treated like professionals and their ideas were not paid much attention, especially in the tight financial times. "Teachers do not always get treated as professionals especially in tight budget situations. I do not like people saying to me that you have this good idea, but it costs too much." Becky could "stay in their classroom and play it safe" as her group member Lucy described when she was asked to integrate technology in teaching. She did not have to take efforts in her busy schedule to try out new things in teaching. However, Becky was willing to take the risks to try out the technology innovation with this group because she was treated as a professional by the group leader and the administer of the ISD:

> We had somebody behind us that said 'you are right, we are going to help you to see that happens.' I felt that was what Nancy and Daniel did. They gave us confidence and they treated us as professionals.

Nancy was an important source of professional support, and her professional support was manifested in incorporating teachers' inputs in their own learning instead of mandating learning agenda to teachers.

> So she was able to take our ideas, and listen to what we were saying. She could see where she could help and pull that stuff together, and make it happen. Otherwise, it would not happen.

Nancy's professional support was also reflected in her providing ideas and support for teachers to accomplish their goals.

> Nancy was there to support that both financially and with ideas. She was able to say "that will work". It was really helpful because she was the kind of person that would help us make sure our ideas could get carried out.

Nancy was accessible to teachers both in person and through emails whenever they need her help:

> I felt I had a good chance learning how to use it [hardware] 'cause I could just call her and ask her questions. And we did a lot of that. We learned to use Yahoo chat, the messenger, we got a lot of work done in questions back and forth that way.

She was the "hub" for teachers because she coordinated the work to meet teachers' needs and the demands from other people.

> Yes, she was the hub of the whole project. She was our coordinator. If there were something important that we needed, we just told her. If she felt she was hearing some more things from other people, she would pull all of us together.

Moreover, the professional support from Nancy also entails a strong push for Becky to reach a higher professional level. For example, Becky would never have presented her project at professional conferences like MACUL for other professionals' scrutiny if Nancy did not "keep pushing us" and "push us a little more". As a result, Becky felt she "went out on limbs" by doing things that she would never imagine, such as presenting at professional conferences and taking the role to train teachers from different school districts of ISD to integrate technology.

Besides the professional support from the leader and the administrator, Becky also gained a lot of professional support from her peers, including having a common goal, sharing pros and cons of one's learning, sharing instructional ideas and teaching resources. To Becky, a shared common goal was very important professional support because they could learn from each other through pursuing the common interests: "The support, we do get support from it [the group], and we do feed off each other. . . . It is just another source of support. It was the people that had the same goal in mind."

Becky also felt that she was supported professionally by her peers when they shared ideas and materials with each other. She appropriated some ideas she learned from other teachers in the group. For example, Jenny shared in a group meeting that she made a presentation of the role of technology in student learning to the Board of Education. Encouraged by Jenny, Becky initiated a presentation to the Board of Education of her school district regarding the role of technology in student learning as well. According to Becky, she would never make that happen if she did not know about Jenny's presentation to the Board of Education.

To Becky, professional support entails not only collegiality and assistance but also accountability, which seemed to be indispensable from her technology integration in teaching. Professional support from peers does not always mean they agree with what each does. As a professional, Becky believes that teachers have to account for their actions according to professional standards. So Becky takes her professional role to make sure teachers work together to integrate technology rather than merely use technology for the sake of technology:

> ...The support of the group makes it [integration] possible. And I think we all support each other. And we need to keep track that we all integrate it. [We do] not use it for the sake of using it.

Becky's learning accountability to professional standards is what Buchman (1986) argued that teachers need to take professional roles over personal preference to justify their action (Buchman, 1986). As a result, Becky and others in the group justified their action through opening their practice to their peers in the group meeting, as well as to a broader audience through presenting at professional conferences and taking the role of training other teachers to use technology with the professional support from peers, Nancy and other ISD administrators.

Resources

Last but not least, Becky thought all her learning could not be achieved without necessary resources from Nancy and other administrators of ISD. Nancy and other leaders (such as Daniel) of ISD were able to get funds to provide equipment like computer hardware and software and other services like busing students. They also

provided resources for getting substitutes to release time for teachers to attend group meetings and conferences.

In short, in Becky's own words, this group provided a supportive framework in every possible aspect to support her efforts to make technology integration happen in her teaching.

> Another factor I think is really important is that we have a positive, supportive framework. In other words, [it includes] Daniel, Nancy and each other. It was positive and supportive. We did not have anybody in our group that thought anyone of us is better than anybody else. We did not have anybody in our group that would give up. We might have some down times. Our attitudes were that 'there is an answer to this. Or I could envision this, would not this be cool?' It was really positive and supportive.

Conclusion

Becky achieved a wide range of learning beyond merely learning about technology through her participating in many activities through this technology support group. Having a common goal was important to set up the common ground for teachers from diverse backgrounds to learn from each other. Nancy's leadership was important to starting the project and sustaining teachers' participation in it. The support from her peers, the leader and other administers of the ISD was indispensable for her trying out technology integration in her classroom as well as the learning and changes that occurred to her over the past three years. Moreover, Becky's ownership of her own learning motivated and sustained her learning through this teacher learning community.

Chapter 5

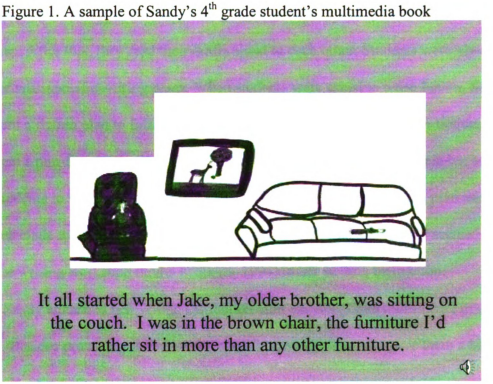
Sandy's learning: A Case of Stepping Out of Comfort Zones

Sandy's Background

Sandy is a 4th grade teacher who has been teaching for 22 years. She currently teaches at Sandywood Elementary, a rural school in the Midwest.

I first met Sandy at a teacher professional development summer institute for technology integration, where she presented how she helped students and teachers in her school to integrate multimedia in student writing. A year later, in the Young Author Embrace Technology in Writing celebration fair, I got the chance to see her students' multimedia books. Picture 1 is a sample of a 4th grade student's writing with multimedia, where the student illustrated her stories through combining words with matching graphics.

Figure 1. A sample of Sandy's 4th grade student's multimedia book



Sandy told me she did not integrate multimedia into student writing until she participated in Nancy's technology support group for the Young Authors Embrace Technology in Writing project. She used technology for math drills and for her to keep records, when she first started to use technology in teaching in the late 80s and early 90s. However, she felt something was missing.

After she participated in Nancy's technology support group for three years, Sandy changed her views of technology as a tool for drills or for only making writing products visually appealing. She started to see technology as a tool for facilitating the student writing processes: "Now I see the capabilities [of computer] are so much more. Now I see it as it can help kids to develop writing skills. Before I thought that they could take their writings and make it look nice."

According to Sandy, her typical writing instruction started out with an example of the writing topic through a group activity. Then she had students brainstorm ideas and map their ideas in mind on the blackboard. Students were asked to write drafts from their mind map. After that, they read their drafts aloud to each other. Students were always provided with specific writing plans. When students were asked to write fiction, Sandy gave them a fiction plan to follow. When students were asked to write non-fiction, she gave them a non-fiction plan to follow. For example, one writing program in her school asked students to write complete sentences. Students were given a writing plan asking them to include a topic sentence, ten facts, and complete sentences. Sandy seemed to adopt the writing workshop model (Calkins, 1994) in her writing instruction.

Sandy enhanced her writing instruction after she integrated multimedia in student writing. Besides providing students with specific writing plans, she gave them a blank

sheet of paper with only six squares on it (See Appendix 3), which allowed students more options in writing.

> So I guess maybe one of the changes that I offered kids was, in one of the plans for their books, I gave them a piece of paper with six squares on it. And they can draw their plans rather than having to write in words. That would be a change of what I did.

Sandy attributed these changes in her teaching as a result of her three years of participation in this professional learning community lead by Nancy.

Learning opportunities

Like Jenny, Sandy originally was attracted to Nancy's technology support group to get equipment, like a scanner and a digital camera, and to see how to integrate computer technologies in teaching. However, Sandy learned more than technology competency through a set of activities that she engaged in through Nancy's technology support group. These activities include the opportunities to talk and share, to try out technology with students in the classroom, to attend computer classes and workshops offered by the ISD, to present at professional conferences, to train other teachers within and outside one's school to integrate technology, and to have opportunities to ask questions through emails and a list serve. Table 5.1 shows the set of activities that Sandy engaged in and the frequencies that Sandy referred to them. Similar how I coded these activities in Jenny's case, the frequency here denotes the frequency of an occasion that the activity is discussed rather than the occurrences of the words.

Table 5.1 Learning activities and their frequencies

	Activities	Frequencies
A	Interaction with the group through talking, sharing and presenting to each other.	21
B	Trying out technology in classroom.	6
C	Attending classes and workshops offered by the ISD.	1
D	Presenting one's projects at area and regional professional conferences.	3
E	Training other teachers.	6
F	Communication through email list serve.	1

Like Jenny's case, the order of frequencies does not necessarily imply the order of the preferences that Sandy chose to learn.

Through these activities, Sandy was exposed to a wide range of learning topics, which provided Sandy with ample opportunities to learn. Table 5.2 shows a range of topics as well as the examples of each topic that she got a chance to think or talk about.

Table 5.2 Topics of learning

Topics	Examples
Computer equipments	Computers, scanners, and digital cameras.
Software	KidPix, and PowerPoint.
Technical trouble shooting	Talking about technical problems and getting suggestions to solve them.
Instructional use of technology	a. How to use KidPix in student writing. b. How to use KidPix to create bar graph. b. How to manage technology in classroom.
Teaching Ideas & materials	a. How to create different books for students. b. Sharing books on how to create multimedia books.
Young Authors Project ideas	Seeing how Margaret, Jenny and Becky use multimedia to create students' books.
Ideas on conference presentation	Brainstorming ideas for conference presentation with Lucy and Nancy.
Ideas on training other teachers	Learning ways to train teachers in Sandy's school to integrate technology.
Grant writing	Learning grant-writing skills.

According to Sandy, the focus of learning varied in different years. In the first year, Sandy learnt to integrate PowerPoint into student writing. She also got ideas for using KidPix to create books for her students. In the second year, she presented her work with Lucy at professional conferences, a task she never did before. The success of her project encouraged Sandy to apply for a Tomorrow technology grant to train teachers in her school district to integrate technology. In the third year, she helped Nancy to train forty other teachers at the ISD to integrate technology. Like Jenny and Becky, Sandy learned and changed in the aspects of technology, student learning, and instruction through participating in various activities of this technology support group in three years. At the same time, she formed new professional identities through taking on various professional roles as a teacher of other teachers. In Sandy's own words, "Professionally, I feel I step out of my comfort zones several times because I know I do things I have not mastered yet." In the following sections, I will discuss how Sandy steps out of her comfort zones by uncovering what Sandy learned and how she changed as well as the conditions that attracted Sandy's participation in learning.

What had Sandy learned and how had she changed through participating in this professional community?

Technology

Sandy changed her view of the role of technology in teaching and how she used technology in writing drastically through being involved in Nancy's technology project. Though Sandy was exposed to computer technology in the late 1980s, her use of

technology was very limited. At that time, she mainly used technology for practicing drills as well as keeping records. In the mid 1990s, Sandy got a Mac computer. She had students type and print their books with the Mac computer. She thought of the computer as a medium to present writing products that could "make writing look nice". Sandy used computers in school and home, but she was not satisfied with these uses of a computer:

> At that time, I felt it was useful. It was something helpful. But I did not use it as much as it could have been. But it was frustrating because it was only doing drill and practice. I mean I thought it was good, but it was kind like something was missing.

Now Sandy thought "the capabilities [of computer] are so much more." "It is the tool to do the things you've already done or do it better". She always tried to seek connections between technology and what she already taught. Nancy's Young Author Say Yes to Technology project, which links technology with student writing, was just the right one for Sandy. Sandy not only got equipment and technical support from Nancy's project but also get ideas of technology integration in writing from other teachers involved in the project. For example, Sandy got the chance to see the multimedia books created by Margaret's students and Becky's students, who were the first graders, in a group meeting sharing each other's work. If the first graders could create books with multimedia, Sandy thought her fourth graders would be able to create multimedia books, too. "They [1st graders] were young and be able to do it [multimedia books]. So I know my ideas were age-appropriate for my kids because they [1st graders] were doing it, and I knew that would work with kids in my school."

When Sandy had her students create stories with PowerPoint and KidPix, she noticed that students tended to review and edit more. Sandy always tried to find ways to encourage student to edit their stories, but she usually had difficult time to get students to revise their final products: "I think right now multimedia really helps my kids write better. They review and edit much more than they ever did before. That is always a big problem because writing it all over again is really a hassle."

The change in students' writing behavior stimulated Sandy to have a new understanding of computers as tools that could facilitate the writing process:

> As they apply to the product, they may change some writing process as they put into a product along the way, they may see how they can improve it. That makes a tool. Some people can write with pencil. When they write with pen, they can write it better. When they write with computer, they can do it better. They can extend what they have done.

Not only did Sandy notice her students tend to review and edit more when they created their stories with PowerPoint or KidPix, she also noticed some students' thinking patterns in writing that she did not pay much attention before. This opens another area about student learning for Sandy.

Student learning

According to Sandy, asking students to edit their final drafts of writing is always a big challenge. However, Sandy felt this was no longer a big problem for her. When students typed their stories in the computer and matched them with pictures, Sandy noticed that students kept making changes:

> I had students say to me ' you know some words do not match the picture. I can not put [it] here because I miss a step'. Or 'I am missing something important that happen. Can I add more to this?' 'Yes, you can. That is really what I want you to do'. They are editing by visually thinking their stories. That is what multimedia has done. They now begin to think in pictures and words. For some kids, that is key.

Observing students write with PowerPoint and KidPix, Sandy discovered the thinking processes in writing of some students: they first would think of their stories in graphics. Sandy thought that allowing students to draw first their stories in graphics was especially beneficial for some students who had difficulties in writing. She described how her students improve writing after they wrote their stories with PowerPoint and KidPix, which provided students with the options to incorporate graphics. According to Sandy, two students who had problems of writing stories that "drag on forever" without a beginning or ending, now can write "understandable" stories when "they put their pictures with their stories." One boy who was reluctant to write now is willing to write because he was allowed to express his thinking in pictures first and then to write in words. Another girl who tended to include every detail and even things that happened elsewhere in her story now can break down her details to main ideas. Through observing these students writing with multimedia, Sandy was aware of student thinking processes in writing that she did not pay attention before:

> When the girl began to see the visual part of the story, she found some details she wrote did not fit with the topic of the story. So she tried to make picture fit the words. Multimedia helps her to be succinct and stick more to the story.

Though using PowerPoint and Kidpix in student writing afforded Sandy the opportunities to discover the thinking processes in writing of some students, merely depending on the affordances of technology itself was not sufficient for Sandy to understand students' thinking process. Sandy used technology before, but the use of technology was limited to practicing drills and record keeping. Only after trying out multimedia projects with this teacher technology support group, Sandy was able to see the usefulness of technology in student writing processes. Actually, Sandy depends on the group for ideas as well as technical skills and technology management strategies through talking and sharing with each other:

> We were put together to create multimedia project in our classrooms. So basically the things we were talking about related to technology, also related to writing because everybody was writing the story. Some of the things we might talk about were: 'how could we manage to get the kids stories edited so that they could be ready?' There were a lot of how tos, 'how do you do this?' 'how do you do that?' Maybe 'how do you import a picture?' Maybe something we would talk about was what we did [with student writing].

As Sandy gained new understanding of the student thinking processes in writing, she was stimulated to revise her instructional strategies.

Instruction

According to Sandy, she is a project-oriented teacher. At a superficial level, participating Nancy's Young Authors Embrace Technology in Writing project enabled

her to extend what she already did, she integrated multimedia into her student writing projects.

> I am a project-oriented teacher in the first place. Obviously, just teaching multimedia or having kids do multimedia, is a new idea that I did not have before. That is new to me. But it still fits in my project that kids create new things. It is still project-based learning. So I guess it expanded my thoughts about project-oriented learning.

At a deep level, integrating multimedia into student writing also provided Sandy with the opportunities to make new sense of student thinking processes in writing and to revise her teaching. Sandy knew the principle that different kids learn differently, but she did not quite understand how to apply this principle in teaching untill she discovered that some students would think first in graphics rather than in words when they wrote. Sandy said: "everyone was given the information that kids learned in different ways. But being involved in the project made me realize how important it was for those visual kids to think visually first." Noticing that different students write in different ways, Sandy provided students with more options to write their stories:

> Yes, I gave them that option that they could do that [drawing their stories] first, and then they can put their words to it. And I am accepting of that. I know I am always a flexible teacher anyway. I thought that was just a map of their plans. For some kids, that is their ways of thinking. So that is an acceptable plan. You know you cannot only hand out one plan, I guess. So I tend to give them options. If I know one student, and am pretty sure if he or she is a visual student, I might suggest them that they use this plan. In that way, if they get into wrong sequences,

I do not care if they cut it apart and put it back together the way they need it, and glue it on another paper. So in that sense, it changed because I used to hand out pretty much one plan, that will be [either] this plan or that plan. "If you do a fiction book, here is the plan." "If you do a non-fiction book, here is another plan."

In addition to getting new instructional strategies through trying out multimedia in student writing, Sandy was greatly influenced by the ways in which other teachers in the group used multimedia in student writing though she had difficulties in articulating her learning processes. According to Sandy, when she saw the multimedia books done by the first graders of Margaret and Becky, she gained ideas and confidence for getting her fourth graders to create books with PowerPoint and KidPix. When they met, they not only talked about projects but also showed each other their projects including materials like student multimedia books. So they had something concrete to talk about and learn from.

Usually it could be materials that they showed people, or seeing different ways they used [technology] in their classroom, like we watched the presentations Margaret and Becky did with PowerPoint. I can see how they bring KidPix to PowerPoint [into student writing]. So I can do that now. I would use that in another presentation. I would use the idea or the way they presented it. So many things they do in their classroom I can duplicate. I can say they are doing good things and interesting things, things that kids can learn from. So we probably mentor to each other in a lot of ways. We probably do not know we are teaching each other.

As Sandy got instructional ideas from other teachers, her invention of the alternative writing plan with 6 squares shed light on Lucy's instruction. According to Lucy, she had not thought to use a blank piece of paper with six squares on it to get down students' ideas for writing. After she saw what Sandy's students did with the alternative writing plan, Lucy incorporated Sandy's story map to help her students to get down their ideas and match their words with graphics.

> ...Oh, [I learned] a different writing strategy. Sandy had this wonderful writing paper for kids to get ideas down. It was called a story map. I heard of the story map before, but this one was where you would write on one side and you have the picture on the other side, and I guess I never realized it was out there. I had heard that but I had never see it. That is one example of how they would share materials with each other. Whatever the information is, we would like to share with each other.

Through sharing and seeing the concrete examples of each other's instruction, both Sandy and Lucy appropriated the instructional strategies they learned from each other.

Learning is "stepping out of comfort zones"

As Sandy advanced her professional knowledge in areas of technology, student learning and teaching through integrating multimedia in her own teaching, she was asked to make her learning public within and outside of her school district through presenting at professional conferences and training other teachers to integrate technology in her school district and the ISD. Sandy often used the phrases like "I stretch myself" or "I am stepping out of my comfort zones" to describe her experiences of doing something that

she felt she had not totally mastered yet, such as presenting at professional conferences and training her peers to use technology:

I: What are the things you feel that are out of your comfort zones?

S: Almost everything. Like, I did not know how to use a [digital] camera, how to import pictures, what I was expected to do at the end of the year. I never presented in the conference, I have never done professional development before. Here I am saying 'I gonna to get up to teach my teachers.' They are not my students, they are my peers. So that is really stepping out of my comfort zones. I used to be in front of students and now I am in front my peers. I have done similar things, but I have never taught my peers. That is stepping out of your comfort zones. That is something I got out from the group. Again, I am the risk taker. I will do things that I have not done before, but the group helps.

Sandy was not the only one who was uncomfortable presenting in front of other adults. Actually all these teachers experienced uncomfortable feeling when they were asked to do something that they had not achieved the confidence to do. When Nancy asked the group to present their Young Authors Embrace Technology in Writing project at local or regional professional conferences, they all felt very uncomfortable. Sandy was not sure whether she could make it because that was a task she never did before. Though she was paired with Lucy to present at the conference, Sandy thought she would not have presented in public if she were asked to at the very beginning. Like Sandy, Lucy did not feel comfortable to present in front of other adults, either:

> I never put myself as a presenter in front of teachers, in front of my peers, that scared me. Because I think I was measured up whether I was good enough by presenting something in front of my peers.

This was exactly what Becky once expressed:

> I would not present at MACAUL if she [Nancy] told us at the beginning that we were going to present at MACAUL some day. I would say 'no way'. We do not know enough, I will never know enough. I will never be at that knowledge thing, and I still am not.

Like Sandy, Lucy, and Becky, Jenny was also worried about being judged when she had to present her project in front of other professionals:

> Actually presenting to another adults is not very exciting. It is exciting, but it is kind of scary. The enthusiasm I think that the group generated for what happened, or what we could do in a presentation helped you to get over the fear level a little bit.

Despite the uncomfortable feeling of stepping out of their comfort zones, they all took the courage to present in front of other professionals. According to Sandy, she "received praises either from the group itself, or from the presentations we were doing". As a result, Sandy built her professional confidence through stepping out of comfort zones:

> We feel we make a difference in education. I feel I make a difference. I think the group makes a difference in education. I think we are on the cutting-edge. I also feel all of us are risk takers. We like to do things that may be just a little bit out of our comfort zones, so maybe we are a lot alike in our personalities.

Like other teachers, the success of her technology integration and the recognition from other professionals encouraged Sandy to take on new professional roles. In the second year of the group, she won her own Tomorrow Technology grant. According to Sandy, she would not have written this grant if she did not participate in a consortium meeting with Nancy's technology support group. In that meeting, she got the chance to learn grant writing. During the academic year of 1999-2000, Sandy got her own Tomorrow Technology grant, which enabled her to train teachers in her school to use KidPix in student writing. Again, Sandy stretched herself from being a participant of Nancy's technology grant to becoming a grant winner herself who trained other teachers to integrate technology:

> I never would have written a grant for 10,000 dollars if I had not been with this group. Professionally, I feel I step out of my comfort zones several times because I take on things I have not mastered yet. Yet, I feel I am comfortable to do it because I know I have someone else there. If I do not have the answer to something, someone else will. Being in that group helps me do that. I like technology; I have an interest in it. But I would not consider teaching technology. I would [do it] now. I would consider that as a career change. Professionally, it is a different way for me to teach. But I see myself teaching others.

In short, Sandy's learning like others entails stepping out of comfort zones to perform the tasks that she had not fully mastered yet. As a result, Sandy built her confidence and took on new professional roles. These new roles include: 1. She made her technology integration public through presenting at professional conferences with Nancy's group, a task she never did before. 2. Sandy applied for a Tomorrow Technology

grant to train teachers in her school district to integrate technology because of her technology integration experience with Nancy's technology grant. 3. She helped Nancy to train teachers in other school districts to integrate technology. Through taking on these new roles, Sandy formed her new professional identity from teaching 4th grade students to teaching her peers:

> I would never present if I had not been in that group. It really rises to another professional level. That seems like a major category itself. We were teachers at the classroom. Now we were teaching our peers.

Sandy's learning illustrates what Lave and Wenger (1991) argue that learning not only is manifested in mastering new skills and understanding as well as performing new tasks, but also entails the forming of a whole person in a social community, which defines and is defined by various relations of this social community:

> As an aspect of social practice, learning involves the whole person; it implies not only a relation to specific activities but a relation to social communities-it implies becoming a full participant, a member, a kind of person. In this view, learning only partly-and often incidentally-implies becoming able to be involved in new activities, to perform new tasks and functions, to master new understandings. Activities, tasks, functions, and understanding do not exist in isolation; they are part of broader system of relations arise out of and are reproduced and developed within social communities, which are in part systems of relations among persons. The person is defined by as well as defines these relations. Learning thus implies becoming a different person with respect to the possibilities enabled by these

systems of relations. To ignore this aspect of learning is to overlook the fact that learning involves the construction of identities. (Lave & Wenger, 1991, p53)

Conditions for learning and changes

Not only did Sandy value various activities of Nancy's technology support group, which offered her ample opportunities to learn, she also referred to other conditions that were necessary to sustain her participation in this teacher learning community.

Ownership

The call for participation in Nancy's Young Authors Embrace Technology in Writing project was disseminated as a grant application. Sandy had to take initiatives to apply for grant, which was more important to sustain her commitment to integrate technology than being mandated to do so.

> Another neat part of this grant is that people who work on these are the ones who want to do it. So they come with a learning attitude than those are forced to do it. I think if people have to apply for something, they are more fully committed to the projects.

Moreover, setting up technology integration projects as grants for teachers to apply not only encouraged Sandy's inputs in her own learning but also further pushed Sandy to articulate why and how her integration project would better benefit her students and herself in the classroom:

> In each of those steps, each time I had to write a proposal. I had to think about 'how can I use this computer?' 'What else could I do with it?' Actually, I am still

> at that point because every time, the grant rolls around, [I had to think] 'What else could I do with it?' or 'what students would learn from it, or they can benefit from it?' So my view comes from that 'what else can I do with the computer?' or 'what else can kids do with the computer?'

Encouraging teachers to give input is important for technology integration and learning around technology integration (Swan et al, 2002)

Embededness and connectedness

Like Becky, Sandy does not have time to do extra work as a busy elementary teacher. The embeddedness in a curriculum area and the connectedness with teaching are another two important features of this teacher technology support group that is central to Sandy' learning. Nancy's project was not targeted at merely learning technology but was tied to the Young Authors writing project of the ISD. The Young Authors project was a project of writing that teachers in Sandy's school were invited to do annually. Nancy's technology project was an extension of the original project to one more dimension, which added a multimedia component for Young Authors' books. It situated technology integration in writing:

> Because we are doing Young Authors and writing, technology and writing should go together as a motivator for students. For some of the teachers, writing is hard to teach. ... Our group is dealing with writing processes to make something that kids would want to do, and the ways that teachers may also handle it better.

Besides the situated nature of Nancy's technology project in writing, Sandy also connected it to a reading theme of her school:

> Everyone [in my school] is required to do reading and writing as a school improvement goal. That was how I wrote the grant. I decided to write the grant that worked into NEA's [National Education Association] reading program. My project was a part of NEA, not an extra part of NEA. NEA was required. Technology was a choice. Writing was a choice. And the grant was a choice. I looked for connections. 'How do you work these all together so that it is not an extra?'

Because of the embeddedness and connectedness of Nancy's technology project, Sandy was motivated to join this technology support group to learn to integrate technology:

> I always grow. I feel I get something out of it every time. I learn something new. I always look for things I can learn. I enjoy learning. I enjoy making connections that is how I can use these for my classroom.

Leadership

As a leader, Nancy kept writing technology grants to bring teachers together, which was vital to get Sandy started and sustained her participation in various activities of this professional learning community.

> Nancy kept continuing writing the grants so there is a reason for us to continue to get together. So each grant lead to a new project that we can collaborate on. And she always found ways to write us into the grants. So she might think about how to get us together again.

Besides writing grants for teachers to work with, Nancy's leadership was also reflected in her technology advising through offering technology classes at the ISD or

through one-to-one technical consultancy. "Nancy was the main focus. She was really our technical advisor in most things that connect to the computer."

However, Nancy was just a coordinator of the project instead of a commander who mandated what teachers needed to do. Teachers were owners of their projects. They decided what needed to be learned and how the project was carried out:

> I: Who decides when to meet?
>
> S: Nancy decided when to meet via email, or teachers decided in the meeting time. Nancy coordinated the meeting time. Nancy asked teachers to come to share the projects that they did in some of the classes she taught. Teachers in this group presented to others. Nancy is the guiding force to get the group together.

Moreover, Nancy's leadership was not only manifested in her role as a project coordinator and technical advisor but also the emotional support that she gave to teachers, as Sandy said:

> I think we all respect each other, I think we see abilities in each other. I get the feeling I can do it, I can accomplish things. I think for me, the group inspires me to do more. I feel appreciated. Nancy did a really nice job making you feel good about what you were doing. You got a lot of compliments, 'that is really cool'. That is a part of the support.

Support

Like Becky, Sandy also got technical, professional, emotional, and resource support from her peers and Nancy, which was indispensable for her learning and development. She especially appreciated the professional support from her peers. For

example, Sandy would not be able to take on new professional roles if she did not have her peers to rely on for professional support. Sandy explained:

> I enjoy the learning we were doing and I want to know more about technology. I want to do the multimedia because I see the benefits for my students. And it is fun. And I think I get a lot of self-esteem from it. And I stretch myself because I have the support when I come to this group. I know if I ran into problems that I could not solve, somebody out there in this group either knew how to do it or maybe knew the resource we could go to find out: 'How to fix it?' 'How to do it?' 'What is the capability we might be able to' . . . There is someone capable to solve my current dilemma. So it is a support group.

The resource support from Nancy was necessary for Sandy's technology integration. Without getting resources from Nancy such as equipment, time-off, and stipends, it was impossible for Sandy to achieve what she had achieved in this technology support group. "The group gave us things like digital camera, the scanner, and the computers. We had to have that. If we did not have that, we could not accomplish a lot of things we did."

Time-off is always an issue for Sandy's participation in professional development activities for technology integration. She could hardly find time in her regular school days to go out to meet and learn with other teachers. By getting paid time-off for the activities she was invited to participate in, Sandy felt her professional expertise was appreciated:

> I think that was an important part of the support group that they need time to plan. So she did put in some planning days in her last grant so that we take time to plan.

> She [Nancy] also gave stipends to us. If we came after school, she would give us stipends. I do not remember if the first year we were, but the second year we were. I knew Michigan Consortium also gave us stipends for our participation with them. I guess that is important. A lot of attitude is that we should give time freely. When you get into a certain point that I am bringing in something to the group, like if someone asked me to do a lesson plan, I am bring in something in an academic area that I know. I am at a point that I am knowledgeable enough. Maybe I should get paid. So I guess someone offers me a stipend I would not say 'thank you'. If I got an offer, I would take it. In this group, Nancy tried to provide the stipend. The first year, it was the equipment we got. Then in the next grant, we got a stipend. In my grant, I gave teachers stipends after school, and I think they appreciate that. ...I think the release time is really important because we do not have that in our elementary day. ...You never could find an hour of time that a group of teachers can sit down in our school. And that makes a difference on getting a group together, being able to have the time.

Therefore, various forms of support Sandy gained from Nancy and her peers were critical for her to engage in learning and development with this technology support group.

Collective nature of learning

To Sandy, making learning as a collective enterprise was important. At the beginning, she just thought everyone come to do her own project with the assistance and support available from Nancy:

> Basically, it was in the first meeting, I never really thought of this as a group working with these people. I just thought it was kind of like 'we were working alone together' 'we are learning some of the same things.'

As time went on, Sandy formed friendship with these teachers through sharing and support. She felt she benefited more from learning with the whole group than what she could learn from each individual:

> The group becomes like a hobby. It is interesting and enjoyable. We develop friendship. We really get more out of the group than just we may learn from each person. We are getting friendships. Emotionally we are developing, but professionally we are developing, too.

She commented that this group was like "ripples that created waves". She envisioned that more collaborative group projects among five school districts would occur in the future:

> Just from this group, I can see our five school districts being able to work together more. Just from this group, the future would be to have five districts getting more and more teams like ours in different areas, maybe not technology, maybe the next area is writing, or like the social studies we are doing right now. This really gets five districts again together along with a bunch of other districts. We are leaders of five districts. You know, technology is the first, social studies is the next. Who will know what would be the next one?

Conclusion

Like Becky and Jenny, Sandy not only learned to integrate technology in student writing but also gained new perspectives of student thinking processes in writing through

participating in the activities of this learning community. Unlike Jenny, who made a paradigm shift of teaching from a traditional text-book oriented teaching to project-based learning, Sandy already did project-based learning. She just revised her teaching by incorporating multimedia in writing and provided more options for student writing. Moreover, Sandy's development with this teacher learning community went beyond merely getting new knowledge and skills about teaching and learning. Learning also entails forming a new professional identity when Sandy changed from being a learner to becoming a teacher of other teachers. Besides various activities that offered ample opportunities to learn, Sandy also appreciated several conditions that made her participation in this learning community possible. These conditions include teacher-initiated technology planning, embededness in curriculum and connectedness to practice, leadership, support, and collective nature of learning. As a result, Sandy formed friendship and a supportive network with these teachers, which is an important feature of a learning community. Similar to Schwab (1976), forming of relationships among members rather than taking the roles or climbing in ranks is essential to develop a learning community, which is important for teacher learning and changes.

Chapter 6

Conclusions and implications

Since teachers' voices are often left out in the literature, I start this chapter with a synthesis portrait of learning in a three-year period represented by these teachers. Then, I reveal the content of learning and single out the critical practices (Rosaen, 1995) of this professional learning community that seem to be crucial for these teachers' learning and changes. In addition, I identify the conditions that are important for these teachers' participation in this professional learning community. Finally, I discuss the lessons and implications of this study for future research and practices.

A professional community facilitates teachers' learning and changes

Through a three-year engagement in Nancy's Young Authors Embrace Technology in Writing project, these teachers individually and collectively experienced learning and changes in many aspects. They not only changed their views and uses of technology in teaching, they also gained new insights about student learning processes in writing and enhanced their writing instruction. Table 6.1 shows the changes in aspects of technology, teaching, and learning that Becky, Jenny, and Sandy experienced through participating in activities of this professional learning community.

Table 6.1 Teachers' changes

	Technology before	Technology now	Teaching before	Teaching now	Student Learning before	Student Learning now
Jenny	a. Games b. Practicing drills and multipli-cations	a. Tools for presentation b. Tools to facilitate student writing process	Textbook-based teaching	Starting to do project-based teaching.	Students learn what teachers teach.	Paying more attention to the needs of individual students.
Becky	a. Tracking assignments b. Practicing multipli-cations	a. Source of information b. Tools for communi-cation c.Tools for expression	Employing writing process but often using writing centers.	Modeling writing for students, conferencing with students individually, and give more options to students.	Knowing that students learn differently theoretically.	Understanding that students learn differently practically through visualizing their thinking processes in writing.
Sandy	a. Record keeping b. Practicing multipli-cations	a. Tools to make writing look nice. b. Tools to facilitate student writing process	Project-oriented teaching Using story web, mind map, and writing process	Giving students more options in writing.	Understan-ding students learn differently theoretically.	Realizing how students learn differently practically through visualizing their thinking processes in writing.

All three teachers drastically changed their views and their uses of technology in teaching. Jenny used to see technology for games, and to practice drills and multiplication. Now she uses computers to facilitate student writing processes and to present students' work. Both Becky and Sandy used to use computers for record keeping and practicing multiplications. Now Becky uses computers to search for information and to communicate. Sandy now sees computers can not only can make writing visually appealing but also can facilitate student writing processes through affording them the opportunities to visualize their thoughts.

Besides learning about technology, these teachers gained new insights about student learning processes in writing and enhanced their writing instruction. Jenny, who used to be teacher-centered, now pays more attention to individual student needs in writing. Becky and Sandy both understand the principle theoretically that different students learn differently. Now they understand what this principle means in practice when they see different thought processes of students in their writing. As a result, all three teachers enhanced their writing instruction. Jenny changed from text-centered teaching to project-based teaching. Becky incorporates individual conferences in student writing processes instead of just having students write by themselves in writing centers. Sandy gives students more options in writing instead of merely providing them with fiction or non-fiction writing plans.

In addition, the learning of these teachers entailed forming new professional identities when they took on new professional roles such as presenting their technology integration projects at professional conferences and training other teachers to integrate technology in teaching. These teachers' learning illustrates what Lave and Wenger (1991)

argue that learning through participation in a professional community entails becoming a new person, which is more than gaining new understanding, mastering tasks and engaging in new activities:

> As an aspect of social practice, learning involves the whole person; it implies not only a relation to specific activities but a relation to social communities-it implies becoming a full participant, a member, a kind of person. ...Learning thus implies becoming a different person with respect to the possibilities enabled by these system of relations. To ignore this aspect of learning is to overlook the fact that learning involves the construction of identities (Lave & Wenger, 1991, p.53).

Moreover, some learning and changes reported by these teachers were evident in my observations of their classroom practices. For example, Becky enhanced her approach to do writing workshop (Calkins, 1994) by incorporating the strategy of conferencing with students individually after hearing what Kate, Betsy and Jenny did with their kids in writing process in a group meeting. In my visit to Becky's classroom, I noticed that Becky used two different methods to conference with each student individually. One method is to have a student present in front of the whole class, and then have other students comment on it by pointing out "stars" and recommending "wishes" of the writing. Becky modeled how to comment on "stars" and "wishes" in front of all students. The other method is to have each student talk to Becky about his/her writing while other students are doing their own seatwork. The following reflective notes after the classroom visit illustrated what Becky meant by "conference with students individually" and how she changed the way she taught writing through appropriating Kate and Becky's strategies to do writing workshop:

Becky talked about how her teaching of writing changed as a result of hearing Kate, Betsy and Jenny talked about conferencing with students individually in the writing process. Becky used to use "centers" a lot for students' reading and writing. In that method, students basically worked on their owns. After Becky saw how Kate, Betsy and Jenny used the writing process to conference with kids at different levels, Becky adopted their strategy. She began with a mini lesson about a topic through whole group instruction, modeling and guiding. Then, she talked to different groups of students. According to my observation, one way to conference with students is to have each student from the group of the day to present their writings in front of the whole class. These students are called authors. When each author presents his/her writing, Becky asked the audience to talk about "wishes" and "stars" to the author. A "wish" means a place that is not clear which the author needs to write more about. A "star" means the places of good writing that needs praise. During this process, Becky modeled to do "wishes" and "stars" for both authors and audiences. Another way to conference with kids is to have each kid of the chosen group to read a story to her during their silent reading time. In this way, she can check the reading ability of each kid. In short, Becky combined whole group instruction and individualized talking in student conferencing processes.

Content of learning: a wide scope of topics around a subject area

For these teachers to integrate technology and make significant changes in their writing instruction, data analysis shows that they were exposed to a wide range of topics

of learning through various activities. Table 6.2 shows a list of topics of learning to which they were exposed.

Table 6.2 Topics of learning

Topics
Hardware and software
Technical skills & tips for technical trouble shooting
Technology management in classroom
Instructional uses of technology in writing
General ideas about teaching
Ideas on doing writing workshops
Student thinking process in writing
Resources about writing and technology uses in subject areas
Information on grant writing

These teachers' successful stories of integrating technology in writing show that it is insufficient to merely master computer competencies to enhance their instruction in writing. KidPix and PowerPoint that these teachers integrated in student writing are software for general uses. KidPix is graphic software, and PowerPoint is presentation software. They themselves do not imply specific pedagogy to solve the problems of writing as some pedagogical tools (Salamon, 1993) do. To integrate technology and enhance teaching, it takes teachers to learn more than computer technologies. From these teachers' learning experience, they need to focus their learning in a subject area. They need to think about student thinking processes in writing differently. They need to reflect their general pedagogies and writing strategies. According to Jenny, what she needed the most was the ideas for integration in writing rather than the knowledge about technology.

> To me, I got familiar now with how to use the equipment. I passed the needs to learn how to use the equipment. Now I need to get more ideas how to use the equipment as teaching tools or as presentation (tools), that type of things.

For Becky, though she already developed ideas for technology integration in the Internet class taught by Nancy before she joined this technology support group, what she needed the most was the support to execute her Road Rabbit project, a social studies project incorporating the Internet for information and multimedia in writing. With the support of the group, she got technology management ideas, such as using fourth grade buddies instead of parents to help her 1st graders to complete their multimedia books for the Road Rabbit project. To Sandy, the group was not only the source of ideas for her technology integration but also the source of ideas for her winning a technology training grant to help teachers in her school to integrate technology after she learned to integrate technology in student writing.

In short, to integrate technology and transform teaching, these teachers not only gained technology competencies but also think about technology, student learning and teaching in writing differently. The substance of their learning covers a wide range of topics and focuses on writing instruction. These teachers' successful stories of integrating technology in writing confirm the importance of having a subject focus for technology integration, an issue that is missing in popular professional development for technology integration (Little, 1989; Survey on professional development and training in U.S. public schools, 2000; Zhao, 2002). The focus on writing afforded these teachers opportunities to change and enhance their writing instruction.

Forms of learning: learning opportunities occur at both social and individual planes

Learning opportunities

Teachers appreciated various activities of this professional learning community that offered them ample opportunities to learn in a three-year period. Table 6.3 shows a list of activities of this professional learning community, which provide learning opportunities to these teachers.

Table 6.3 Activities of learning

	Activities
A	Interacting with group members through talking, sharing and presenting projects to each other.
B	Interacting with group members through CMC communications.
C	Attending technology classes and workshops offered by the ISD.
D	Trying technology out in practice.
E	Grant application: a means to articulate technology plans.
F	Attending conferences
G	Making learning public: a. Presenting at conferences b. Training other teacher to integrate technology.

Among these activities, three seem to be crucial for these teachers' learning and changes: sharing, trying technology out in practice, and making learning public.

Sharing

Among various learning opportunities, sharing (including talking and presenting to others informally) seems to be the key form of learning. Data analysis shows these teachers not only share technical skills and tips for technical troubleshooting but also share instructional ideas and materials in writing. In addition, they shared personal lives. Through sharing, these teachers got ideas for technology integration and ideas for teaching writing. Moreover, these teachers formed friendship, which was crucial to sustain their continuous participation of this professional learning community as Sandy

commented: "As we became friends, as we became support for each other, I guess we noticed the value of having that support for each other. We thought 'we should keep this going, we should not stop'."

In an isolated culture of teaching, sharing about teaching and learning among teachers is missing (Little, 1990). Even when teachers shared, their staff room conversation is always about "tricks of the trade" of teaching instead of seeking alternative ways of instruction (Lortie, 1975). Therefore, teachers' careless and occasional sharing of curriculum materials and information about students is unlikely for them to open their practice for scrutiny and lead to changes in teaching (Little, 1990). To overcome the limitations of informal sharing, scholars advocate critical colleagueship among teachers through debating and constructive criticism among colleagues, which would challenge teachers' underline assumptions of teaching for fundamental changes in their practices (Lord, 1994; Ball & Cohen, 1999).

This research does not ignore the limitations of careless sharing nor does it intend to challenge the importance of critical colleagueship. Instead, this study suggests that authentic sharing among teachers is essential for teachers to get ideas to integrate technology and to discern the differences between one's own teaching strategies and that of others to stimulate reflection and appropriation. Computer technologies are new instruments to facilitate teaching and learning. Teachers rarely have experience of what teaching and learning with computers look like, especially in writing. Therefore, it seems to be important for them to share each other's project to get ideas and strategies on technology integration in writing.

The content of sharing seems to be crucial for the kind of outcome of learning.

If what teachers share is only about "tricks of the trade" of teaching and learning, it is very unlikely that teachers will make authentic changes in their beliefs and teaching practices. This technology support group focuses on writing instruction, a factor that will be discussed in the section of conditions of forming a professional learning community. The examination of the content of sharing of these teachers shows that they not only share technical skills but also share general pedagogical ideas and subject specific pedagogies. So they all experienced changes in their teaching in addition to learning technical skills. Jenny learned general pedagogical ideas on 4th grade teaching and subject specific ideas like the ideas to connect writing with a social study project. Becky incorporated the strategy of "conferencing with students individually" in writing through Kate and Betsy's sharing of their strategies to conduct writing workshop. Concrete sharing of writing strategies helped Becky to distinguish the differences between her strategies to teach writing and that of Kate's and Betsy's because they had a common ground, a practice advocated by reformers for better communication among teachers (Little, 1982; Ball & Cohen, 1990). Lucy, like Jenny and Becky, also benefited from the sharing of each other's multimedia project. Lucy appropriated Sally's Storyboard, an alternative writing plan for students to jot down their ideas be incorporated into their writing processes.

In sum, the authentic and concrete sharing affords these teachers to get instructional ideas and distinguish the differences between the strategies of their instruction and that of others' instruction, which provide them with opportunities to reflection on their teaching and change their practices.

Opportunities of trying technology out in practice

As Nancy's multimedia project was a writing project, these teachers had opportunities to create an authentic multimedia-writing project in their own teaching. Trying technology out in practice provides teachers opportunities to reflect, an important means for teachers to gain new understanding of teaching and student learning (Schon, 1987). When Jenny, Becky, and Sandy got the chances to observe students write in a multimedia environment, they were able to see how different students wrote in different ways. Thus, Becky and Sandy both understood the meaning of "different students learn differently" at a practical level. And Jenny paid more attention to students' individual needs than merely focusing on textbooks. As teachers achieved new understanding of student learning, all teachers gave students more options in their writing. Making new sense of student learning processes during their teaching may further shape these teachers' action, which is called reflect-in-action (Schon, 1987), a quality that is important for professional learning. Observing student writing in multimedia also provides teachers opportunities to reflect-on-action (Schon, 1987), to think back on the instructional strategies they used. For example, Sandy used to provide students with two fixed writing plans, a plan for fiction writing and a plan for non-fiction. When she gained a new understanding of "different students learn differently" at the practical level, she revised her writing strategies. She offered students a new writing plan, a blank piece of paper with 6 squares on it (See Appendix III). She called it a Storyboard, where students could draw pictures and write matching words to their pictures simultaneously.

Having opportunities to try technology out in practice also provides teachers opportunities to appropriate their learning, a "process by which individuals transform

their understanding of and responsibility for activities through their own participation" (Rogoff, 1995, p150). For example, the birth of Jenny's Cruising Coyote project is the appropriation of Becky's Road Rabbit project, which is achieved through Jenny's "adjusting, modifying and maybe enhancing whatever was done before."

Becky also enhanced her method to do writers' workshop through applying the strategies of "setting up individual goals" and "conferencing with student individually" that she learned from Kate and Betsy in a group meeting on writing processes. Becky used to rely on writing centers for student writing, where students wrote on their own. Now Becky appropriated these new writing strategies she learned from Jenny's team in her own teaching. These new writing strategies were evident in my classroom observation of Becky's teaching. Unlike the workshop model of professional development that emphasizes learning techniques and general procedures without addressing teachers' authentic concerns in practice (Little, 1993), having teachers try technology out in one's own teaching afford these teachers opportunities to reflect and appropriate new teaching strategies.

Making learning public

Not only did these teachers share among themselves, they were also pushed by Nancy to open up their practice for public examination through conference presentation and training other teachers to integrate technology. According to Becky, this helps to make sure that they are learning to "integrate technology" rather than "using technology for the sake of using it". Making learning public helps them to overcome limitations of

sharing (Lortie, 1975, Little, 1990) and move a step forward toward the professionalism of teaching (Sykes, 1999).

For a teacher to be a professional, Buchman (1987) argues that s/he has to subordinate her practice to professional rules and standards so that s/he can overcome personal preference that was empowered by the isolated culture of teaching. At the beginning, they were reluctant to present to the public. Jenny was "scared" to present in front of others. Lucy did not like to be measured by other adults. Sandy and Becky both would not join this teacher learning community if they knew they were expected to present at professional conferences. Through taking on the roles of presenting their projects at professional conferences and training other teachers to use technology based on their own experience, these teachers were under the examination by professionals in a bigger professional community other than colleagues in this technology support group. This strengthened the tie among these teachers because they needed support from each other for taking on these new professional roles.

Learning occurs at both social and individual planes

Looking across the activities of this professional learning community, some of them offer learning opportunities at social planes, and some of them offer learning opportunities at individual planes. Learning opportunities at social planes include a) chances to learn through interacting with teachers in this professional community as well as b) chances to learn through interacting with other professionals in a broader education community. Learning opportunities at individual planes refer to learning opportunities occurring when a teacher a) makes new sense of teaching and learning by him/herself

without interaction with other teachers and professionals or b) appropriates what s/he has learned in social planes. Sharing and making learning public afford learning at social planes while trying technology out in practice provide learning opportunities at individual planes.

Data analysis shows that these teachers all depend on learning opportunities at both social and individual planes for technology integration as well as changes in their teaching. Each of them does not necessarily follow the same learning path. Take these teachers' learning of technology integration as an example. For Jenny's creation of the Cruising Coyote project, she first got the idea of creating a non-fiction type of writing with multimedia through Becky's sharing of her Road Rabbit project in a group meeting. Jenny saw the project and talked to Becky about how she did the project. Becky shared with Jenny her lesson plans of the Road Rabbit project and passed Jenny a CD regarding this project. It was from sharing ideas and materials of the Road Rabbit project that Jenny started her Cruising Coyote project.

However, Jenny did not simply copy what Becky did. When she developed her Cruising Coyote project, she reflected on Becky's project and appropriated it to invent her own through adjusting and modifying Becky's project according to her own classroom situation. The comparison of Jenny's lesson plans and Becky's lesson plans shows the differences between these two projects (Appendix 2). Jenny's Cruising Coyote project tries to integrate math, science, social studies and writing while Becky's project is a combination of social studies and literacy. In a sense, Jenny advanced Becky's project. Jenny's appropriation of Becky's project depends on on-going learning opportunities at both social and individual planes.

Unlike Jenny, Becky seems to follow a different path to learn technology integration but still relies on learning opportunities at both planes. When Becky joined this technology support group, she already had the idea for integration, which was the Road Rabbit project she developed in a technology class led by Nancy. She first implemented the Road Rabbit project in her classroom and then relied on others for the ideas and technical support to enhance this project. Becky found her students lacked parental support compared with the parental support that Jenny's students had. She learned from Nancy's advice of using 4th graders as buddies to support her 1st graders. She also got busing support from the ISD to bring over 4th graders for technical training at the ISD. She first identified the problem associated with technology integration during her implementation, and then she sought advice and support from others to solve the problem.

Like Jenny and Becky, Sandy also depends on learning opportunities at both social and individual planes to integrate technology. When she observed how students wrote with multimedia, she made new sense of student thinking processes in writing, an instance of learning that occurred in the individual plane. I asked if she could learn the idea that some students would visualize their stories first in graphics through using technology alone instead of interacting with other teachers in this technology group. Though Sandy had difficulties in articulating her learning processes, she told me that her ideas for technology integration were actually based on what she saw Margaret and Jenny's 1st graders use KidPix in creating multimedia books. She appropriated their ideas and helped her 4th graders create multimedia books.

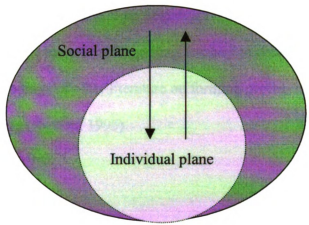
Though each of these teachers followed a different path of learning in integrating technology in writing, they all moved back and forth between learning opportunities at social and individual planes including classrooms, a professional learning community at district level, and regional professional associations which are in charge of disseminating professional standards and methods such as the established writing workshop model (Calkins, 1994) for writing instruction.

For these teachers, learning and development that occurred in one plane is inseparable from learning opportunities occurred in the other plane (see graph 6.1). The boundary between these two planes is blurred rather than clear-cut because these two planes are mutually constituted. Each plane is either foreground or background to the other, which constitutes the whole social cultural activity of teaching (Rogoff, 1995). The mutually constituted relationship of these two planes and the relationship of being foreground or background to each other probably can be illustrated through visualizing how a drama goes on at the stage. When the main characters are highlighted on stage, they are not the whole story. The scene at the background is an inseparable context in which the story took place. Just like the highlighted stage and its background scene, teacher learning occurred in the highlighted stage is inseparable from its context, which constitutes the whole social culture activity of teaching. In the process of teacher learning, the attention to learning opportunities in individual planes should not be separated from learning opportunities at social planes, and vice versa.

Moreover, engaging in various activities of a professional community allows these teachers to learn more than merely internalize techniques, skills, and understanding at the cognitive level. Their participation in this professional learning community created

learning opportunities at both social and individual planes, which enabled these teachers not only to appropriate their learning about and with technology integration but also to appropriate their new professional roles. Their appropriation of learning was manifested in publicizing their knowledge about technology integration in professional conferences and training other teachers to learn to integrate technology. It is "the change resulting from a person's own participation in activity, not to his or her internalization of some external event or technique " (Rogoff, 1995, p153). Therefore, participation is "itself the process of appropriation" (p.151).

Figure 2. Relationship between learning opportunities at social and individual planes



Conditions for forming a professional learning community for technology integration

Besides being exposed to a wide range of topics of learning and having multiple opportunities at both social and individual planes, there are other conditions that are necessary to enable teacher learning through this professional community. In this section,

I highlight these key factors that attract teachers to join the community and sustain their learning.

Incentives

Incentives are very important to draw teachers to this professional learning community. Each teacher reported that she was attracted to join this technology support group to get and learn computer technologies. Providing grants for teachers to work with is another important incentive to sustain teachers' participation. As Nancy kept wining grants for teachers, these teachers felt they had a reason for meeting with each other to accomplish their grants. Providing stipends for substitutes makes it possible for these teachers to get release time to come to participate in activities of this professional learning community. The incentives for getting teachers to come together for learning is consistent with the findings of other literature on forming professional communities that enable teacher learning (Rosaen, 1995).

A common goal

As early adopters of technology, these teachers were drawn to Nancy's technology support group with a common goal of learning to integrate technology. Nancy substantiated this common goal to a writing project called Young Authors Embrace Technology in Writing, a project aimed at incorporating multimedia component in an existing Young Authors project at the ISD. Having a common project to pursue was very important because it created a need for them to learn as Jenny said:

> It is always more valuable to learn when you have a project to use on. That we were offered a project, multimedia books for young authors. So we have a need to learn.

The common goal among members of this group provided Becky a sense of belonging as she could hardly find people who shared the same goal with her in her school. Sandy appreciated this common goal because it provided a common ground for them, who taught different grades, to learn from one another. Lacking concreteness and common ground for teachers' discourse has been a big challenge for teachers to engage in collaborative inquiry about their practice (Ball and Cohen, 1999). In this study, producing students' multimedia books is the common goal of this learning community, so it provides a common ground for these teachers to learn technology integration and strategies to teach writing.

Situatedness in classroom practice of a subject area

Moreover, the common goal of learning to integrate technology is situated in writing and connected to teachers' classroom practice. The situated nature of learning influences the content and outcome of these teachers' learning as the content of learning covers a wide range of topics more than technical skills, including technology in writing instruction, student learning and strategies of teaching writing. As their learning is also connected to classroom practice, it creates opportunities for these teachers to observe student thinking processes in a multimedia environment. Having opportunities to examine student thinking is the core component for teacher learning because the ultimate goal of teacher learning is to be better teachers for students' learning (Ball & Cohen,

1999). Situating technology integration in writing instruction afforded these teachers opportunities for understanding student learning as well as teaching strategies, a desirable feature of effective professional development that scholars argue for (Putnam and Borko, 1997).

A leader that provides vision and support

Nancy played an important role in attracting teachers to join this professional learning community and sustaining their learning. Nancy had a vision that technology integration should be embedded in a subject area by setting up the Young Authors Embrace Technology in Writing project. With this goal in mind, she had teachers share their projects as well as the writing process they used. From sharing, these teachers got ideas to integrate technology and strategies to enhance their writing instruction. Besides providing a vision for technology integration, Nancy also provided technical, professional and resource support for teachers. Nancy offered computer equipments like scanner and digital cameras to attract these teachers to join this professional community. She also offered computer-training classes at the ISD. She kept writing grants to sustain teachers' continuous participation. Over three years, the group was able to get grants and work together. Nancy made herself accessible to these teachers for their technical problems. Meanwhile, she was also a source of ideas to accomplish their Young Authors Embrace Technology in Writing projects. In addition, she pushed these teachers to make their learning public through presenting at professional conferences and training other teachers to use technology. As a result, all these teachers reported that they were able to "stretch" themselves and "step out of comfort zones". Instead of an authority, who mandated the

content and process of teacher learning (Hargreaves, 1992), Nancy was a coordinator who coordinated resources and support for teachers to carry out their innovations besides her role as a technology consultant. In short, Nancy played a critical role in supporting the learning of these teachers as Becky commented:

> So she was able to take our ideas, and listen to what we were saying. She could see where she could help and pull that stuff together and make it happen. Otherwise, it would not happen.

Ownership of learning

Though teachers were asked to carry out a common project, they had their own inputs in deciding what to learn and do to fit the project into their own classroom needs. In the first meeting, Nancy brainstormed with them together about the content of learning and the kind of assistance they need.

> Right before we got the hardware and after we had been selected for the project, we met together and decided what it was we needed to learn. We did brainstorm session with Nancy. We all talked to her what we felt we needed as far as training. We set up a schedule from that [Becky].

These teachers had inputs in their own learning, so they came up with different products, which became a resource for new ideas for them to distinguish the differences between their teaching strategies and that of others through sharing (Ball & Cohen, 1999). Jenny got the idea of creating non-fiction book combining writing and social studies from Becky and created her own Cruising Coyote project. Becky expanded her repertoire to do a writing workshop by appropriate the writers' workshop strategies

learned from Kate and Betsy. Sandy incorporated KidPix in her multimedia project the second year after seeing the multimedia books created with KidPix by Becky, Margaret and Jenny's students.

Traditional professional development has been criticized as ineffective because it treats teachers as passive recipients of knowledge by delivering or disseminating knowledge to them (Little, 1993; Wilson & Berne, 1999). As owners of their own learning, teachers in this study took active roles in their learning through participating in various activities of this professional learning community. From a social constructive view of learning, it is vital that teachers taking active roles to make sense of teaching and student learning through interaction with other teachers (Putnam & Borko, 1997). In an era of socially, structurally, and technically complex educational reforms (Little, 1993), teachers need to be active learners to engage in continuous inquiry about teaching and student learning as Wilson and Berne (1999) advocated:

> Teachers should not be the targets but rather tools for teacher learning. Teacher knowledge should be actively generated by teachers rather than passively delivered to teachers as traditionally defined.

Over time

Just as a one-shot workshop that is ineffective for teachers (Little, 1998), the Internet workshop Jenny attended twice did not help her integrate the Internet into her teaching until she joined Nancy's technology support group. It takes time to integrate technology, transform teaching and form new professional identities. These teachers spent three years building relationships, developed new understanding of teaching and

student learning and appropriate their learning in practice. Their learning experienced in this professional learning community showed that learning is an on-going process (Abdal-Haqq, 1995; Putnam & Borko, 1997).

Support

According to these teachers, learning entailed not only gaining new techniques and understanding but also the ability to "stretch" oneself and to "step out of comfort zones" when they performed news tasks (such as integrating technology in writing, conference presentation, and training other teachers to integrate technology) they would not perform if they had not been a part of this technology support group. The changing roles of these teachers from learners of technology integration to teachers of technology integration illustrates the concept of zone of the proximal development, the distance between teachers' current capabilities of performing activities individually and the potential capabilities they can achieve with the support of more experienced others (Vygotsky, 1978). The process of these teachers' learning in this professional community involves active participation in various activities, publicizing their knowledge at professional conferences, and appropriating their learning by taking on new professional roles.

As Vygotsky (1978) point out that potential development is "determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86), the support from the more capable others is indispensable. Unanimously, these teachers unanimously, talked about the importance of various forms of support from Nancy and each other for technology integration, enhancing teaching and taking on new

professional roles. These teachers each came with their own expertise, they themselves and Nancy are more experienced others. In Sandy's words, they "mentored" each other.

Each teacher got technical, emotional, professional support from their peers. Technical support was necessary but not sufficient for them to integrate multimedia in their teaching. Both Jenny and Sandy needed integration ideas from other teachers to create their multimedia projects. Though Becky had integration ideas, she needed ideas for executing her integration project in her classroom practice. With the professional support from the group, Jenny and Sandy got the ideas to create multimedia books. Becky got the idea to use 4th grade buddies instead of parents for her 1st graders to complete their multimedia books. For these teachers, professional support entails asking each other questions freely, offering general and subject specific ideas, as well as having a social network to rely on. Becky talked about "a support network" that she could rely on for improving her teaching. Jenny and Sandy both felt they had someone to "fall back on" when they had questions. Jenny's first experiment with Cruising Coyote project was incomplete because the Cruising Coyote was lost in the middle of the journey due to the mishandling of it by a host family. However, Jenny did not give the project up. She got Becky's lesson plan on a CD. She revised it and wrote a new lesson plan for the Cruising Coyote project, integrating science, math, social studies and language arts for the upcoming semester.

Besides technical and professional support, these teachers mentioned the importance of emotional support from each other. Learning to integrate technology was an uneasy task. Each teacher talked about the frustration she experienced when the files were lost or computers broke down. Moreover, learning and development were not

comfortable especially when these teachers undertook tasks that were beyond their capacities such as presenting their projects in public for the examination by other professionals. Having opportunities to share their feelings and frustration with each other was a great emotional support in sustaining their innovation in classroom.

As the leader of this professional learning community, Nancy was another important source for technical, resource and professional support. These teachers would not join this community in the fist place if Nancy and the ISD did not provide the incentives and resources (e.g. equipments, time-off, and stipends for substitute teachers). Besides providing technical and resource support, Nancy's was "at the disposal" of the whole project because of her accessibility for the professional needs of these teachers. Nancy's professional support also entailed a strong push for making these teachers' learning public. None of these teachers had ever thought to present their work in front of other professionals. Nancy pushed them to share their learning with a wider audience. That is why these teachers reported that they were able to "stretch" themselves and "step out of comfort zones" in the areas of technology integration, conference presentation and training other teachers to use technology.

Rosaen (1995) argued that support is necessary for professional learning and risk taking. These teachers demonstrate Rosaen's concept through technical, professional, resource and emotional support from peers and the leader in this professional learning community.

Cultural and organizational influences

Further analysis of these factors that impact teacher learning through a professional community shows both cultural and organizational conditions matter. The importance of cultural and organizational influences in this study does not mean that individual characteristics are not important. Their voluntary participation in learning to integrate technology showed they were active learners. The influence of individual characteristics is recognized here but not the emphasis of the discussion because these teachers attached great importance to cultural and organizational conditions rather than their individual features for their participation in this professional learning community for technology integration.

As teacher collaboration and professional community are not conventional organizational practice in the US schools (Little, 1990), the organizational intervention is necessary. In this study, Nancy's leadership role in technology integration, incentives, a common project situated in writing, administrators' attitudes toward teachers as professionals, and resources support such as grants, time, and stipend are organizational support that are necessary for teachers' participation in this professional learning community for technology integration in writing. Without them, teachers would not join this professional learning community in the first place.

However, merely organizational initiatives and intervention is not sufficient for forming teacher collaboration for significant learning and changes. Hargreaves (1992) cautions that if teachers are asked to carry out administration-imposed agenda through contrived collegiality, they may only engage in superficial learning rather than make

significant changes in their teaching. To foster authentic learning of teachers, it is the culture of teaching that needs to be the focus of change.

In this study, sharing and support are cultural factors that influence teacher learning if culture is defined as shared visions, beliefs and values. In the persistent isolated culture of teaching, teachers seldom have opportunities to share and support each other's teaching (Little, 1990). Even when they share, the sharing is often limited to the "tricks of the trade" (Lortie, 1975). However, teachers in this professional community engaged in authentic and substantive sharing about technology and teaching, which resulted in their learning in many aspects. In a sense, Nancy and these teachers created a culture of sharing.

Besides sharing, these teachers also built a culture of support. They were from five different school districts and did not know each other well at the beginning. Each expected to gain support from Nancy to do her own project when she first joined the group. Due to the common project, these teachers shared substantively in the three-year period. Through sharing, they gained many forms of support from each other and formed friendships. The supportive relationship among these teachers added a new cultural dimension to this professional learning community.

Similarly to what Newmann and associates (1996) argue, it depends on both cultural and structural conditions to foster professional communities, the teachers in this professional learning community also rely on both cultural and organizational conditions for their learning to integrate technology in writing. If they did not have organizational support like incentives, they would not be a part of Nancy's technology group. However, merely organizational support was not enough for them to form collegial relationship and

learn many important things together. Originally, they all expected the support from the leader instead of other teachers. It was through sharing and many forms of support from each other to accomplish the common project that they formed a supportive culture, which was crucial for their learning and development.

Implications

If teachers desire or have been asked to integrate technology and enhance teaching, my study suggests doing so involves a community of learners who take active roles to engage in on-going inquiry about their practice through interaction with other teachers and professionals in the field. This form of learning goes beyond merely gaining technology competencies. It is about having a new vision of student learning, of content, and of curriculum. It entails forming new professional identities and requires learning opportunities at both social and individual planes. This form of learning is made possible by certain conditions. For example, purposeful and authentic sharing embedded in a subject area is important for teachers to gain new ideas on teaching, learning, technology integration and to avoid the limitations of the "tricks of the trade". Trying technology out in practice offers opportunities for reflection and appropriating learning in social planes. Making learning public helps to avoid the risk of teachers' self-preferences (Buchman, 1987). Various forms of support are important because learning is demanding and time consuming. It depends on both organizational and cultural conditions beyond individual agencies and dispositions for forming a professional learning community for learning and changes.

As I make these conclusions, I also realize the limitations of my research. When I argue the importance of purposeful and authentic sharing to foster teacher learning, I do not pay attention to the relationship between the authentic sharing and critical colleagueship (Lord, 1994, Ball & Cohen, 1999) because critical colleagueship is not an issue in my study. Future research may look at the relationship between authentic sharing and critical colleagueship. As the situatedness/embeddedness in a subject matter is important for these teachers' learning, I do not know what impact a different subject area like mathematics would have on teaching learning because some research suggests that "subject matter knowledge is acquired differently across disciplines" (Wilson & Berne, 1999). Future research should attend to subject differences in teacher learning.

This research also can offer some practical suggestions for the audiences who want to know how to help teachers to integrate technology, and the audiences who intend to develop professional communities for teachers. To integrate technology for the purposes of improving teaching and learning, teachers need to gain more than technical competencies. They need to situate their technology learning in a subject area and connect it to real classroom practice. They need to think about student learning and their teaching differently. To make learning happen, teachers need to have learning opportunities in both social and individual planes. They need to have opportunities to interact with other teachers about the content of their learning, they also should be provided opportunities to try what they are learning in practice and have opportunity to reflect and to appropriate what they have learned. This form of teacher learning is time consuming.

Building a learning community for teacher professional development requires both organizational and cultural conditions beyond individual disposition such as voluntary participation. Organizational condition may include a common project in a subject area that instantiates the calls of educational reforms in teachers' classroom practice so that teachers from different backgrounds would have a common ground about which to talk and from which to learn. It may also include a leader to coordinate the program and provide technical expertise and various forms of support that are necessary for teacher learning. It is valuable to involve teachers in joint decision making so that they take the ownership of their own learning. It is also important to provide opportunities for teachers to make their learning public so that they will take on professional roles rather than personal preferences (Buchman, 1986).

However, this study suggests that merely organizational conditions are not sufficient to foster authentic teacher collaboration as Hargreaves (1992) argues. In addition, this study, similar to what Newmann and associates (1996) found in their study on school restructuring, suggests both cultural and organizational conditions need to work together to foster professional communities. Creating a culture of sharing and support is important for teachers to implement their innovations in the classroom because they need to have opportunities to share ideas and strategies. Authentic sharing is also important to form relationships among teachers because a learning community is about developing relationships among members (Schwab, 1978). Various forms of support in terms of resources, professional and emotional support are necessary for learning and development if learning entails that one needs to "step out of comfort zones". Authentic learning is hard (Wilson & Berne, 1999). There is no one-fit-all recipe for fostering a

professional learning community that promotes teacher learning. If one wants to develop a professional community, then one needs to take into consideration cultural and organizational influences in addition to individual characteristics.

Appendix A

Interview Questions

First Interview: Questions about teachers' teaching and learning biography

I want to get to know you as a teacher now.

1.1 Why did you become a teacher? What do you like most and least of being a teacher?

1.2 If I come into your classroom, what could be 3 things I could see that are import to how you think about teaching as well as how you teach? Why they are important to you?

1.3 Think about someone who you consider to be a good teacher. What does good teaching look like? What is the role of the teacher (what does the teacher do)? What is the role of students? Is this same or different when teaching writing? Why?

1.4 Think about students you have in the past year. What do you think about students at this age are capable of reading and writing? (students' current capacity). Can you describe for me a typical lesson that you teach writing? What do you do in students' learning to write (the teacher's role)? What do students do in their writing (students' role)?

Now I am going to ask your experience about teaching with technology.

2. Tell me about your prior experience with technology before you join this group.

2.1 When and what was your first experience with technology in teaching?

Why did you use that technology in teaching at that time? Can you pick 2 or 3 phrases that best describe your experiences using technology for teaching when you first started

to use technology? Why did you pick these words? Can you recall a time or lesson or anecdote that illustrates these (phrases)?

2.2 How do you think about technology in teaching now? If you are asked to pick 2 or 3 phrases that best describe your experience using technology in teaching now, will they the same with the previous ones you pick? Why or why not the same? Can you recall a time or lesson or anecdote that illustrates these (phrases)?

2.3 When and what was your first experience with technology in writing? Why did you use that technology in writing at that time? Can you pick 2 or 3 phrases that best describe your using technology in writing when you first started to use technology? Why did you pick these words? Can you recall a time or lesson or anecdote that illustrates these (phrases)?

2.4 When did you start to use Kid Pix? How did you choose Kid Pix for student writing? If you pick 2 or 3 phrases that best describe your experience using technology in writing now, will they the same with the previous ones you pick? Why or why not the same? Can you recall a time or lesson or anecdote that illustrates these (phrases)?

3.Now I want us to talk about your experience as a learner (learning skills as well as develop a new understanding, voluntary learning as well as required learning).

3.1 Think about something new you have learned, a skill or an understanding. How did you learn it?

3.2 Think about a recent experience that you were required to learn something new in teaching. How did you approach the new thing that you are required to learn? What were

your attitudes toward learning something you are required learn? From whom and where did you learn?

3.3 Think about a recent experience that you choose to learn something new in teaching. How did you approach the new thing you choose to learn? What were your attitudes toward learning something you have to learn? From whom and where did you learn?

Now I want to hear your experience about professional development in your school and school district.

4.1 Give me a list of all professional development activities available in the past year in your school and school district.

4.2 What activities did you choose to participate in the past year? Why did you do it? How did you decide what activities to take and what activities that you won't take?

4.3 Think about a few (three) professional development activities you participated in last year offered by your school or school district. What did you get out of these activities? Are they valuable? Why? How valuable are they?

4.4 Describe the in-service training you have or have had that involves learning computers and computer technology. Are they valuable to you? Why or why not?

4.5 Last but not least, can your describe the kinds of relationships between teachers and others (administrators and other staff) professionally and socially in general in your school?

4.6 How about the kinds of relationships among teachers and others in your school district? Do people collaborate?

If time permits, I will ask some general questions about the group.

Now I would like to know the history of your group with Mary Ann and others.

5.1 When was the group formed?

5.2 Why did you come to be a part of this group? What makes you keep coming to this group?

5.3 How often did you meet? How did you decide how often to meet?

5.4 What did you hope to get out from this group? How did you decide what to do?

5.5 What opportunities occurred around the particular thing you want to learn?

Probes: What activities are available for the particular thing that you want to learn? What role did you peers play in the particular thing you want to learn? What role did materials (software, resources from web, curriculum materials, etc.) play?

5.6 Are you able to/not able to apply what you have learned from this group into your own practice? Are there any opportunities occurred when you were able to or not able to apply what you have learned?

5.7 Did you learn anything valuable that you did not intend to learn with this group? How did you learn it?

Second Interview: questions about what teachers have learned and how they have changed through this teacher learning community?

5. What have you learned and how have you changed?

Probes: 5.1 what have you learned about teaching, learning, writing, and technology you did not know before you join this group? Give examples.

5.2 What were your goals of using technology? How did your participation in this group help you to achieve your goals?

5.3 What impact of this group had on your planning and teaching?

Probes: 5.3.1 Can you describe any changes have taken place in your approach to planning and teaching between now and three years ago?

5.3.2 Did you think and use technology differently as a result of participating this group?

5.3.3 Did you think and enact literacy instruction differently?

5.3.4 Did you think student and their learning differently?

5.3.5 Did you think and use literacy instruction pedagogy differently?

5.3.6 Did you think and form professional relationship with other colleagues differently?

5.3.7 Did you think and do anything else differently?

Questions about what contributed or hindered their learning in this voluntary community.

6.1 What affect your participation and learning in this group?

Probes: 6.2.1 How did you personal experience affect your learning in this group?

6.2.2 Who takes on leadership role? How did your leader impact on your learning in this group?

6.2.3 Describe collegial relationship professionally and socially in your school and school district. How did that affect your learning in this group?

6.2.4 Your relationship with teachers in this group.

6.2.5 Others

Appendix B

A description of Becky's Road Rabbit project

Dear Parents,

Our class would like to embark upon an adventure. Let me explain the project and how you can help us.....

We have adopted a small stuffed rabbit as our class mascot. He is named "Road Rabbit" in honor of his upcoming adventures. I have told the students that Road Rabbit will be sent around the United States. I've explained that his route would depend on the availability of "host" families who would be willing to keep him for a short time and write to the class about his adventure in their community. Now comes the part where I need help from you. I need help in locating host families. They could be relatives or friends around the country who would like to participate in this project and be willing to host our class mascot. These "host" families MUST be committed to following through by writing to our class and sending the mascot on to the next destination on the itinerary. I will need names and addresses of possible participants. I would like to emphasize that it would be especially helpful to our class Goals 2000 project if these names had access to email or maybe the local school and their email accounts. Our Goals 2000 requirements are such that we will be emailing hosts (or local people of the hosts). Please include email addresses on the bottom line of the "Address" section of this form. Call me for further explanation if you have questions. My number at school is 111-222, home 000-222-3333.

I will plan Road Rabbit's route from the information that you send in, making his journey as practical and as broad as possible. I might not be able to include everyone's name that is sent in but I will do my best. I would like to include different states of

course, small towns, large cities, rural areas, coastal regions and other diverse locations so the students can be exposed to a variety of places. A sequenced itinerary with names and addresses will be alongside Road Rabbit so that each participant will know where to send him next including our school address last where we will be eagerly awaiting his return before the end of the school year. Road Rabbit will be packed in a box with his itinerary, a letter explaining the project (see attached letter), and a class photo. I would like to plan a field trip (we can walk there) to the post office to send him on his way. We will have a large U.S. map posted in our room with each stop labeled and current location marked. This project will involve reading, writing, geography, the Internet and FUN! Host families could include information about their community and/or state, photos or videotape of Road Rabbit enjoying sights or other interesting things in their immediate area, post cards "written" by Road Rabbit, or maybe even samples of natural items from their area. The sky's the limit and we hope to have a memorable experience with Road Rabbit!

If you know of someone who would be great for this project, please list them and their address and send it back to school to me ASAP. Make sure that they are aware of this project and would be committed to helping us make this a success. It must be people who don't mind their names and addresses being included on the printed itinerary that will be traveling alongside Road Rabbit throughout his travels.

Last year we received many exciting facts and things representative of the area he visited; oranges and a book about manatees from Florida, a video tape from N. Carolina, a fax from Georgia, pictures and postcards from many sights, etc. The sky's the limit!

Becky Lane

APPENDIX C

A description of Jenny's Cruising Coyote project

August 8, 2001

Welcome Voyageurs and families,

Only a short time now before school starts again. ☺ We are so eager to see all of you. We're going to have a great year this year! We've been in the classroom getting ready for you. We have some awesome activities planned.

Our theme this year is "Working Together on Our Voyage through Time!" We will be learning about communities in America: how they were settled, who settled them, what traditions they brought with them, how the citizens worked together, and how communities have changed over time. As part of our study, we will be interviewing senior citizens in our community to write their histories; thus, getting a first-hand understanding of our own community's diversity and growth. **Then, to broaden our understanding, our own "By-way Bear" will be visiting different US communities to gather information about their regional traditions, history, and growth.** Finally, to bring it all home, we will be creating our own digital family trees, complete with pictures and family stories, as this year's Young Authors Projects. We are also planning some walking field trips to such places as the museum, library, cemetery, and local businesses.

We will be relating math (mileage, dates, time lines, averages, etc), science (sound, plants, matter, etc), reading (informational books, historical fiction, regional stories and legends, etc), and writing (personal histories, opinion papers, legends, and poetry, etc) to our communities studies as relevant. Whew! Maybe we'd better start before August 21! Just kidding. ☺☺

Which brings us to opening day. The **First Day of School will be August 21** and will be a half day. (Let's hope it cools down a little before then.) **Open House** will be the evening before on **August 20th at 6:30-7:30 p.m. in Room Numbers 12 and 13.** You can bring your supplies that night and put them in your desk. We're looking forward to seeing you at Open House.

Here are some things that you will need this year. **Please make sure all of your things have your name on them!**

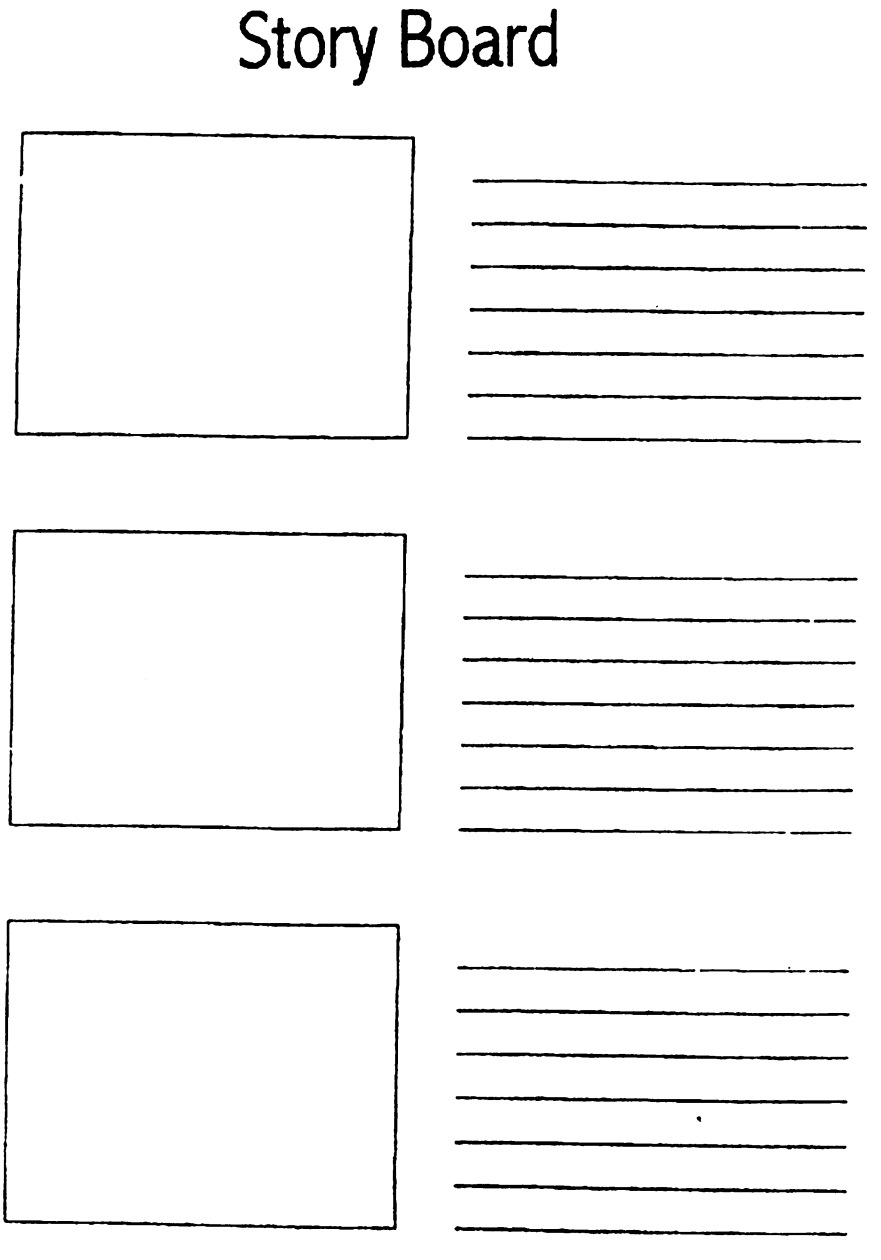
Box of tissues
A red pen (for editing)
1 or 2 floppy disks, 3½ inch, IBM formatted
glue stick
colored pencils
crayons
scissors
homework (pocket) folder
water bottle
snack

*You do NOT need a binder/notebook. We found they were not as helpful as we had thought last year. Instead, we will be supplying pocket folders that are color-coded by subject.

If you have any questions, give us a call. See you soon!☺

APPENDIX D

Sandy's alternative writing plan



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