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CONVERSATIONS ABOUT TEACHING AND TECHNOLOGY: A TECHNOLOGY SUPPORT GROUP FOR TEACHER PROFESSIONAL DEVELOPMENT

presented by

Andrew G. Topper

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Ph.D. degree in Educational Psychology

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CONVERSATIONS ABOUT TEACHING AND TECHNOLOGY: A TECHNOLOGY SUPPORT GROUP FOR TEACHER PROFESSIONAL DEVELOPMENT

By

Andrew G. Topper

A DISSERTATION

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Counseling, Educational Psychology, and Special Education

May 1998

ABSTRACT

Major political and societal forces are coming together to create an unprecedented push to infuse technology into K-12 schools. This infusion represents a serious challenge for teachers and an opportunity for researchers to better understand how technology is shaped by and shapes beliefs about teaching and learning. This study examines the relationships between teacher knowledge and beliefs about teaching, learning, and technology, and their plans and talk about technology within a support group. The conversations we had as a group became a focal point for my analysis as I examined the content of these discussions, the social organization of the group, and changes in participation patterns over time. These patterns reveal changes in group leadership and conversational norms that allowed the teachers to engage in substantive pedagogical discussions, stimulated by talk about technology, and to negotiate group goals. The content of these conversations also reveals that these teachers' beliefs and knowledge of teaching and learning, along with their assumptions about student abilities and external pressures they feel, shape the plans they made for teaching with technology. This study provides evidence that a conversational forum for technology learning allows teachers opportunities to make public their taken-for-granted assumptions about teaching and learning, begin to examine these assumptions in a supportive social context, build confidence with technology, and ultimately take a more active role in school decision making related to technology adoption.

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DEDICATION

This Dissertation is dedicated to my father, James Leo Topper II, who appreciated the value of a good education.

ACKNOWLEDGMENTS

I want to take this opportunity to thank everyone who directly, or indirectly, helped me on this project and throughout my doctoral study. First, let me thank the members of my dissertation committee for their advice, guidance, and encouragement: Ralph Putnam, my committee director, Susan Florio-Ruane, who helped me analyze my conversational data, King Beach, who helped me think about developmental aspects of my work, Chris Clark, who encouraged me to take an active role in my interpretative research, and Yong Zhao who provided insight and support throughout the project.

My first teacher, my mother, is and always has been an inspiration to me. The teachers I worked with in this study - Carolyn, Dayna, Katie and Marje - all have my utmost respect and admiration, along with the other teachers and professionals at BWE. Without their help and support this project never would have been possible.

I'd also like to thank those people who's ideas have shaped my own, in no particular order, including Ann Brown, Carl Bereiter, Joe Campoine, Marline Scardamalia, Fred Erickson, Doug Campbell, David Laberee, Penne Peterson, Patrick Dickson, Cheryl Roasen, Mark Gillingham, Ruth Garner, Joe Byers, Rick Banghart, Valerie Worthington, Margaret Reil, Denise Murray, Peggy Dunn and Nicole Ellefson.

Finally, and perhaps most importantly, I have to thank my family and friends who supported my work over these past four years. To Samantha and Steven, thanks for allowing your dad to immerse himself in this work and not bother him when he was writing. To Amy, my soul mate, thank you for all your help, support, and love. To all of you I owe a big debt of gratitude that I know can never be repaid. I can only hope that I have the chance to support each of you somehow in the future and make the same kind of sacrifices you all made for me during this time.

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PREFACE

These are the stories of four ordinary elementary teachers, told through my eyes, who have access to technology in their school, whose administrators are encouraging them to use technology, and who are tying to make sense out of this technology as a tool for their own learning, their students' learning, and their teaching practices. These stories are actually a series of ongoing narratives, in the form of regular group conversations around technology, where I played an important part as a researcher and story teller. I provided these teachers with my ideas and expertise in the application of technology towards teaching and learning and they shared their ideas and expertise in teaching. Together, we collaborated on the hard work of bringing technology into the lives of their students in pedagogically beneficial ways.

These stories are necessarily complex but are bounded by time and space: We met informally every other week, usually in one of the teachers' classroom. These conversations were not always about technology, although that was our shared focus, and these teachers' personal and professional lives became resources for all of us through the stories we shared as a group. I did not have direct access to the experiences these teachers had during the times when we were not together as a group but external factors often influenced what we did in the group and provided us with topics for discussions on many occasions.

According to Denzin (1989), a goal of this kind of narrative research is:

to gain increased understanding of the multitude of meanings that are created by practitioners and by researchers working together, and to thereby empower all the participants in the process. This empowerment, in turn, will inevitably bring about changes in schooling, but the changes cannot be foreseen in advance, and are not in themselves goals of the narrative process. (p. 21)

Denzin goes on to argue convincingly that:

The lives of ordinary people are, in this sense, just as potentially illuminating as the lives of those who have attained some form of externally-defined greatness. What we might learn from these cases is that the stories are most instructive and revealing when they are most personal, and often when the owners of the stories are most vulnerable. (p. 23)

As technology becomes more and more prevalent in K-12 schools, and as districts and policy makers raise and allocate money for the purchase of technology, this infusion represents perhaps the most pressing issue for teachers in the history of education. Never before have we as a culture been so committed to bringing an educational innovation into every school and classroom as we are now committed to investing in technology for our schools.

As a teacher educator, and as a parent, I believe this commitment represents both a challenge and an opportunity: The challenge will be for teachers who are expected to take advantage of the growing technology in their schools now and in the future; the opportunity is to examine and define the role technology plays in the teaching and learning created in the context of technology in the classroom.

I also believe that if teaches are going to be successful integrating technology into their teaching, they will need to learn to think and act appropriately with regard to pedagogically sound uses of technology. This means teachers will have to take a more active role in learning about technology and in the acquisition and planned use of technology in their schools. For technology to be used successfully as a pedagogical tool in the classroom it must be subject to the same critical examination as any other educational innovation. Teachers must construct their own arguments and justifications for using technology in meaningful ways based on their knowledge and beliefs about teaching, learning, and technology. In many cases, this introduction of technology may lead to changes in teaching practices if teachers are supported in these efforts in their schools.

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One powerful way to prepare teachers in this light is to help them develop the skills, dispositions, attitudes, and knowledge necessary to be thoughtful in their planned uses of technology and to help them develop criteria for evaluating the benefits of these uses for their students. These goals are also consistent with current calls for reflective practice in teaching and could encourage teachers to examine their own assumptions and beliefs about teaching, learning, and technology as they integrate these tools into the curriculum.

A necessary part of this teacher preparation process is an opportunity to talk, think, and learn about technology in a supportive social context. This kind of learning environment must include a long term commitment, be sustainable, and draw upon the classroom practices, experiences, and problems of the teachers involved.

In this study, I worked collaboratively with elementary teachers to create and study just such a supportive social context, in this case implemented as a technology support group for lower-elementary teachers. While the initial focus of this group was to learn about technology, and we spent lots of time learning and talking about technology, the group also became a place where these teachers could engage in substantive pedagogical conversations where they made public their own beliefs and knowledge about teaching and learning. Being in the group was beneficial for the teachers who participated, both personally and professionally, and resulted in a growing sense of activism around technology that spilled over into other areas.

I enjoyed working collaboratively with these teachers, and their excitement and enthusiasm towards the possibilities technology affords were tempered by their fears and anxieties as they became learners again. Traditional methods of teacher training - in service workshops - may help teachers learn functional skills and factual knowledge but they do not provide them with adequate opportunities to engage in long-term learning and social interaction which I believe is required to support learning to teach with technology. These kind of short-term training sessions also do not support the kind of serious thinking

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about pedagogical choices that is required if teachers are to construct their own practices around technology.

I am convinced that working collaboratively with teachers around technology adoption has benefits for everyone involved: The teachers got a chance to learn about technology in a safe and nurturing environment; they had opportunities to ask questions, which they might never ask in a traditional workshop, and that are contextualized in their own classroom practice; they were encouraged to make their assumptions and beliefs about teaching and learning public as they considered how technology might be helpful for their students. For myself, I learned firsthand the practical problems teachers face everyday trying to use technology in the classroom. As a result, I gained valuable insight into the issues these teachers must address as they weave technology into their teaching practices.

The idea for a technology support group grew out of the work of Clark and Florio-Ruane (1983; Florio-Ruane & Clark, 1993), who have developed a model for sustainable teacher learning in professional inquiry and development groups. These groups provide teachers with opportunities to participate regularly in conversational professional development where the goals and purposes of the group come for the problems and questions members raise. A researcher provides facilitation and documentation of the group's efforts and participates as an equal member in group activities.

This was my role as I worked with a single teacher for about six months in the Spring of 1997 when we decided to develop a technology support group so that other teachers in her school could learn about technology and I could study the process and experiences of these teachers at the same time. Over the next nine months, we met regularly before and after school to talk and learn about technology. These sessions were influenced by the teachers' own interests and our conversations were not limited to technology issues.

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In this study, I report on the first nine months of our work together, even though the stories are still unfolding. Although this work has been informative, it is unfinished; there is still much to be done, making these results preliminary at best. Building a supportive social context for teacher learning is a long process, and even though we have made tremendous progress, I believe some of our best and most challenging work is yet to come. Keeping a group of professional teachers together over a long period of time has its own challenges, as there are often personnel changes within schools.

So this work represents a snapshot in time of the work we have done thus far, realizing that it is only part of the story — the part I chose to tell and in my own words — and that the story continues.

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CHAPTER 1 INTRODUCTION

Major political and societal forces are coming together to create an unprecedented push to infuse technology into K-12 classrooms. This infusion represents a serious challenge and an opportunity for teachers to explore the powerful resources technology makes available and for researchers to better understand how technology is shaped by and shapes beliefs about teaching and learning.

At the same time, this infusion of technology into K-12 schools presents a pressing need for effective professional development for teachers that is sustainable over the long-term and focused explicitly on teacher learning. If technology is to benefit student learning, an implicit goal of placing technology into K-12 schools, it will ultimately be up to individual classroom teachers to make intelligent and informed pedagogical choices with technology and to incorporate technology into their classroom activities. Otherwise, technology will at best be used at the periphery of classroom learning, or at worst be ignored by teachers who are unable to make sense of it as a pedagogical resource.

This study focuses on how expanding knowledge of technology shapes, and is shaped by, teachers' beliefs about teaching and learning in a school setting. By participating in a technology support group, I have described and analyzed the experiences of elementary teachers who are being asked to incorporate technology into their teaching. The goal of this work is to better understand the relationships between these teachers' beliefs about teaching and learning, their knowledge of pedagogy and subject matter, their experiences learning about technology, and their plans for classroom technology use. This research lies at the juncture of three disparate lines of study: (a) research on technology adoption in K-12 schools, (b) inquiry into teacher knowledge and belief in the face of educational innovation, and (c) developing and studying dialogic forms of professional development for teachers (see Figure 1).

Technology Adoption



Figure 1

A Computer in Every Classroom!

As this country races to provide every school, and eventually every classroom, with access to the Internet, there is a need to better understand the opportunities and problems this new technology presents for K-12 classroom teachers. Schools are moving rapidly to bring technology into classrooms and leading to a general increase in availability of computers and the Internet during the 1990s (Becker, 1993). Although much time and money has been put into providing K-12 schools and classrooms with the necessary technology and infrastructure, little effort has been expended understanding teachers' use of this technology or how its introduction might lead to enhanced student learning. The benefits students ultimately derive from increased access to technology are dependent on effective use of these new technological resources by classroom teachers in pedagogically appropriate ways. Researchers who study classroom educational technology adoption have found that, while the number of computers and Internet connections have increased in the past few years, this increased availability has not filtered down to students. For example, Peck and Dorricot (1994) found that many teachers are not yet incorporating technology into their regular curricular activities. An obvious explanation for this finding could be the general lack of access to computers in K-12 schools.

Access has historically been a factor in the limited use of technology, especially in the past when computing resources were in short supply, but may represent less of an obstacle today given the rapid rate of technology acquisition in most school districts. As technology becomes more accessible in K-12 classrooms, and as more and more schools connect to the Internet, other factors will likely play a larger role in shaping how these instructional resources are used. Key to beneficial use of technology in K-12 student learning are the ways teachers think, plan, and use those technologies in their teaching practices. In order to better understand the factors that shape teachers use of technology, we need to look closely at those studies of technology adoption in K-12 schools.

Teachers' Use of Technology

In order to understand how technology has been used in the classroom when it is made available to teachers, researchers have looked at so-called "early adopters" of educational technology who are estimated collectively to represent less than ten percent (10%) of the total population of K-12 teachers (Anderson, 1993). These are teachers who have embraced educational technology, usually on their own, and who are often cited as technology-using educators in the literature.

Sheingold and Hadley (1990) found that only about one teacher per school were integrating technology into their classroom teaching and that development of mastery in educational uses of technology was a gradual process requiring several years of work. Honey and Henriquez (1993) surveyed the characteristics of proficient technology teach-

ers and found they were "highly motivated to learn and use technology" for their own reasons and most of them were self-taught. Studies like these have examined individual characteristics of technology-using teachers in an effort to understand why some teachers have already adopted technology while others have not. Why have not more teachers integrated technology into their regular teaching practices? One possible explanation supported by the literature is a conflict between the perceived pedagogical value of technology by teachers and their own beliefs about teaching and learning.

Honey and Moeller (1990) suggested that, until teaching practices change, technology will not be widely integrated into K-12 classrooms because of a mismatch between teacher beliefs about teaching and learning and the perceived value of educational technology. Hodas (1993) argued that one reason technology often fails to be integrated into K-12 classrooms is a "mismatch between the values of school organizations and those values that are embedded within the contested technology itself" (p. 7). Hodas argued that teachers adopt neutral and value-free technologies that do not require substantive teaching changes, and as a result schools have been largely impervious to substantive change surrounding technology adoption.

Even those teachers who have had adopted technology seem to be using it in ways that are consistent with their views of teaching and learning. A study by the Center for Technology in Education found that "unless teachers are personally ambivalent about computers or have lacked the opportunity to get involved with computer technology, it appears that their educational beliefs play an important role in how they choose to appropriate and make use of technologies in their classrooms" (Hadley & Sheingold, 1993, p. 10).

The most comprehensive longitudinal study of technology-using teachers undertaken to date is the Apple Classrooms of Tomorrow (ACOT) program. A key aspect of the ACOT program were the extensive resources, both monetary and personal, provided to all teachers who participated. One author called the ACOT schools technology-saturated,

perhaps because all teachers and students who participated in the program received a computer at school and at home. This level of support, while perhaps ideal, is impractical for most schools and districts with already dwindling resources. Principal findings from the ACOT research are (a) that it takes up to six years for teachers to use technology in support of student-centered instruction, (b) that teacher beliefs largely shape how technology is ultimately used, and (c) that a supportive context for technology adoption is required for successful integration into the K-12 curriculum (Sandholtz, Ringstaff & Dwyer, 1996).

In one ACOT study, researchers found changes in teachers' beliefs, management issues, instructional strategies, and student assessment activities associated with technology adoption. For example, Dwyer, Ringstaff, and Sandoltz (1991) found that changes associated with technology adoption forced many teachers to confront their beliefs about learning and the efficacy of their instructional activities. The 32 teachers who were part of ACOT shifted from curriculum-centered towards student-centered instruction, from individual towards collaborative tasks, and from passive towards active learning. These researchers also found that teachers' struggles to use technology "were compounded by the inflexibility of the contexts in which they worked" (p. 50).

These studies suggest that teachers who are currently using technology in their classroom — the early adopters — are using it primarily to support their existing teaching practices or to provide students with practice and skills in basic computer literacy, such as keyboarding, word processing, and database applications (Becker, 1993). So it appears that when technology is adopted and used by classroom teachers it is used in ways that are consistent with their knowledge and beliefs about teaching.

Although much focus and effort has been put into providing the hardware necessary for classroom technology use, little energy has been spent understanding how the

introduction of technology might shape individual teacher beliefs or actions and vice versa. Scant research has focused on the intersection of technology, teacher beliefs, and teacher knowledge. The literature on teacher beliefs and knowledge might provide a lens through which to understand the complex influences on teachers as they struggle to embrace technology as an educational innovation.

Teacher Beliefs and Technology

Researchers have developed a variety of ways for thinking about teacher knowledge and beliefs that shape their classroom practices. Teacher beliefs — encompassing suppositions, commitments, and ideologies — have been studied in a variety of settings and contexts. It is generally assumed that beliefs are more often associated with affective and evaluative cognitive components than teacher knowledge, but that beliefs play an important role in teaching practices.

Calderhead (1996) identified five categories of teacher beliefs: (a) beliefs about learners and learning, (b) beliefs about teaching, (c) beliefs about subject areas, (d) beliefs about learning to teach, and (e) beliefs about self and the role of teachers in learning. Teacher beliefs about learners and learning often come from assumptions about student abilities, although beliefs about teaching usually reflect a teacher's overall beliefs about teaching and sustaining positive social relationships with their students.

Building on the work of Shulman (1986), Grossman (1990) offered a framework for thinking about teacher knowledge that includes: (a) general pedagogical knowledge, (b) subject matter knowledge, (c) pedagogical content knowledge, and (d) knowledge of context. General pedagogical knowledge describes a body of general knowledge, beliefs, and skills related to teaching and learning not specific to any particular content or domain. Subject matter knowledge includes not only factual knowledge of the domain, but also knowledge of the substantive and syntactic structures of the discipline. Pedagogical

content knowledge incorporates beliefs about the purposes of teaching a specific subject area, knowledge of students' understandings of that subject area, curricular knowledge, and knowledge of instructional strategies and representations. Contextual knowledge refers to individual teachers' understandings of the school culture and setting in which they teach.

Teachers' knowledge and beliefs play an essential role in their practices and shape the learning that goes on inside and outside their classroom (Borko & Putnam, 1995). These beliefs and knowledge shape teachers' learning as they work to improve their teaching, acting as filters through which teachers view educational change. In order for teachers to adopt new educational innovations, such as technology, they will need to "think in new ways about students, subject matter, and the teaching-learning process" (p. 38).

While individual teachers can expand their knowledge and learn about technology, they need opportunities to develop and sustain professional relationships with their peers to effect changes in the larger school culture. These professional relationships, which I consider *collegial*, provide a supportive context for examination of teacher beliefs and teaching practices as well as a collective environment for changing aspects of the school culture necessary for successful technology adoption.

School Culture and Technology Adoption

Technology adoption, like any other educational innovation, is shaped by teacher beliefs about teaching and learning as well as the context in which adoption takes place. Teacher knowledge and beliefs shape the sense that teachers make of any educational innovation, technology included, and play a critical role in how technology is applied for learning. Likewise, as pointed out above, the school culture or context plays an important part in supporting or constraining classroom changes that are brought about or required by the introduction of technology.

The literature on educational reform and change offers some insight into why educational technology has not yet been instrumental in changing teaching practices and been slow to be adopted by most teachers. For example, in their book, Tyack and Cuban (1995) argue that educational reform efforts have failed because they have not accounted for the institutional nature of public K-12 schools, they have largely disregarded the culture of teachers, and they have been ignorant of the localized nature of all reform efforts. The authors suggest an alternative way of conceptualizing school reform, which they describe as an "inside-out" process, where the focus is on supporting teachers as major agents of change within public education.

The main thrust of their argument is that all reform efforts are transformed and hybridized, if not simply ignored, by teachers. Reformers must therefore plan for this process including teachers as active participants in reform. To the extent that educational innovations are adaptable to local circumstances, the authors argue, is the extent to which they will be incorporated into teaching practices. Tyack and Cuban suggest instead that educational innovations be considered as resources for teachers which may or may not be adapted individually to improve classroom instruction.

Tyack and Cuban make a strong case for why educational change has been hindered in school systems and suggest that "Reforms should be designed to be hybridized, adapted by educators working together to take advantage of their knowledge of their own diverse students and communities and supporting each other in new ways of teaching" (p. 135).

Teacher Collegiality and Professional Development

Little (1993) reported that collegiality is rare in K-12 school settings and that "cooperative work among teachers is scarce, fruitless, and hard to maintain" (p. 507). She identified two factors crucial to teacher collaboration: interdependence and opportunity. Interdependence implies reliance on each other, or reciprocal relationships, that are not

imposed by outside forces but rather by circumstance. Opportunity represents a chance to engage in a trusting but intellectually challenging environment with peers.

All this emphasis on collaboration should not lead us to believe that these types of relationships are the panacea for teacher development. There is, for example, a danger of teachers engaging in "contrived collegiality" when collaboratives are imposed on them by external forces (Hargreaves and Dawe, 1990). This type of collegiality represents "administratively contrived interactions among teachers where they meet and work to implement the curricula and instructional strategies developed by others" (p. 227). For collegiality and collaboration to be beneficial, teachers must voluntarily engage in these interactions, which must be directed and shaped by their individual needs and purposes.

To examine the actual benefits of teacher collegiality, a number of questions should be considered. For example, what does it mean for teachers to be colleagues? What types of teacher relationships might support the benefits of collegial relations and interactions? How might technology support these kinds of interactions?

To develop this concept of collegiality further, a concise definition of collegial relationships or interactions among teachers is needed. Little's distinction between socially supportive relations and professionally supportive and challenging relations is an essential one. While social support, via sharing and participating in trusting relationships, is obviously important in teacher groups, there must be more to these relationships if they are to be considered valuable for individual teachers' professional growth and development.

I therefore propose the following working definition of collegial teacher relationships: where teachers engage in joint work and conversation with their peers within a trusting and supportive social setting that challenges their beliefs about teaching and learning by helping them articulate and examine those beliefs in a public forum.

It seems therefore helpful to consider how individual teachers can gain necessary experience and knowledge with technology, hopefully in a supportive but challenging

social context, while also provide them with opportunities to shape the nature of their existing school professional culture. In order to gain insight into the challenges of providing these kinds of professional opportunities for teachers, we need to examine the literature on teacher professional development with an eye towards those programs that are sustainable and contextualized in the classroom.

Teacher Professional Development for Technology Adoption

The potential value of teacher collegiality as a form of professional development suggested by Little also stands in stark contrast to existing models of teacher professional development: in-service workshops tend to be cookie-cutter sessions that are short-term and rarely draw upon teachers classroom experiences.

These forms of teacher training, often provided as short-term in-service workshops, provide skills-based learning opportunities that are designed to build technical skill and present prescriptive teaching strategies or curricular materials. This is especially true for technology training. These types of workshops do not provide teachers with the time or resources to examine their own knowledge and beliefs about teaching and learning in the face of the pedagogical choices made available to them with technology.

For professional development programs to be successful, Borko and Putnam (1995) argue they should embody several key features of teacher learning programs. These include an explicit focus on teacher learning and knowledge expansion, opportunities for teachers to examine their beliefs about teaching and learning, programs that reflect the assumptions about teaching and learning held by the designers, and opportunities for teachers to construct their own knowledge in an environment that supports and encourages risk taking and reflection.

A promising idea for helping teachers participate in collegial relationships and for shaping professional school cultures that comes out of social views of learning and cognition is creating discourse or learning communities and enculturating teachers into

these communities as part of their ongoing development process (Putnam & Borko, 1996). As 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" (p. 16). By engaging in conversations about teaching practices, teachers have opportunities to learn to be critical and reflective of their own teaching and these communities provide such opportunities for learning. For these conversations to be a resource for teachers, they must take place within a supportive, but challenging, environment for reflection and inquiry.

Clark and Florio-Ruane (Clark and Florio, 1983; Florio-Ruane & Clark, 1993) have developed a model for teacher discourse communities where explicit focus is placed on fostering and sustaining these kinds of collegial conversations within a supportive group setting. The authors are conducting research to understand what these discourse communities might look like, how they might function, and how they might be of value to teachers.

Our overarching goal is to learn about how teachers can change local cultures of teaching so that school faculties become 'learning organizations.' If we and the teachers are successful in coming to a deeper understanding of how conversation-based professional development works, Professional Development and Inquiry Groups could become an important element in a new infrastructure for teacher learning, professional development, and adaptation to dramatically changing conditions in K-12 education. (Clark, 1996, p. 2)

The idea of a comfortably challenging peer relationship, or talking and working with a "critical friend" (Clark, 1996), is consistent with my definition of collegial relationships above. For teachers to reflect on their own teaching practices and question their beliefs, they must be willing to make explicit their assumptions about teaching and learning in the presence of others so these beliefs can be challenged, probed, and ques-

tioned. These types of conversations require a trusting relationship with peers and a comfortable social setting. Working toward improving teaching practice begins by opening ones self up to scrutiny by others and pushing one's beliefs and thinking toward deeper and broader understandings of practice.

Essential ingredients of these teacher learning communities are voluntary participation, shared goals and purposes, negotiated topics for conversations, local control and a long-term commitment to improving practice. These types of learning communities have been successfully used in a variety of settings and the role researchers can play in creating and sustaining these communities is well understood (Short, 1992).

The idea that teachers might learn from participating in conversations is not a new one. Yonemura (1982) described research directed at exploring and supporting outcomes of one-on-one conversations between teachers around their classroom experiences. The author found that out of these "reflective, supportive conversations a clearer identification of the practical principles guiding teachers can be formulated." (p. 241)

Examining Teacher Beliefs and Knowledge in a Technology Support Group

Based on prior research, teachers use technology in ways that are consistent with their existing beliefs about teaching and learning. Teachers who ignore or disdain technology may be unable to understand how technology might support their notions of good teaching. In both cases, teacher beliefs and knowledge shape and are shaped by technology in complicated ways that are not well understood. This study examined these relationships within the context of a technology-rich elementary school. I used access to a technology support group to investigate the nature of these relationships, through talk about technology use, and the beliefs and experiences of these teachers as a window through which to examine these influences.

The research described in this dissertation focuses explicitly on teacher learning, using their knowledge and beliefs as a starting point for understanding the sense they made of technology as a pedagogical tool, within a supportive and sustainable environment for professional growth and development. The learning these teachers engaged in was self-directed and contextualized in their own individual classroom experiences.

A technology support group provides an environment for supporting changing individual teacher beliefs about teaching and learning while also changing aspects of the school culture. This type of support group is also a model of professional development that is consistent with research on teacher learning and one way for teachers to develop the knowledge and skills necessary to take advantage of technology by supporting longterm, sustainable professional development.

Through the experiences of the teachers who make up this support group, as reported by me, other teachers may see connections to their own situations and perspectives on teaching, learning and technology and insight from the stories these teachers tell about learning to use technology. I also hope that educators and administrators will see the benefit of this kind of professional development opportunity for teachers — that is, participation in a dialogic group setting — as an effective alternative to traditional forms of professional development.

CHAPTER 2 THE STUDY

It has been argued that inquiry or research discourse communities can be a forum for sustainable teacher learning; but what do these communities look like and how are they supportive of teacher learning? These communities, sometimes called inquiry groups or teacher networks, support learning that is drawn from the classroom where teachers bring authentic questions to a group setting and make public their thinking.

Educational technology is a form of educational innovation; a variety of factors affects technology adoption and use, including access, support, local context, and teacher knowledge and beliefs. In order for teachers to use educational technology in thoughtful and pedagogically appropriate ways they must engage in their own learning that will ultimately benefit their students.

This study examined how teachers' beliefs about teaching and learning shaped and were shaped by their uses of technology in a school setting. My hunch was that by engaging in their own learning around and with technology, these teachers would have opportunities to examine their own assumptions and beliefs about teaching and learning in a safe and nurturing setting — the support group — where they could begin to make sense of teaching with technology in their own classroom.

I expected that the initial conversations these teachers had would be focused primarily on technology, but that the discussions might eventually expand to include topics more relevant to teaching and learning. I based this hypothesis on work done in a prior study with one of the teachers in this group, where we met regularly after school and where the talk originally centered on technology issues but ultimately expanded to include discussions about learning, teaching, and classroom practice.

Talk about technology, I thought, might be connected to talk about teaching and learning and might facilitate conversations that cover broader topics related to technology adoption. This kind of talk might also allow participants opportunities to revisit ideas or issues from different vantage points or with different perspectives. If these teachers could become comfortable sharing their stories in this group my hope was that they might also begin to make explicit their own assumptions and beliefs about teaching and learning, expand their knowledge through the conversations they have with their peers, and begin to examine their own teaching in light of the collective sense making that is supported within the group.

Site Selection

The subjects in this study were selected because of ease of access and prior entry into the school culture by me. All the participants were first or second grade teachers at an elementary school where I began working with one of these teachers in the spring of 1997. This led to our plan to expand our work to include the other teachers in her grade level and some of her peers. The teachers were all volunteers who wanted to learn about and use technology in their classrooms. All the teachers had been through district provided in-service workshops and had Internet — accessable computers in their classrooms as well as access to a computer lab in the school.

Since I had been working with this teacher, *Susan, for several months I expected her to take a leadership role in the formation of the group. She and I had established a collaborative relationship that helped her gain knowledge and skill with technology. Susan originally approached me during an in-service workshop and shared her anxiety and fear about technology which ultimately led to our working together.

* Note: All names used in this text are pseudonyms

As a result of our prior work together, Susan decided to explore using technology in her classroom, as well as to work with a student intern around classroom technology use. This teacher was also instrumental in getting her peers, especially the other first and second grade teachers in this school, to participate in this study. The collaborative work we did in the past represents a model that we hoped would be successful in a small group setting with the other first and second grade teachers.

The K-5 elementary school itself is new, built in 1993, and resides in a wealthy suburban school district near a Midwestern capital city. The school principal believes the school should be a model for other schools in the district and has been effective in implementing new programs, including an alternative school calendar. The school has extensive technology in place, including fully networked classrooms, a 25-workstation computer lab, multimedia cart, digital video network, voice mail and phones in every classroom. The school district has also spent lavishly on technology in the past few years and the high school has been recognized as a model technology school around the state.

Setting and Participants

The teachers involved in this study all work in a school context where the principal has an aggressive stance towards technology use and strongly encourages teachers to develop their curricula around technology. The school has provided every teacher with their own classroom computer, connected to the Internet, and the school district has offered in-service workshops on a variety of technical topics. These teachers volunteered to work together around technology to learn and try using it in their classrooms and allowed me to study this process.

These teachers do not represent early adopters of technology typically described in the literature, but rather represent the larger percentage of ordinary teachers who are more ambivalent and less knowledgeable about technology than those often described in

the literature. I believe these teachers would not have been as successful using technology in transformative or innovative ways if they were only exposed to traditional forms of professional development around technology. I hoped that through participation in this support group each of these teachers might realize their own professional growth and development — perhaps leading to transformation of teaching practices — around and through technology and be successful incorporating technology into their teaching.

Researcher Role

I view my role in this research as a guide or advisor (Apelman, 1986) to these teachers in their efforts to learn and develop new practices of teaching with technology. This research represents a chance for me to study K-5 teachers who are learning to use technology in a school setting within a supportive social context. Within this group, the learning and use of technology was self directed and grounded in these teachers' specific classroom settings. I acted as a resource person, a guide, an advisor, and a facilitator for these teachers as they worked to incorporate technology into their teaching. I tried to facilitate the conversations and structure the group sessions to be supportive but challenging for the participants. I also offered to help these teachers as they used technology in their classrooms and in the computer lab.

Participating in this group hopefully offered these teachers a chance to engage in authentic conversations about technology in the classroom and to construct their own meanings for technology in their teaching. Together, we explored how technology might be used in their classrooms, located any resources they need, addressed any problems they have, answered any questions, and I described their experiences as they learned about and used technology. I hoped that we could collectively construct a meaningful sense of the possibilities technology holds for the students in these teachers' classrooms.

I believe this kind of supportive social context is necessary for meaningful and sustained learning to take place around and through technology in the classroom. Teachers construct their own sense of what technology is, its benefits, and how they plan to use it within the culture and context of their school by discussing it with their peers. My own assumption about educational technology is that it is another form of innovation, and as such should be critically examined by individual teachers. I hoped to help the teachers who participated in this study become knowledgeable consumers of educational technology so they could make their own choices about how to incorporate technology into their teaching. My own view of effective professional development for teachers occurs when they are treated as professionals who make decisions every day about the pedagogical benefits of various teaching methods and curricular materials and the goal of the professional development effort should be to help teachers make informed decisions and consider the consequences of their actions in the classroom.

The support group sessions were modeled after the work I had already done at this school which involved bi-weekly sessions which lasted about 90-minutes and took place in a teachers' classroom after school around the computer. During these sessions, we explored and learned about whatever the teachers were interested in learning.

Research Questions

I developed a set of guiding research questions which, in the conventions of qualitative research, were modified as the study unfolded and I built grounded theory based on the constant comparison of data (Glaser & Strauss, 1967):

1. What do these teachers believe and know about teaching, learning, and technology?

2. How do these teachers' beliefs and knowledge about teaching and learning influence the sense they make of educational technology and their learning experiences around technology?

3. How do issues of teaching practice, pedagogy, and beliefs about teaching and learning surface in the conversations these teachers have around technology adoption?

Data Collection Strategies

I used a variety of data collection methods for this study, including one-on-one interviews, group learning sessions around technology, field journal notes, and classroom observations. I audio taped the interviews and learning sessions and kept field notes of my observations. As I collected data, I analyzed it looking for patterns of communication and behavior that were connected to my research questions above. As I observed or interpreted patterns in these data sources that were interesting, especially related to my original research questions, I used triangulation to examine these patterns across the data corpus.

Methods of Analysis

I used an interpretive method of inquiry in this study, where I describe the experiences of the participating teachers and identified patterns of change and growth over time. While the principal lens for this analysis were the patterns of participation these teachers had in the discourse, this data was triangulated with my field notes, classroom observations, and participant interpretations.

Using transcripts of the group conversations, and analysis of interviews and field notes, I examined changes in the teacher talk over time focusing on topics introduced and patterns of participation. I examined how the discourse these teachers engaged in changed to see if these kinds of conversations could move beyond simple technical discussions and towards substantive collegial interactions and collaborations that can be a more viable form of professional development for the teachers involved. The conversations these teachers had around technology were a direct reflection of their thinking about

technology in relation to teaching and learning so how these topics come up in their conversations shed some light on the ways these teachers were thinking about using technology in their own classrooms.

Specifically, I examined how discussion topics were introduced — who introduced them, who picked up on them (uptake), who challenged a stated position, and how topics were changed — as well as access to the conversational floor. This allowed me to examine the nature of the talk from the perspective of the form and function of the discourse. Part of my role was to facilitate talk, model patterns of participation in the discourse for other group members, and draw them into the conversation using a variety of conversational strategies such as requesting alternative perspectives on issues, summarizing positions, and coordinating access to the conversational floor (Saunders, Goldenberg, & Hamann, 1992; Michaels & O'Connor, 1993).

Conversations represent one way for teachers to communicate about issues of importance and to be exposed to critical ways of thinking through discourse. Conversations, triangulated with other data, also represent a tool for analyzing participation in discourse that has a directionality and academic purpose: To provide opportunities for these teachers to identify their assumptions, consider the limitations of their beliefs, incorporate multiple perspectives into their conversations, and be clear about their reasoning and thinking.

These conversations also provided me as a researcher with access to how these teachers think about technology, teaching, and learning. The conversations, however, did not take place in a vacuum, but instead were influenced by a variety of factors, inside and outside the group itself. In order to understand how these conversations were viewed by the participants, I shared my observations with the participants and relied on Susan as an informant.
The process I used during analysis was cyclical, where I started by identifying patterns in the data that I reported to my dissertation committee members. I regularly wrote analytic memos sharing my observations with my committee members at various points during the data collection period. My normal analysis process was as follows: I kept a reflective journal with notes and observations about our group sessions; as I listened to the audio tapes of each meeting, I developed a timeline of each meeting selectively transcribing portions of the conversations I thought were interesting and connected to my analysis. As this process continued, I focused on different aspects of the conversations including power, authority, leadership, and strategies for managing access to the conversational floor.

From this initial analysis, I saw patterns emerge across group meetings that reflected the nature of the group discourse and individual patterns of participation in the conversations. I also observed changes in patterns of participation in the conversations over time as things changed inside and outside the group. The influences of the school culture, the district, and the community all played an important part in shaping the experiences of these teachers and I tried to understand how each teacher construed the situation they found themselves in during our meetings. My conclusions were drawn from my own interpretations of the data as a member of the support group.

From this second level of analysis, I developed some assertions which I later used to reexamine my data and recoded it to reflect evidence to support or refute these assertions. As I listened again to the audio tapes, I noted statements or comments made during our meetings that were connected to these assertions. I soon found that three of the assertions related to the individual teachers in the group while the other three were connected to the discourse and changing patterns of participation in the discourse over time. These assertions later helped me shape the sense I made of the group, focusing on the individual teachers as well as on the context for their talk, and helped me understand

the complex social interactions that these teachers engaged in inside and outside the support group.

While group members' participation varied across the sessions, and no single teacher attended all the meetings, I did get a sense for the ways these teachers thought about technology and the connections they made with their own ideas about teaching and learning through their participation in these conversations. I realize, however, that my own interpretations of these conversations are biased by my own assumptions and interests, and the ways these teachers participated were in turn shaped by our individual and collective sense of the situations that occurred within and around the support group.

Significance of the Study

I believe this study is significant for a number of reasons. First, it represents an examination of the experiences of ordinary teachers who are struggling to make technology part of their teaching practices. These teachers have been provided with access to technology, in the form of classroom computers and a lab in the school, and have also been given district-provided training and technical support. The teachers in this study, while interested in learning more about computers, are not early adopters of educational technology. For example, three of the four teachers in this study described themselves as "technology novices" when this study began, with the fourth having used technology the year before. I believe that these teachers represent a large percentage of K-12 teachers — teachers who are interested in technology but unable to learn how to incorporate it into their teaching, but a population which is largely under represented in the literature.

The experiences of ordinary teachers are worth sharing for a variety of reasons, not the least of which is that the literature suggests that these teachers may not use technology or may use it in ways that are consistent with their beliefs about teaching and learning. In addition, the experiences of these teachers, all of whom are lower-elementary teachers, are not found in the existing literature on technology adoption. The literature

has mostly focused on upper-elementary, middle school, and high school teachers, largely ignoring the predominantly female classroom teachers who make up this study.

While the teachers in this study have access to technology, and their school might in fact be considered technology-rich, the resources available to these teachers are, or soon will be made, available to most teachers. These teachers stories, more than any others represented in the literature, I believe reflect the future of K-12 schools in so far as they give us a glimpse into what is possible for ordinary teachers to accomplish when technology is introduced into their room.

The teachers who make up this support group are, or were, anxious, frightened, and in many cases may have remained silent about their experiences if they had not been part of this research. It is essential that these teachers' stories be told so that other teachers can realize that their fears of admitting they don't know how to use technology, their concerns for being judged as incompetent when they do admit this, and their inability to articulate their own plans for technology are common and not a sign of weakness. As the teachers in this study help remind us, it is only by admitting that we do not know something, in this case how to use technology in teaching, that we can begin to learn it. Hopefully, those teachers who have so far been unable or unwilling to admit they do not know how to use technology, and are in fact afraid to try, will find in the stories of these teachers a shared perspective and a common point of view.

The form this research takes is another significant aspect of it that is rarely found in prior work in the area of technology adoption. Most of the previous studies of technology adoption in K-12 schools have used quantitative analyses to examine and explain the experiences of teachers who have been successful incorporating technology into their classrooms. We rarely hear about those teachers who are unsuccessful, for whom the experience of bringing technology into their classrooms is traumatic and threatening, or those who see the use of technology as an external imposition that they have little control over. Because these stories are often excluded from the literature, we take for granted the

complexity and difficulty ordinary teachers face when a computer is placed in their classroom or they are asked to use computers in a lab.

The use of narrative, ethnographic methods in this study were another important part of this work. I felt that understandings of the complex relationships between teachers and technology would be more accessible and understandable to more teachers if they took the form of narratives. I also thought that teacher stories are themselves a powerful means for sharing knowledge and experience that many teachers can understand and find interesting. Through the descriptions of the experiences of the teachers in this support group, I hope that the salient aspects of the complex relationship between teaching and technology can be made clearer for others who are interested in seeing technology become a part of K-12 schools.

This study also had a very personal agenda because I wanted to help the members of this support group learn about, talk about, think about, and plan for technology in their teaching. I was allowed to be part of this group, to have a glimpse of the professional lives of these teachers, and I took seriously their interest in learn about technology. It is, therefore, imperative that the work we did collaboratively is influential for them and for me, and that we all have learned something as a result of this work.

I think perhaps the most important reason for this study is the general lack of prior studies that have investigated in any depth the relationship between teacher beliefs and technology. When I originally did a literature review in preparation for this work, I was surprised to find that there were in fact few prior studies looking into the nature of this relationship. Given the literature on the influence of teacher beliefs in preservice and inservice teacher education, and the studies which suggest that teachers actions are directed by their knowledge and beliefs about teaching and learning, this struck me as especially problematic. I hope this work will provide a starting point for those who follow this line of research and that the experiences of the teachers who participated in this study will help illuminate these relationships in multiple ways.

Lastly, this work represents an alternative model of professional development and growth for technology from those often described in the literature. Whereas most of the prior work directed at staff development for technology use has not considered the key role of the teacher, and their agency in the process, as part of preparation or training, I started with the assumption that the teachers involved in the group would take responsibility for their own learning. Traditional inservice workshops, while inexpensive and easy to offer, also do not provide the kind of ongoing and sustainable learning that I believe technology adoption requires. I believe that helping teachers take ownership over their learning is an important part of viewing teachers as professional adults.

This work sheds light on the way teachers think and talk about technology, and the opportunities its introduction into the classroom affords them to examine their own knowledge and beliefs about teaching and learning.

CHAPTER 3

THE CASTING CALL

Background

I was giving an overview of a research project to teachers at Pennington High School in December, 1996, when Susan came up to me and we talked for a few minutes. Susan had been my son's first grade teacher, so we knew each other beforehand, and I had always admired her ability to embrace and make comfortable all the students in her class. She asked me about my Ph.D. work, how my courses were going, and what my plans were for a dissertation.

Susan and I began to talk about technology in the classroom, especially at Oaktree Elementary where she worked, and I recall how animated she became as she described her fear and frustration to me:

I just don't know how I'm going to learn to use all this technology when I'm already so busy with my students and the other things I do at school. Besides, I drive 45 minutes to school and another 45 minutes home every night. What I really need is a personal technology tutor.

I could tell that Susan was deeply concerned about how she was going to be successful using technology, given her existing commitments. The conversation ended when the session restarted after a 10-minute break.

After Christmas, I happened to be in a technology committee meeting at Oaktree Elementary school when I saw Susan at the meeting. The group discussed a range of issues — from what hardware to purchase with the money they had collected to how best to prepare teachers to use the Internet. Towards the end of the meeting I began to notice how ill-at-ease Susan became, especially when the elementary school technology coordinator told a story about how a presentation she gave fell apart at the last minute and almost did not work. As the coordinator described her frantic efforts to make her computer presentation work, and in gory detail how difficult it had been to use the computer, I began to see how the story she was telling was a nightmare one might tell to dampen the spirits of lesser mortals or scare away the timid or meek. It struck me at that moment how out-of-place Susan must have felt sitting in that meeting listening to technology proficient people share their own personal stories of catastrophes they had with technology. I realized how uncomfortable Susan must have felt in this group of technology experts and how the conversations they were having left little room for her to participate, given her fears about technology.

I began to formulate in my mind a way that I might be able to help Susan and gather an interesting story about her experiences in the process. In the hallway a few days later I called Susan over and offered to help her one-on-one at her convenience. She was grateful and I explained how I wanted to tell her story, especially her experiences learning to use technology in her classroom, for a paper I planned to write. She agreed to work together on the condition that she remain anonymous so that no one in the school would realize what a difficult time she was having learning to use technology. We scheduled our first working session for the following week at a time that was convenient to her and agreed to meet after school in her classroom.

We began by meeting every week and, while our working sessions did not follow a strict pattern, they usually involved some conversation about technology in general, so that I could gather some background on her experiences. This was usually followed by a session at her computer where she would ask questions or we would work together on how to use e-mail, the Internet, or a software program. In these working sessions, I let her direct what she learned and took the time to explain concepts she may not have been familiar with and connected what we were doing with her classroom.

For example, one day we spent about 20 minutes discussing the physical features of her computer, including what all the buttons were for, how she could open the CD/ ROM, and even play music CD's on her computer. She admitted that the person who

setup her computer had run through a litany of things when they had delivered it but she could not recall any of the details.

At each of our sessions, I explained to Susan that we were working together to help her learn about technology so she could use it in her classroom. I also reiterated my own plans to study her experiences and a paper that I hoped she could have a part in writing. While she declined my offer to co-write the paper, she agreed to help me understand the process she was going through and our partnership was formed. I audiotaped our conversations, and sometimes our working sessions at the computer, and later transcribed them. I also kept a journal of my field notes as time went on and I began to understand her experiences and perspective and to see how informative these experiences might be for other teachers.

I believe Susan has a common, but rarely heard, perspective on technology adoption in the classroom: While she recognizes the potential of computers and an Internet connection to help her students learn in important ways, she faces a dilemma regarding how to incorporate technology into her teaching practices. Lower-elementary school teachers' experiences are not often included in the literature on technology adoption. The principal constraint is the time required to learn about technology, which could easily result in her ignoring technology because of inadequate support and encouragement.

While there are certainly teachers in Susan's school who have given up their own time and energy to learn about technology, many other teachers are struggling to understand how technology can help them in their teaching and are unable to find the time and support they need in order to be successful with technology. The processes Susan is going through are likely common, or at least will be common in the next few years, given the focus our society and policy makers have on bringing new technology into K-12 classrooms.

As Susan and I continued to work together during the Spring of 1997, we talked about expanding our work to include more teachers. Susan told me that some of her peers were interested in being part of the collaborative learning we were engaged in and we talked about starting a support group for first and second grade teachers in the Fall. I encouraged Susan to think about how the work we were doing might change when we brought in more people, especially since Susan and I had established a comfortable and productive working relationship. I stressed my own opinion that the group would need a leader and that I would be uncomfortable taking that role given my outsider status in the school and my role as researcher. I asked Susan to consider how she might be a leader of the group, the nature of the relationships she already had with her peers, and how these relationships might be effected by the group.

We talked at that time about how the goals for the group and the tasks that might be beneficial to the other teachers might differ from ours and we agreed that we would try to include or foster the key aspects of our own work in the support group: (a) the trust we shared, (b) the focus on learning what teachers want to learn, (c) scheduling meetings at times that are convenient to everyone involved, and (d) my goal of not telling teachers what they should do but allowing them to construct their own sense of the value of technology in their teaching.

When I met with Susan in August she shared with me the invitations she had extended to all the teachers in first and second grade to be part of the support group. I scheduled interviews with each of them and asked them to sign consent forms before we began working together in September.

As I met and interviewed each of the teachers who Susan had invited to join the group, I explained that we were modeling it after the collaborative work Susan and I had been doing in the Spring. I also explained that I would be a resource for these teachers, especially to help them learn about technology, and that I would also be studying their experiences as part of my own dissertation research. Susan had also talked with each of

the teachers and shared her own impressions of the kind of work we had been doing together prior to my initial interviews with each teacher.

The School and District

The environment where Susan and her peers work is in some ways unique, but also has similarities with many other schools. Oaktree Elementary School was built in 1993 in an upper-middle-class suburb of a Midwestern capital city. Pennington is an affluent suburb that has six elementary schools, two middle schools and a new high school built in 1995. Ninty-two percent of Pennington High School graduates go on to college and students typically score highest in the region on the state high school proficiency test.

Pennington Public Schools has also been a leader in the use of technology throughout the grade levels and has been implementing a series of 5-year technology adoption plans since the late 1980s. All Pennington schools are networked together with fiber-optic cable, all the schools have had their own network file server, and all had Internet access since January 1997. Pennington leads the area in its aggressive adoption of technology and has an extensive support and training system in place for teachers. The district has a department of media and technology, composed of several staff, and has established a computer club, made up of students in the district, whose members train and support staff in technology.

Oaktree Elementary is also a leader in technology adoption. The school was built with voice and data lines in every classroom. A separate computer lab houses over 25 IBM Eduquest computers and all teachers and administrative staff have Internet access. Oaktree Elementary has a mission, vision and goals for technology adoption that were developed by the school technology committee in November, 1996. The school offers teachers regular once-a-month workshops for professional development that cover a variety of topics, including multimedia presentations, Internet, math with manipulatives, etc.

Oaktree Elementary has a technology adoption committee composed of teachers that has been meeting for several years and focuses on technology purchase decisions, coordinating training efforts (which are offered through the school district technology department), and supporting integration into classroom activities. The principal of Oaktree Elementary has taken an aggressive stance towards technology adoption and all the teachers have attended the Internet in-service training offered by the district.

Within Oaktree Elementary, a small group of teachers have used their own time and money to incorporate technology into their teaching practices. These teachers form the core of the technology adoption committee, which meets every month, and members have developed expertise in a variety of computer applications. There is an informal support system in Oaktree Elementary where these technology-using teachers showcase their work and train/support other teachers in the school.

While the members of the school technology committee are drawn from the population of teachers, those who are ambivalent or fearful of technology are not included in this group with the exception of Susan. I estimate that about half of the teachers at Oaktree Elementary are not overly enthusiastic about technology.

Getting Started

While I was interviewing one of the teachers who was joining our support group, I learned that Susan had been diagnosed with breast cancer and would be out of work for a few months. It was at this point that nature stepped in and wrestled from my grasp control over what I had hoped would be a study of emerging leadership skills and expertise in a teacher I had been working with since the Spring. But this is also a good example of how life often intrudes on our plans and we are forced to recognize what is really important. Here is an excerpt from my regular field journal during this period of time:

Today I interviewed Margie, one of the first grade teachers at Oaktree. I also found out that Susan's father died on Tuesday and that doctors may have found cancer in her breast. I haven't talked with Susan so I don't know the details, and I'm sure she will be upbeat about it, but hearing bad news like this is very difficult.

[Later that same night]

I called Susan tonight and she told me her doctor thinks the lump in her breast is cancerous but the test results from the biopsy will not be back till Monday. Sober news that makes me question how important the research I'm planning to do this year, and the dissertation I will eventually write, is in comparison to the life and death issues Susan is going to be dealing with this weekend and perhaps in the future. As I told Susan, I only wish there were something I could do to help. I guess being her friend and wishing her the best will have to do.

Needless to say the news of Susan's health problems were a blow to me and the other teachers, but we agreed to move ahead with the group anyway and I invited Susan to return whenever she was ready. This, added to the fact that another second grade teacher had dropped out of the group at the last minute, made me anxious about how this group might actually develop and what my role would be given Susan's absence. This resulted in my own trepidation about who might assume a leadership role within the group given Susan's inability to attend the sessions.

The first scheduled meeting of the technology support group was a disaster, because of scheduling problems and missed e-mail messages; one of the teachers had scheduled a doctor's appointment for that date and time and another had to leave early. We decided to use the little time we had together on that first day to schedule our first real meeting. The news of Susan's illness darkened our mood as we planned to meet a week later before school.

Cast of Characters

After I interviewed each of the participants in our technology support group, I developed brief portraits or descriptions of these teachers that guided my analysis in the study. I was especially interested in their initial beliefs about teaching, learning, and technology, as these were important parts of my original research questions.

Susan is a first grade teacher in her fifties who has been teaching for over 15 years, the last 5 years at Oaktree Elementary, and she prides herself on building and sustaining a warm, nurturing, loving environment for her students. She focuses on the affective aspects of her students needs and has a relational view of her teaching. Susan works to build a recriprocol loving and caring relationship with all her students and has an intern in her classroom this year. She collaborates regularly with Jessie, another first grade teacher, on a variety of projects and tasks often sharing materials and experiences. Susan enjoys being a teacher and has no plans to retire or change jobs in the near future.

Susan has a Windows/95 computer in her room connected to the school network and at the beginning of the school year she did not own a home computer. She describes herself as an inexperienced or novice technology user and her plans for technology use this year were focused on helping her students gain confidence and comfort with technology, which were consistent with her own plans for learning to use the computer. She described wanting to use the computer for student typing, thinking, writing stories, and exchanging e-mail with their key pals.

Susan sees herself and her students relating to technology much as she views her own personal relationships — as being friendly or comfortable with technology. She talks about wanting her students to be friends with the computer, the same way she has talked about herself and computers. There have been times when Susan has talked about the computer as a motivator for students, as well as times she has agreed with Jessie about the value of technology as tutor for building skills through remedial programs. She has

also talked about the power of technology to change her students lives and she believes that technology is, and will continue to be, an important part of their lives.

Jessie is a first grade teacher in her fifties who has taught for over 12 years, the last five at Oaktree Elementary. She describes herself as caring but disciplined and views good teaching as knowledge of subject, having an organized room, providing students with structure, and being disciplined. She is protective of her classroom, rarely asking for parental help, and does not have an intern in her classroom this year. Jessie is very concerned with what the principal expects and has a strong personal and professional relationship with Susan. While Jessie does not have a computer at home, she lives close enough to the school that she can use her Windows/95 classroom computer whenever the need arises.

Jessie describes herself as an inexperienced or novice technology user who planned on having her students use technology to gather information and become comfortable and confident this year. She has talked about using technology to keep her disruptive students occupied while she can teach the rest of her class and has also talked about using the computer with remedial software for drill and practice.

Margie is a first grade teacher in her thirties who has taught first grade for two years, after teaching fourth grade for six years. She tries to make learning fun, but is disciplined and ensures that her students see the consequences of their own actions. Margie works hard to cover the curriculum and likes to get parents involved in her classroom. She is a caring teacher who has an intern in the classroom this year. Margie has strong opinions about the school, the administration, and her peers, and is not afraid to share them with anyone, including the school principal. She works hard to satisfy the expectations of her parents and has used technology for two years, giving her a reputation for classroom innovation with technology.

This year, Margie's stated goal was to transfer what she knows about technology to help her students learn. She feels somewhat isolated and independent in the school,

having offered to support her peers use of technology, and has aspirations to become a principal in the near future. In fact, Margie applied for a principalship in another school district last year but was not offered that job. She has an Apple IIgs and an Apple IIe in her classroom, along with a Windows/95 computer but she does not have access to a computer at home.

Margie has talked about using technology, particularly e-mail, as a way to model for her students the writing process, and has also talked about wanting to move beyond use of technology for games and basic exploration. She has talked about wanting to move towards her students' use of technology for meaningful activities. Margie wanted more information on how to incorporate technology into the curriculum and I think she wants to work with her peers on a grade-level approach to using technology so all students who enter the second grade can be prepared for technology use at that level.

Martha is a second grade teacher in her fifties who has been teaching for over 20 years. She sees her job as taking the school curriculum and adjusting it to fit the individual needs of her students. She works to make the classroom environment exciting and motivating for her students. Martha has been aggressive incorporating technology into her teaching, showing a willingness to allow her own students to teach her specific computer programs. She is also concerned with what the principal expects of her and sees lots of exciting possibilities for technology in her classroom. She has a Windows/95 computer in her classroom and an Apple IIe with associated software. Martha has access to a Windows/95 computer at home and receives support from her husband who is an engineer.

Martha has at times talked about using technology as a reward for good student behavior, as well as using technology for writing and finding resources on the Internet. Martha describes herself as an inexperienced or novice technology user and described her

plans for technology use this year as getting her students on the computers, having them use the Internet, and felt the group would help provide her with direction she needs in this area.

Over the next nine months, these teachers and I met regularly — about every other week — before and after school to discuss technology, the school, the curriculum, and related issues that these teachers felt were important to their understandings of technology. The initial group was composed of myself, two first grade teachers (Jessie and Margie) and a second grade teacher (Martha). Later on in the fall, Susan joined us after returning to work from surgery. The story continues in the next chapter with our first session together as a group.

CHAPTER 4 THE PLOT

As I participated in the support group, and as I collected and analyzed the data, I began to see changes in the ways the group members participated in the conversations. These conversations became a focal point for my analysis, but as I thought and wrote about these conversations, I confronted a dilemma: How could I describe the conversations we engaged in without ignoring the importance of the context in which these conversations took place?

The way to resolve this dilemma became clearer as I realized that there are in fact two different, but inseparable, lines of substance or interest that emerged from my analysis: (a) the nature of the social interactions of group members, especially how they participated in the conversations, and (b) the window their talk provided me with into what these teachers believe and know about teaching, learning, and technology. These lines of substance cannot be looked at separately, but must be held up together under the light of analysis to get a clear sense of how these teachers thought about, talked about, and planned to use technology. While these lines are in tension, because they constrain and focus my attention on different aspects of the data I collected, they also provide a vehicle for describing the complexity of the situation I encountered in the field.

This is not a new or unique dilemma, as many other researchers have struggled with disentangling the form of discourse and its content. I spent much of my time examining what these teachers talked about as well as how they talked about it and how their talk was shaped by the context in which they work. This also points out the inherent complexity and interconnectedness of my work with these teachers as constituted in the social culture of their school.

In this chapter, I focus on the social dynamics of the group, especially the different ways group members participated in the conversations and how patterns of participation changed over time. This focus on the social organization, roles, and responsibilities within the group is essential to understanding the experiences of the teachers involved, including the influences of external factors on the groups' activities. I provide a chronological analysis of the group activities when we met regularly, approximately every other week, from September 1997 through March 1998, and I examine changes in the conversations that influenced the group members. This analysis includes my assertions, which I drew from the data, and evidence to support these assertions, as well as possible counter evidence or alternative interpretations.

In the next chapter I will examine the content of the conversations we had, drawing on the interviews and my own observations to develop another set of assertions that focus more explicitly on my original research questions: What do these teachers believe and know about teaching, learning, and technology, and how do these beliefs and knowledge shape their planned uses of technology? While these two lines of substance cannot be understood in isolation, I have organized my discussion of them into two separate chapters for practical reasons of space and readability.

In order to understand how patterns of participation in our group sessions changed over time, I began by examining each of our meetings and the ways these meetings changed based on who was in attendance. Table 1 below describes the meetings and lists the group members who were in attendance during each session. Note: I attended each of

Date	Teachers in attendance
09/16/97	Jessie, Margie & Martha
09/24/97	Jessie, Margie & Martha
10/09/97	Jessie, Margie & Martha
10/23/97	Jessie & Martha
11/06/97	Jessie, Margie, Martha & Susan
11/13/97	Jessie & Susan
11/20/97	Jessie, Margie, Martha & Susan
12/04/97	Jessie & Susan
01/15/98	Martha & Susan
02/05/98	Jessie, Martha & Susan
02/18/98	Jessie, Martha & Susan
03/05/98	Jessie, Margie, Martha & Susan

these sessions.

Table 1

Phase I - Becoming a Group

We gathered for the first time on September 16, 1997, when we met in Martha's room before school. I talked in this initial meeting about my dissertation plans and shared some of the history of the collaborative work Susan and I had done during the prior spring. I made it clear during this first meeting that the group was not something I would take control over:

This is not my group. This is your group. And so you all can think about having somebody else involved. It's totally up to you. And if you do, that's fine. When we meet, where we meet, and what we do are all going to be decided by you. I've got a lot of ideas and a lot of experience with machines but I'm going to wait basically for you three to tell me what you want to do and then we'll try to do it and I'll try to help you do it and then I'll try to understand it, that's my role is to try to understand and write about it. And when I'm done you'll get a copy of the final report and get a chance to say what you think about what we did or what we didn't do, and hopefully help me understand it. An interesting aspect of that first meeting was how Martha and Margie interacted. Upon review of the audiotape of the meeting, I noticed that on two occasions, Martha deferred to Margie or made remarks that indicated she was positioning Margie as an authority in the group. In the short segment below, Martha defers to Margie on the first issue of importance for the group: when will we meet?

All right, first issue: when are we going to meet again? [Laughter]
Well, I'm completely flexible.
Ok.
I'm pretty open to some of these Monday staff meetings after school.
Ok.
I didn't bring my calendar. It's very, very dependent on my husband.
Ok. Well we had talked about every other time having it early? Is that reasonable?
Every other time, not every time?
Right. So that way we get a session where we're all waking up and then we get a session after school, but that's totally up to you.
ie Fine.
Are you sure Margie? I think that's up to you. Can you meet at this time?
Because it was hectic even for me, and [laughter] I could imagine I
thought of you all morning.
It's probably more convenient for my husband in a way because I'm out
of the house before they've even woke up.
Right. [Laughter] Yeah.
But once a month.
Right, so I was thinking maybe in two weeks we'd meet in the afternoon. Whatever.

Notice that Martha defers to Margie for this decision about when to have the meetings. The issue of scheduling regular meetings was problematic for the group, especially given the difficulty we had scheduling the first meeting, and represents perhaps the first issue the group had to resolve. As such, it may be a reflection of negotiating power and authority in the group, and positioning for decision making within the group.

Another instance of this positioning by Martha of Margie as an authority in the group occurred later in the same meeting when the subject of a Web page design in-

service workshop came up and the teachers were talking about whether they would attend. In the segment below, Blaine, a fifth-grade teacher, walks into the room and asks the teachers if they plan to attend this workshop which I was going to teach:

Blaine	Can you guys sign up for the in-service next Tuesday if you need subs?
	If you're all together?
Jessie	We have to sign up for our own subs?
Blaine	If you could sign up for your own.
Jessie	Absolutely.
Martha	For the 23rd?
Blaine	For the 23rd.
Martha	Ok. I did that.
Blaine	For Andy.
Jessie	Ok, I will.
Andy	[To Margie] And if you want to come,
Margie	For the afternoon? [Unintelligible] all day tomorrow [unintelligible].
Martha	[To Andy] She doesn't need it.

Note that Martha feels obligated to offer her opinion about why Margie is not planning to attend the workshop. It seems that Margie has knowledge and expertise that Martha and Jessie do not have, especially in the area of technology, and perhaps this was said by Martha in jest; but it may also be reflective on a positioning for power within the group where Martha will defer to Margie in the future for decision making.

I learned later by talking with Susan that Martha and Margie had in fact been involved in a prior disagreement that had become a rift between them professionally. This early deference on the part of Martha towards Margie might have helped to repair this prior professional rift and allowed them to work together in the group in later meetings. The deference I saw in this meeting functioned in part to help Margie feel she was a part of the group, because Susan, Jessie, and Margie had all mentioned in their initial interviews that Margie felt and acted in isolation from the other teachers.

Following this example of how deference was used in the conversation, I also noticed talk about pedagogy. The teachers engaged in a conversation about Math Blaster, a mathematics software program that supports student learning of basic math skills in a game-like atmosphere. During this conversation, Margie was explaining to Jessie how students must move numbers up and down in the window to conserve them for later equations (see figure 2 below).



Figure 2

Margie talked about her use of Math Blaster and Jessie asked her how to move

between different levels of the program:

And then there's a, there are more levels after that if you keep going.
So the trick is to just move the little guy to the different columns
Right! And you just want to move it -
- and just
- you may, you may see a number way up here
that you can move to make this part of the equation right? But you could
just move one over in the second column to make it right and therefore
you save all those numbers up above.
So they have to learn those strategies?

Margie	So they're kind of learning to look at all options, I can move my answer, I can move my addend, I could
Jessie	But often I'll look at it and they'll be nothing!
Margie	Well, then, see that's usually because they've moved down too far.
Jessie	Oh.
Margie	If you do it right from the beginning, usually by the time they need help is when they've already pushed the thing down too much and there aren't solutions
Jessie	So it wouldn't make any difference which column you put the little guy in, nothings going to -
Margie	- Right.
Jessie	- make sense.
Margie	And then what you have to do is get rid of one row, they'll take away, I noticed one time that it didn't take away all the red stuff, they just took away a little of the red stuff and then they make you start over.
Andy	Hmm.
Margie	But one time I did I said, "I wonder what will happen," and I pushed the button and all the red stuff was gone [Laughter]
[unintelligible]
Martha	They love that, they love Math Blaster! Yeah.
Margie	And you can save it too, from week to week. When it asks you if you want to save your mission, if you say "Yes," it just saves it on the network. I said "Well try it" and they tried it and the next time they put their name in and it came back right where they left off.
Martha	So you should move your man rather than the numbers. Not always.
Margie	Well, you want to try and move it so you're using, you want to move the one that is the closest, so you're not eliminating so many numbers. That's a hard skill for some [<i>first graders</i>]. But it's a good skill, because they really have to examine that equation. And not go for the easiest one but go with the one that will help you with future problems.

Notice in her description of how best to solve the problems presented by Math Blaster that Margie indicates her belief that the skill it requires, although difficult for some first graders, is a necessary and worthwhile skill for them to learn. Although I did not explore this issue in more detail at this meeting, or ask the others about their own beliefs about this kind of math skill, this conversation represents an instance of how thinking about technology is connected with thinking about the curriculum and teaching. It seems clear from this talk that Margie believes that using Math Blaster helps her students develop worthwhile skills and therefore is an appropriate tool for teaching mathematics in her classroom. It also seems clear that Margie believes this skill is developmentally appropriate for first-grade students.

The next support group meeting took place on September 24 after school in Margie's classroom. The batteries in the audiotape machine I was using during this session went dead after only a few minutes so I was unable to transcribe the discussion so I relied on my field notes for my analysis. This meeting had similarities with the prior meeting, except that I did not detect deference on the part of Martha towards Margie during this meeting. I did note, however, that sometimes when Martha or Jessie talked to Margie, they physically turned in their chairs to face Margie, which I took to be a sign of Margie's authority in the group.

I also realized that my role as researcher, and my background with technology, did not make me an authority in the eyes of these teachers' since I had never taught elementary school myself. While I brought significant technical knowledge and expertise to the group, and was often asked questions about technology, I did not have practical K-12 teaching experience. I thought about my role on occasions when I would talk about technology and group members would remind me that I did not know about how first graders think or what they are capable of learning or doing.

Following this meeting, I decided to take a more active role in stimulating conversations around pedagogical issues and try to help the members articulate their own assumptions in the talk. Below is an excerpt from my field journal:

Sunday, September 28, 1997

After transcribing the audio tape from our meeting this week I've decided to take a more active role in facilitating these teachers' discussions about technology and pedagogy. I've observed examples in the transcript where issues of technology have led to discussions of pedagogy and I'm interested in whether I can move the topic of discussion in these kinds of conversations towards examining underlying beliefs about teaching and learning instead of just letting them die. I'll probably do this in a slow, and subtle manner, not forcing the issue, because I think some members of the group are still getting comfortable with me but I also believe this kind of social norm for discussion will ultimately benefit these teachers. The issue of a writing software program for first graders that came up in our meeting this week is a good example: I think if these teachers had exposure to a writing product - I'll try to find some this week on the Web - they might be inclined to discuss and examine their own assumptions about teaching reading & writing in the classroom. I also want to draw upon their own practical experiences in the classroom to make the group more contextualized.

At our next group meeting, held on October 9, the conversation again turned to pedagogical uses of technology and brought out some of the assumptions these teachers have about their students' abilities and what they are capable of doing on a computer. In the transcript below, Margie talked about her plans for using a key pals project in her classroom:

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Margie	class works on a letter. The teacher types it in. But then to the kids I can
	show how I go about it. You know. I type in my e-mail. I get my e-mail.
	Oh, here's a letter from them. You know so they can see it on the screen.
	And I click on this and it opens it up and here's the letter they wrote. And we can read it together.
Martha	So maybe more class letters?
Margie	Yeah, and then we can work on writing a letter. And then one day at lunch
	I could type it all in, and let them see it, and show them how I'm sending
	it now.
Jessie	So it could be a classroom letter?
Martha	That's what I'm thinking about doing.
Jessie	That would be better than individual!
Andy	Right.
Jessie	Whoa, that would be a lot better!
Margie	And even as a highlight near the end, when you get near the end of the year, where if you could get your teacher to agree to it, they each took like
	a key pal. So instead of writing a whole class letter, Jimmy was matched up with Bobby in my room, and you wrote it all by hand, you know,
	everything was written, you proofread it together, you kind of analyzed it
	together, and then if you could get parents to come in, you know, you
	could send two or three kids down to the lab room, because the letters
	aren't going to be that long, -

Martha Um hm, that's what I was thinking. Margie - or, buddy up with your third grade your third grade or fourth grade buddies.

You can see in this segment that Margie has clearly thought about how she will incorporate the key pals project into her classroom activities, and has accounted in her plans for the capabilities of first graders related to their limited reading and writing skills early in the year. It seems that Margie's experience with what first grade students are capable of doing, in terms of writing a letter, is consistent with the other teachers in the group and Martha and Jessie both liked the idea of using e-mail in a whole-class setting instead of as an individual student activity. Margie believes that in the first half of the year, her students will be unable to type e-mail messages on their own and will need help.

This segment also shows how Martha and Jessie view Margie as a valuable resource in the group, and as an authority, because she helps them see how they can make the key pals project work by using a whole-class letter instead of having each student send and receive individual letters. Also notice in the segment above how Jessie and Martha accept Margie's ideas without question or criticism, calling her idea "better" than the alternative without asking her to share her pedagogical decision making around this issue. In the conversation above, Martha and Jessie were passive listeners, not willing or able to take a critical stance towards the ideas Margie was putting forth. As such, they accepted these ideas without question, along with Margie's implicit reasoning for why this approach is better than the alternative — individual students sending and receiving their own messages. This was another case of deference to Margie's authority, but not one that served to repair prior relational problems, but was in fact reflecting Jessie and Martha's respect for Margie's having used technology in her first grade classroom.

Evidence in support of this interpretation of Margie as leader is also found in my field journal:

We had our third support group meeting today and it went very well. Susan could not make the meeting but Jessie, Martha & Margie were there. I think Margie is seen as the defacto leader of the group — Martha often defers to her judgment and experience and even Jessie seems to turn towards her in the conversation when it comes to questions about how to proceed; both seem to ask her for advice and play off what she says. I wonder if both respect her for her knowledge and disposition towards technology and the school culture — Margie seems to be the rebel in the group but also the leader in terms of what she's done with technology. She mentioned today that parents of some students in her class have expectations of her related to technology because they heard she was the "technology teacher."

This issue of what first graders are capable of doing, and how this influences what these teachers might imagine in terms of benefits using technology, comes up throughout the early meetings and reflects the expertise these teachers bring to the conversations. These assumptions about what their students could accomplish also helped me understand how my own assumptions about technology use were inconsistent with the experiences of these teachers. There were other factors that these teachers were thinking about, but not talking about, related to this issue of students writing e-mail messages to key pals that came up in our next meeting which represented a change in the group that I will describe in more detail in the section below.

To summarize my observations and interpretations to this point, in the early conversations we had, which did not include Susan, there is evidence of deference on the part of Martha towards Margie which served to repair prior relational issues that occurred before the group was formed. The nature of the conversations in these early sessions also reflects a certain amount of confrontation and challenge by Margie to positions taken by Jessie and Martha. During this time, Margie emerged as a central figure in managing these conversations, eventually being responsible for most of the topics introduced into the talk and most of the speaking turns. She was also seen as an authority figure within the group based on her prior experiences with technology and her outspoken attitudes towards the school administration. By the third group meeting, held on October 9, Margie had established her expertise within the group and Martha and Jessie on several occasions directed their questions about what the group should do to her. Margie had experience with technology, and had probably thought more about how to use it in her teaching, than Martha or Jessie and they placed her in a position of authority during these meetings. For example, Margie shared her plans to use a key pals project to expose her students to the writing process, but she described her idea of writing the initial messages herself as a whole-class activity and then moving towards students sending individual messages later on in the year. Martha and Jessie both liked this idea, as shown in the transcript above, perhaps because it resolved some of their concerns about how their students would be able to type e-mail messages themselves and the group used the discussion to talk about their own sense of the limitations of their students when it comes to reading and writing.

Margie managed these early conversations in ways that allowed her to keep on the floor topics that she was interested in — including her sense that these teachers did not have enough time to conduct their technology projects, that the administration did not appreciate how hard they work, and whether the teachers should make a stand against doing the technology projects. These are all topics that surface again in later meetings and Margie uses her conversational skills to encourage the other group members to take action as she builds support for her positions. This conversational management style is consistent with Margie's personality — she tends to be honest and open with her beliefs and to challenge ideas from others if she disagrees — and may have resulted in an acceptability of open challenges as part of the norms of participation in the early group conversations.

There is also evidence in these early meetings of Margie's building up to a confrontation with the school principal over whether teachers have time to do their technology projects and how technology decisions are made without input from the

lower-elementary teachers. Margie actually talked about this issue during her interview and in earlier meetings. For example, in her interview, Margie complained about the decision making process at the school being closed to those outside the committees. "If you are not on those committees," Margie said, "you don't have a say in the decision making." She mentioned two committees, the school improvement and the technology committee, as examples that excluded her views. Margie also talked in the interview about her belief that the teachers did not have time to work on the planned technology projects, an issue that she brought up in the early group meetings.

Margie also expressed her frustration in the first group meeting and claimed the principal had time to play and learn about technology while the teachers did not. She believed the principal's intentions were great but "we need prep time for computers." When I suggested the group ask the principal about specific time during the week to work on computers, Margie thought this was a good idea. This pattern continued in the meeting on October 9, when Margie again expressed her frustration with the computer lab, the difficulty of using a single computer in her classroom, and her feeling that the school was not being well led in the area of technology.

Finally, during this early phase, when Margie described her plans for technology, the other teachers in the group — Martha and Jessie — did not challenge or question her ideas, nor did they ask her to share her pedagogical reasoning or rationale for the choices she makes. I consider their participation in these early meetings to be a form of passive listening, where they were not thinking critically about the ideas Margie put forth or questioning her decision making processes.

Phase II - Negotiating Group Roles and Purpose

Following this early phase of development the group moved into a transition period which culminated in changes in participation, changes in norms for participation,

and the emergence of Susan as the group leader. Margie did not attend any of the subsequent group meetings until March 1998, despite our efforts to schedule these sessions at times she would be available. This transition period also coincides with the addition of Susan to the group following her time off and recovery from surgery and with a renewed focus during group meetings on the practical issue of how these teachers would use technology in their classrooms.

I met with two of the teachers — Jessie and Martha — on October 23, after school in Martha's classroom. Martha set the agenda for the meeting, and was not challenged by Jessie when she did, and we spent much of the session with Martha exploring the Internet looking for soil and volcano resources for her students. Another topic that surfaced during this session was the question of how these teachers might have their students engage in e-mail exchanges with key pals elsewhere in the world.

I encouraged Jessie and Martha to think and talk about how they might use e-mail in the classroom. While I recognized that Margie had helped both of them when she described her own plans for e-mail use in the classroom, I also wanted to learn what Jessie and Martha thought about the pedagogical implications of e-mail in their classrooms. Much of the meeting was spent talking about logistical issues related to how students might type their e-mail messages, in the classroom or in the lab, and how parents might be helpful in accumulating e-mail messages onto a single computer or disk so that Jessie and Martha could send their e-mail messages to their key pals.

I began to consider how my role within the group might need to change in order to facilitate the kinds of pedagogical conversations I thought would be beneficial. I reflected on this question in my field journal:

Tuesday, October 21, 1997

I think I need to be more explicit about my own assumptions and beliefs as I continue my work with the Oaktree teachers, especially related to pedagogy, learning, and technology. For example, the discussions about Math Blaster have been opportunities I've not yet taken to offer my own views about the value of

drill-and-practice for 1st graders. I guess I'm waiting to see how these teachers work in the classroom before I make any assumptions about the pedagogical value of specific software. I need to share my own beliefs about technology with these teachers so that we can have conversations about the value of technology for them and their students.

As part of this conversation, Jessie and Martha talked about their own concerns about having parents helping their students type their e-mail messages, especially the possibility that these parents might see student messages that contain errors misspellings or grammatical errors. This focus on surface feature correctness reflects assumptions these teachers were making about how parents might view student products, in this case, e-mail messages, that are not of sufficient quality to reflect well on the teachers. I include a transcript from this conversation in the next chapter where I use it to show how these teachers' beliefs about their students' work shaped their ideas about the role e-mail might play in their learning.

The Venting Session

The group meeting on November 6, was the first that Susan attended after her surgery and was generally referred to by the group members as "the venting session." This session was a milestone for the group for a variety of reasons: First, it showed how important the issue of time and support were for the teachers related to their use of technology in their teaching; second, it provides evidence of a growing trust and collective authority among these teachers as it relates to their participation in the wider school culture; third, it reflects conversational management strategies and leadership authority within the group by Margie setting the agenda for the members and using her voice to keep the topic on the conversational floor throughout the meeting; and fourth, it connects the work that takes place in the support group with larger school influences, in this case, the expectations of the school administration, reminding the participants that their professional lives exist in the broader context of this school and district.

The venting session the group engaged in on November 6, is strong evidence of the pressure these teachers are feeling from outside their classrooms to use technology. During this meeting, Margie was encouraging the others to stand up to the principal and ask him to provide them with the necessary resources. Margie said: "I think there is no realization as to how overpowered we are, overworked we are, we're not even trained to know how to use it, …" Here is an excerpt from my field journal for Thursday, November 6:

Today's meeting turned into a venting session for the teachers. They were angry and talked about a lot of things, including (a) the principal doesn't understand how hard it is for us to do these e-mail projects, (b) there isn't enough time to do these projects (as well as other projects), (c) the technology doesn't work well enough, (d) we don't have enough technology, (e) technology decisions are being made without our input, (f) lower-elementary teachers are different from upperelementary teachers and they just don't understand us.

The issue of time was a big factor in this conversation and all the teachers agreed they were overwhelmed and didn't have any time to work on their technology projects. I suggested the group ask the principal to provide them with an hour a week to work on these projects. Margie wanted to have the principal attend the next meeting so they could share their frustrations with him and ask him for more support.

This meeting was an important event in the development of the group because it brought to the surface the impact external expectations have on these teachers plans for and use of technology. There is no doubt that the goals and purposes of the support group were constantly influenced by the larger school context, including the actions of parents, administrators, and other teachers. These external influences lead to my first assertion.

External Influences on the Group

Contextual factors — including external expectations, available equipment, available time, technology and administrative support — all played an important part in shaping the sense these teachers make of technology and their plans for its use. These contextual factors comprised a large percentage of the early talk about technology and focused mostly on teacher motivations for technology use.

Within the group, we spent considerable time discussing external factors — such as administrative expectations, parental expectations, available time and resources, and district-level support issues — which I interpret as evidence that the teachers in this group may be unwilling or unable to think about using technology without also thinking about the expectations placed on them when they do so. It could also be that these teachers needed to talk at length about whether they should use technology, and this includes external motivations for use, before they could begin to talk and think about why using technology might be beneficial for their students.

The issue of external factors — including the district, the principal, other teachers, and even parents — occupied much of our early conversations. Since the principal had stated in a staff meeting early in the school year that the theme for the year would be connecting to the world, and he had suggested that each teacher find a collaborating teacher somewhere else in the world and incorporate use of technology, especially the Internet, into their curriculum around these activities, all the teachers felt pressure to work on a key pals project which would satisfy this goal.

In Jessie's case, she voiced her fear early and often that the principal's expectations for teachers having key pal partners outside the U.S. would conflict with her own plans to communicate with her daughter who is a teacher in Massachusetts. On several occasions, Jessie expressed her fear that if she did have a key pal project with her daughter, the principal would look unfavorably upon her. It turned out that Jessie did her project with her daughter and the principal's expectations were not a contributing factor in the success of these efforts.

Margie said during a meeting on October 10 that she didn't care what the principal wanted, she was going to have her students use technology because their parents expected her to. She acknowledged her reputation in the school as a teacher who uses technology and felt an obligation to continue using it this year. Margie also was willing to ask parents to help her in the classroom and in the computer lab, and so felt the parents who were helping her in the lab would want to see evidence of educational use of computers.

Because Susan was out of school for almost two months in September and October, she felt behind when she returned to work in November. In the meeting we had on November 6, Susan said she felt as though she had taken ten steps backward since the summer. Martha also seemed concerned with the principals' expectations for technology use, asking me during our initial interview if that was not the goal for the group — to help them meet the principal's expectations for technology. Additional evidence of this assertion is found in my field journal entry:

Friday, November 7, 1997

While the discussion [*yesterday*] centered on the key pals project, it's obvious that other factors outside the control of these teachers brought on this conversation and venting; there was mention of the new math curriculum and other topics that seem to be part of an overall anger or frustration with the status of these teachers in the school. Again, I believe Margie was an instigator of this thinking and I wonder if the others feel as strongly as she does about this discontent, but it does provide evidence of the feeling of being overwhelmed these teachers must have and the problem of time in implementing any form of curricular innovation. I hope this complaining will lead to something productive, perhaps asking [*the principal*] for time off every week (or every other week) to work on the technology projects, and is not forgotten.

Both Margie and Martha also commented on the influence of external factors in their initial interviews. Margie talked about feeling pressure from parents to use technology in her teaching, since she had gotten a reputation for using it the year before,

and Martha said, "I hope we can do what [*the principal*] wants us to do, meet his goals and expectations."

This assertion is consistent with other work in the field focusing on teacher conversational groups. For example, Richardson (1990) found when working with a group of teachers at two different schools that:

the nature of the discourse at the group level was quite different than that at the individual level. At the group level, teachers focused on systemic barriers and mandates that caused them to institute practices over which they had no control. ... At the individual level, the teachers appeared more willing to talk about their practices and justifications. ... It appears then that the shared language for justifying or explaining a practice at the school level revolved around barriers, mandates, and lack of control, even though the teachers often expressed different personal justifications for the given practice in their individual sessions. The general feeling of lack of control and autonomy may, in part, function to maintain a laissez-faire approach to teaching activities and their justifications within a collective of teachers. (p. 15)

During this venting session, which included many instances of overlapping speech and multiple conversational floors, there was emotion in the talk that I had not observed in prior sessions, indicating a heightened investment in the topics being discussed. Margie used the conversation to encourage the teachers to take collective action to resolve their sense of feeling overwhelmed and unsupported by the administration. This was a topic Margie had brought up in earlier meetings and in the initial interview I conducted with her in September. This meeting brought to the surface the question of whether the teachers should stand in opposition to the external expectations placed on them by the administration and their peers to include the key pals project in their classroom activities. Margie wanted the group to invite the principal to the next scheduled meeting and press him about their concerns in an attempt to resolve the issue directly. Martha disagreed but deferred to Margie and offered to go along with the others so there would be solidarity in the group. Susan and Jessie were hesitant to go along with Margie and the meeting ended without any clear sense of how they would proceed in preparation for the next meeting.

There was also a confrontation during this meeting between Margie and Susan, where Margie challenged a point Susan made about differences in the time available to upper-elementary teachers compared to the time available to lower-elementary teachers:

Susan	I was just going to say Jessie that Blaine [a fifth grade teacher] with his sixth graders can sit down for half an hour and work on a project, everybody's in a seat and he can concentrate, whereas we don't have
	that luxury.
Jessie	No.
Andy	Right.
Margie	Well, I disagree with that though, I don't think you do. I mean I'd like you to go, Blaine has had an intern for how many years in a row and also Blaine doesn't, you know, he's at home, he probably buys a new computer a couple times a year.
Susan	He [a fifth grade teacher] has a natural inclination and he is certainly interested in this.
Margie	He does, but having taught fourth grade I mean when you give a project you don't have a classroom that sits down quiet for 30 minutes or an hour or whatever. They're always, just like first graders -
Susan	- Hmm.
Margie	- it just that their questions
-	are at a much higher level.
Andy	Well -
Jessie	- So you don't feel that there's more quiet time that you can actually
Margie	No, no, I mean not anymore than you could pull out when you're teaching first grade. I mean there are times, and I don't know if you do it but I do, especially on Friday when I'm doing my newsletter, I'm sitting there typing and "If you have any questions, if you need me to help you spell anything, I'm over here." You know, and within about five minutes you have this big mob around you.
Andy	Right.
Martha	[laughter]
Margie	But, you know, and then you say you get up and you get up and you quit what you're doing. You can do it, you know a teacher who, you do it when you have to do it. A teacher who, you do it when you have to do it. But I mean it's not this picture perfect, you give an assignment and everybody sits down and does the assignment and nobody asks any questions [<i>laughter</i>]. I mean it is
Jessie You know, in all honesty, I think what I would find most helpful right now would be to establish in the classroom some of these extra computers for children to work on, get some really good first grade programs where they could learn, and it would be you know for remedial kinds of things, and figure out how to get the computers working in our first grade.

Note in the segment above how Margie disagrees with Susan about differences between upper-elementary grades and lower-elementary grades as it relates to demands placed on a teacher for student attention. Margie is direct in her disagreement, saying it outright, and Susan seems to hedge her bet and moves to accept a call for a change in subject — referring to Blaine's inclination for technology — but Margie doesn't let this issue go and states her position clearly, even when questioned by Jessie.

The nature of the group discourse in this session was consistent with what I had seen in prior meetings, but there were also important differences, perhaps because of the addition of Susan to the group or because of the importance of the question of whether these teachers felt they had a choice about doing the technology project. These changes were reflected in a variety of ways: Margie dominated the conversation, holding the floor for long periods of time and often providing her own personal stories of how the administration at the school, especially the principal, had not communicated effectively with the lower elementary teachers; there were multiple conversational floors on more than one occasion during the meeting, something I attribute to the emotionally charged nature of the discussion; there were many instances of overlapping speaking at the meeting; and the conversations were more confrontational, with participants challenging each other about issues. I felt a sense of anger and frustration in this meeting by the teachers and genuine question about whether they should attempt to use technology in the classroom. These changes lead to my second assertion.

Changes in Group Conversations

The group conversations changed over time as members became more comfortable and trusting of each other. Specifically, the group talk changed over time based on who was the conversational and group leader — Susan or Margie.

These changes concerned how these teachers participated in the group conversations, the nature of the talk they engaged in, the role of authority and power in this context, and the social norms of talk to accept different points of view and encourage equal participation by all members of the group.

During the venting session, Susan and Jessie asked me if I would meet with them the following week to see if they could get started on the key pals project. The following week, the three of us met and Susan and Jessie decided they could spend time and energy arguing with the principal or they could spend that time working on their key pals project. They decided they would try the project anyway.

Sometime afterward, but before our next group meeting, Susan used her personal relationship with the principal to ask him if she was obligated to do the technology project and he told her "no." She related this to Margie who also approached the principal and was told the same thing. Upon further analysis, it occurred to me that even though Susan and Margie were given the same answer by the principal, they may have viewed the response differently based on their current institutional status — Susan had more experience as a teacher in the district and was assured of keeping her teaching position the next year while Margie had the least amount of experience of the group and knew she might lose her teaching position the next year due to changing attendance patterns in the school. It is quite possible that Susan and Margie saw this issue in different ways that later shaped the development of the group based on changes in participation patterns.

Margie indicated to me that she was unable to attend the meetings from November through February because she didn't have time, the meetings conflicted with

other priorities she had, and she was sharing with the group but not getting much in return. She may also have felt she had lost power and authority in the group to Susan because of her move to go outside the group to resolve the issue with the principal, thus undermining her play to use the group and its solidarity to strengthen her own position. [Note: Margie disputes this interpretation.] The move Susan made outside the group to solve the problem Margie was pushing us to address in a confrontation with the principal resulted in Margie's absence from the group and led to changes in the discourse that made it more cooperative, less confrontational, more indirect and subtle, more nurturing, and less direct and challenging.

This meeting was viewed collectively by the teachers as an important point in the development of the group, but for different reasons. Margie said in a later meeting and in her follow-up interview that she felt the group needed to take a more active role in the decision making process around technology and the group offered a collective voice for them in their relationship with the principal. Susan told me later she was upset about the way the venting session went and was determined not to allow the group to become an angry and dissenting view within the school around technology adoption. Jessie also commented on the importance of the "venting session" in the follow-up interview, when she said she was originally surprised that Margie had initially joined the support group, and that she thought she had dropped out after the meeting on November 6 because she had wanted the group to ask the principal to attend the next meeting and they had "backed out."

Margie described her view of how this issue was resolved at a group meeting in March 1998:

MargieAnd it's ok not to agree, -Andy- Right.Margie- but I don't want to approach [the principal] and -Andy- Right

Margie	Well what was the one time we met, and then we agreed we were going to invite <i>[the principal]</i> to the next meeting, and then I invited <i>[the</i>
	principal] to the next meeting, and then the next day everybody decided
	we had solved the problem and we didn't need to invite [the principal] to
	the next meeting, right? It was about whether we were going to do the technology. Because we had -
Andy	- a meeting where people were saying "Well, we're overwhelmed, "
Margie	- Right. Right. So we were going to talk to [the principal] about that and
U	then it was, all of a sudden, "Well, you know, we solved, I think that
	problem is solved." Because nobody wants to -
Andy	- Right.
Margie	- and we talked about that, how
Ũ	people don't want to disappoint [the principal]. Because [the principal] is
	so kind and caring and all of that. And I think that's what happened
	vesterday.
Andy	Right.
Margie	Because <i>[the principal]</i> stood right up there and said, "If you really think
	I'm on the wrong road don't be afraid to stand up and say," well, I'm sorry, but there are a lot of people who are afraid to say and maybe not
	because they're afraid <i>[the principal]</i> will get mad but they want to do
	what <i>[the principal]</i> wants to do they're not willing to stand up and say what are the chances of one of them not being good
	what are the chances of one of them not being good

Margie may have felt she needed the strength of the group to support her own weaker position *vis a via* the principal. As a result of Susan resolving this issue outside the group meeting, without Margie feeling it was resolved for her, this may have contributed to Margie's not attending any of the group meetings between November and March. Margie talked about her fear of approaching the principal at a group meeting on March 5:

Margie	So should we just sit on this for a now? [Laughter] Maybe
Andy	Um, we're going to meet in two weeks? Right? Do you want to work on this?
Jessie	Is there any, <i>[to Andy]</i> you're so good, you speak so beautifully, is there any way that you could say "In meeting with lower-el that some concerns were brought up"
Susan	I just wonder if it shouldn't be brought up before that, I'm afraid, are they going to do this before two weeks?
Andy	I don't know. Don't know.
Susan	I think this ought to be addressed fairly quickly.

Margie	I don't feel like I'm in a position to approach [the principal], you maybe
	more so than me.
Susan	I will. I don't know that I'm in a position to, but I will.

After talking with Susan during the follow-up interview, she explained her own sense of the venting session and how it was a point of change for her in the group and in her own plans for the future:

Susan	I don't know if this really applies or not, but what turned the corner on me,
	this is going to sound crazy, when I came back from my operation, and that first time we met, it was so negative, and something welled up within
	me and I thought "This isn't right! This is not what it's about "And I
	refuse I refuse to go that direction and I want to be as positive as
	constructive as I can in that and I will not be part of this. And it was, it
	was
Andv	"This" being?
Susan	The negative, criticism
Andv	The questioning whether or not you would do this?
Susan	The questioning, up hm, the whole atmosphere of that one meeting in
	Margie's room was a turning point for me. Whereas you and I had such a
	good relationship before, and this group and I thought, "It's not going to
	be like this and I'm not going to allow, this isn't the way to do it." And
	something, like I say, welled up within me, thinking, "Ok, I'm going to,
	onward here, I'm going to do the best I can to beat this and not only beat
	this negativism but to beat my fear"
Andy	I remember you saying you felt behind, that you felt you had taken steps
	backwards. I think that was a big point for the group, a transition point for
	the group in a lot of ways.
Susan	It was for me, it really was for me. And, what was the question?
Andy	Anything that sticks out in your mind?
Susan	That was a real turning point, our relationship, [we] could ask questions,
	but then to be involved with the other people, changed it. And it backed
	me up against, I know I can be this way with you but, and then when that
	happened, I thought "I don't care. I don't care how I sound. I'm not afraid.
	I'm going to tell you what I think," whereas before I was thinking "well if
	they're going to do it I should to." And that was so typical for me.
Andy	The pressure.
Susan	Yeah. That I always kind of went along. It doesn't matter. It's ok. It's ok.
	I'm going to do what I feel is right for the kids and how can the kids
	benefit. And what do I have to do? What do I have to do to make this
	happen and to forge ahead, this is moving quickly, and if I don't move

along with it I'll be left behind. I want to learn for myself and I'm a different person than I was two years ago, I feel so, what happened to me physically. You know, life is short. I don't have time to mess around anymore. I don't have time. I'm going to make things happen that I feel are important.

The changes in leadership — from Margie to Susan — also resulted in changes in the nature of the group conversations and especially the ways that the two other teachers — Martha and Jessie — participated in these conversations. In the early meetings, when Margie was managing the conversations and was seen as an authority and perhaps leader of the group, there were instances of passive listening to the ideas and opinions she put forth about how technology should be used. In these discussions, neither Martha nor Jessie questioned or challenged Margie when she talked about her own plans for technology. The norms for participation in the discourse during these meetings supported direct challenges and disagreements, mostly initiated by Margie, that may have left Martha and Jessie feeling uncomfortable putting forth their own ideas or questioning Margie's ideas.

When Susan joined the group, and as a result of her move to resolve a problem Margie had asked the other group members to address outside the group using her relationship with the principal, the nature of the discourse changed. This change coincided with Margie's absence from the group and allowed Martha and Jessie to participate in more equitable and comfortable ways in the conversations. Susan's conversational management style of indirect or subtle questioning or disagreeing allowed Martha and Jessie to begin to put forth their own thinking and begin to question their assumptions. It is also likely that Susan's role as leader and her own actions to model reflection and taking a more active role in the technology adoption process at the school may have influenced Martha and Jessie in positive ways as well.

The second phase of the group development, which occurred between October 23 and November 15, and coincided with Susan returning to the group, was a time of transition. This transition was centered around an important event for the group — the venting

session — where these teachers had an opportunity to share their anger and frustration with the external expectations placed on them by those outside their classrooms. The members of the group worked during this period to establish roles for themselves and to co-construct a shared purpose for the group.

Phase III - Group Development

Following this transition period, the subsequent meetings were much more task oriented and focused on helping these teachers use technology in their teaching. The November 20 meeting showed much more equity of talk in the conversations, less confrontations or direct challenges to individual points of view, less emotion and overlapping speaking, more cooperation among the group members, and a discussion of a sense of the value of the group for the teachers involved. I believe this represented a change of leadership within the group from Margie managing the conversations with a more direct and confrontational manner to Susan using a more indirect and subtle, inviting and nurturing conversational management approach that was carried forward in subsequent group meetings. During the meeting, Martha talked about her plans for incorporating technology into her teaching:

Martha I want to do things like we write, I start a story, they put a paragraph in, we put a paragraph in, etc. ... So I want to start something like that. .. it depends on the child's interests ... But I'd like to have a lot of projects like that ...

Jessie questioned Martha about how she plans to use the key pals project in her classroom:

Jessie	I'm not quite clear, so you would say start a story, your whole class as a
	group would add a paragraph?
Martha	Or, well I've got it two ways: I've got the whole class working with this as a class project, where we would start a story with the beginning paragraph
Jessie	One on one or the whole class?
Martha	The whole class.
Jessie	Whole class.

Martha	And then their whole class could put in another paragraph, and we
	could add on like this. But then I'd also like to do it with key pals, you
	know individuals, if they were that advanced.
Margie	When you got to the end of the year you could have one child start and another child in the other class write.
Martha	Um hm

Notice in the segment above how Jessie questions Martha about her ideas for how she will implement a whole class project with technology, and how Margie makes a suggestion regarding pairing students together to help them successfully write their stories. This segment represents an early example of cooperative but critical examination of the ideas Martha put forth in the conversation and establishing social norms for engaging in conversation that include indirect questioning in the talk. Later in the discussion, Martha continued her think aloud with the group:

Martha The other thing that I would have them do is, what we used to call seatwork, on the computer. Where the rest would be doing something else that was work work or whatever was assigned. And for that day those children would do that. And then the next day it would be rotated.
 Margie More of a center approach, where they might do spelling ...
 Martha Spelling programs, and your Science, you know, every subject.

Notice in this talk that Margie is much more subdued in sharing her opinions about the plans Martha describes for an Internet-based story starter project. In prior meetings, Margie would have questioned and perhaps directly challenged Martha when she described her ideas about the use of technology. Perhaps Martha was describing plans that were consistent with the ones Margie had described in a prior meeting, and therefore Margie did not disagree with them. It could also be that Margie is adopting a softer, more subtle approach to examining other people's ideas in her talk. It is also interesting in this segment that Margie does not comment about her own plans for using technology, something she had not been shy about doing in prior meetings. Whatever the implications, Martha shares clearly in the segment her plans for technology use in her teaching. During the same meeting, Margie talked about her sense of the value of this group and where she thought the group should go in the future:

Margie	See that's kind of the problem I'm having is again here we are teacher's
	using it, and I mean you're expressing to the kids but they aren't really
	using it. That's where if I we're going to direct this group I'd want to
	focus more on what am I going to do in January when I take my kids,
	what am I going to do with my kids? I want to know specifically how
	now I can I take all this technology and make sure my kids aren't just
	going in there and printing flowers. It's boring.

- Andy Right. And I think that's the next step. If we're comfortable that we're going to do this then we ought to take that next step. We ought to start thinking about what we're going to do, and how it's going to impact the children.
- Margie And then what you [to Martha] would be helpful for us to do for you by the end of the year. If they ever came up with the writing program, whatever writing program they were going to use, then it would ...

Again, in this segment, Margie is sharing her ideas, but not in a direct or confronta-

tional manner. She acknowledges the issue of development of first-grade reading and writing skills over the year and still puts forth her own concerns that much of the focus of technology so far has been directed at teachers and not at students, an issue she has talked about in prior meetings. Susan shared her belief that what is happening in the group was helpful for her and could be used to help other teachers at the school:

Susan	But this is what's helpful is the nitty gritty.
Jessie	Yeah.
Susan	We're down in the trenches right now and we're really on here <i>han</i> ds on, asking questions, learning [and] that kind of thing. And it can start here. And then perhaps if we work togethe r all year long on this. And next year, each of us take one more teacher, or two more teachers, and work with them and learn from them. They learn from us. Then, think how this is
	going to spread throughout the whole school.
Andy	Right.
Susan	I mean does that make sense?

This short segment of transcript is an initial attempt by Susan to put a positive spin on the work the group is doing, to share her own ideas about how the group could be even more helpful to the others in the school, and to redirect the group to be more productive. Towards the end of the meeting, Jessie, Susan and Margie all talked about the value of the session:

Jessie	I feel like we accomplished a lot today!
Andy	Good
Susan	This was good!
Margie	Yes.
Susan	I really feel like we accomplished a lot!
Jessie	I've got a much better sense of you know maybe the direction that
Margie	And a voice.

This meeting seemed to reflect the "calm after the storm," and I remember at the time wondering if the teachers were now committed to incorporating technology into their teaching or if other factors might intervene to cause another session of venting anger and frustration.

I characterize the discourse that emerged within the support group during this phase as nurturing and indirect because it is more consistent with the way these teachers normally engage in conversations among themselves. In this kind of discourse, people do not challenge each other directly, at least about issues they are strongly invested in, but rather disagree indirectly in nonthreatening, subtle, and face-saving ways.

As I mentioned above, Margie was absent from the group following the meeting held on November 20 and this resulted in Susan taking a leadership role in the group. There are many instances in the data of Jessie and Martha's deference to Susan in their talk and in the tasks they work on as part of the group.

For example, in the meeting on December 4, when I met with Jessie and Susan in Susan's classroom after school, we negotiated setting the agenda:

Did you have a little agenda?
No, no, really I don't. I did want to answer your question, Andy, at one
point you mentioned, "What did we think the purpose of this group was?"
I got to thinking about that and I thought three things. First of all, it means
a lot for me to share perhaps what I know, as little as I know. It's good for
me to kind of review and say "Oh, yeah, I know that." That gives me
confidence. The second thing is to glean from the other ones what they
know. And then the third thing is accountability. I don't want to come and
admit or confess that I've not done anything. So it kind of forces me each
week to say, "Well, yeah, I was on, and I did this and I did that. That kind
of thing." So those three things are meaningful for me in this group.
Good.
[To Jessie] What's meaningful to you?
Well I am here just to learn anything I can possibly learn. And I feel like
no one is going to glean anything from me. [Laughter]
Oh Jessie, that's not true!
I know, I am just here to glean from others. [Laughter]
That's not true.
But I did forget some that I learned earlier about the borders and the
newsletter, [to Susan] remember when we did that? And I would sort of
just like to review that quickly if we could.
Sure. Well, it's completely up to you guys. I do have an agenda but as
usual my agenda can wait.
No, well tell us what it is!

Notice in the segment how Susan recalls a question I had asked in a prior meeting and clearly states her views on how the group is helpful to her. She did this partially for Jessie's benefit — to help her see that they are both novices at this computer thing and she (Susan) is not afraid to admit that she doesn't know much about technology and hasn't used it much, an indication of her feelings of trust within the group. You can also see in this segment how Susan encourages Jessie to consider her own learning as a positive step.

Later in the same meeting, Susan encouraged Jessie to talk about how she thinks the computer in her classroom is affecting her teaching:

Susan[To Jessie] Do you feel like it's [the computer] changing you?JessieI don't feel like I've given it my best shot. You know, I feel like if I put
more time into it. If I put as much time into this as I have into aerobics I'd

	probably feel more qualified to say "Yes." Um, I mean I'm feeling more confident, but I don't feel like I've really given it a good shot. I could do more.
Susan	I told Andy I don' know how many times, how this is changing me most is that this has brought me to the level of the kids who don't know how to read. When they say, "I don't get it. I don't understand this. I don't [<i>unintelligible</i>]." And you want to say "Just sound it out!" you know. "Just
	look at it!" [Laughter] I mean, Andy you know I don't actually do that. It
T	has put me in their place. Do you understand what I'm saying?
Jessie	I understand, it is, basically is what it comes down to it you talk with people who are really pretty proficient, it's just reading it, you know? You just have to go to the directions, open up the software, and read it. You
	know, and do it. But it's hard to do that, it's hard to read all those tedious steps, and then follow it.
Susan	Well, and not only that, but if you skip two spaces when you only were supposed to skip one, it won't let you in there. I mean it has a mind of it's own. So it's one step beyond reading directions. It's understanding
Jessie	and figuring out what you're doing wrong
Susan	But I'll tell you, and I just can't emphasize enough, how it has changed
	my view, and having so much more empathy for a child that doesn't
	understand something. It is like, "Oh man, do I know how you feel! I
	really, really understand how you feel." Because I am a student at this. And I don't understand a lot of this.
Jessie	Well I think where it has changed me more is where it opens up the world. I mean it's like discovering books for the first time, you know it just opens up everything wide open. You could just you know if you're a curious
	nerson, you could just do this all day long. You play with it. You get into
	one thing and then your curiosity encourages you to go on and on and
	pretty soon you're into something else. I could see where people could get
	carried away and just sit in front of their computer all day and play with it.
Susan	Do you feel like you have time?
Jessie	I haven't, see I haven't put in the time. I haven't done that. But when I've
	been on the Internet it's been fun.

An interesting aspect of this conversation between Jessie and Susan is how Susan uses an indirect and nonthreatening move to disagree with Jessie about the nature of technology when she says: "Well, not only that, but if you skip two spaces ..." This is evidence of Susan's conversational style, which is consistent with her personality, through which she tries to provide a safe and nurturing conversation for her peers without directly contradicting them or aggressively challenging their statements. On December 11, Martha, Susan, and I met in the computer lab to review a software product that the district was considering purchasing for the second and third grade students. During the conversation around this software, Susan and Martha talked about how Martha might manage student access to the few computers in her classroom:

Martha	They color it but I think if they wrote a report In second grade, we do our reports on the computer and I notice that other schools do the very same thing. So that would probably be the thing that you would use for reports.
Susan	Ok. Now how do you [to Martha] handle when one child wants to write a report and the other wants to write a report at the same time? Do you set the timer? Is everybody assigned a certain time? How do you work that? Because in my room, it just seems like "Now it's my turn. He's been on
	long enough!" How do you do that?
Martha	I think it's very hard. If we're really doing reports though, and we have to actually do them, then someone goes up there and types until they are done, with their report
Susan	What if that takes two days?
Martha	Um I might go over there and help them but it would not take two days
Ματηα	You know, it can only take like an hour. Their reports aren't that good, [<i>laughter</i>] I mean long. Excuse me, their reports aren't that complicated. They can sit there and they can do it in an hour. I've never had anybody
	so maybe a paragraph.
Susan	So I might get to it on the third day, or the second day.
Martha	If you had to do that?
Susan	No, but I mean if I was in your room.
Martha	A week. I, I, that's, I take a week on the ocean report and I take a week on the insect reports. And I'd say that's about five a day. And you try to squeeze them in whenever you can. "Ok. It's your turn. Now it's your turn." And some are very fast, by second grade, by the end of second grade. So, and they're only a page. Big fonts!

Note in the segment above how Susan questions Martha about the way she manages

the problem of too many students and only a single classroom computer, but she does it in a way that allows Martha to describe her approach without Susan being judgmental or disagreeing with her. Also notice how Martha starts by admitting this is a difficult problem, and that she doesn't allow students to spend more than an hour writing because there reports are not that long. I'm not convinced that Martha understands what Susan is asking her how she deals with students who take longer than the time allocated to finish their work
but it's interesting how Susan uses herself as an example of a students' perspective and to ask Martha about those children who might have trouble finishing on time .

Evidence of Susan's emerging role as leader within the group also appears in my field journal where I reported on a conversation I had with her after Martha left the meeting on December 11:

Susan talked about her feeling of freedom, of being able to speak her mind and talk with a sense of authority and not being afraid or ashamed to talk, and I commented on how she is now a spokesperson for the lower elementary teachers. She mentioned that she had given the list of items we wanted to discuss to Martha at the [technology committee] meeting, since Martha had actually written them down at our last full meeting, and then Martha had given the list back to Susan and she had been the one to talk at the school Technology Committee meeting. I said this was a negotiation of power as spokesperson for the lower elementary teachers where Martha chose to give that power to Susan.

At the next group meeting, held in Martha's classroom before school on December 18, I met with Martha, Jessie and Susan and we spent most of the meeting looking for software from MECC, an educational software company. Susan and Jessie both had talked at prior meetings about how they loved the MECC software for the Apple II series computers and so we checked their website but could not find the software they were looking for on the site. Martha pointed out that she had an Apple II in her room, which the group began looking at, and we discovered that she also had most of the software Susan and Jessie were looking for. Both Susan and Jessie got very excited about this, saying they felt as if they had found an "old friend," and the group decided to look into availability and pricing on Apple II computers for the next meeting after their Christmas break. Jessie had volunteered to visit a local computer store to find out how expensive these Apple II computers would be and I gave her a list of questions to ask.

In the group meeting on January 15, Jessie reported back to the group about what she had found about the Apple II computers. I mentioned that the district might have used Apple II computers that they would give to the teachers and Susan suggested to Martha that she ask the district coordinator about that. Jessie then asked Susan if she should make another call to follow up on the Apple II computers and Susan suggested she should. I began to see these exchanges as evidence of how Susan had become the leader of the group, how she had garnered the other teachers to work together, and how they had collectively developed a plan of attack and resolved these issues. Susan saw her role as helping to encourage the others in the group towards resolution of these problems and acted as a coordinator of their efforts outside the group meetings.

During the same meeting, when we were discussing the lack of money the district had for purchasing more computers, Susan asked me: "All right, what can we do about this?" I sensed that Susan was taking a very proactive stance towards the problem we had identified, not enough computers in the school, and was pushing the group and herself to figure out a way to resolve this issue.

After examining the way the group conversations changed when Susan joined the group, when Margie was unable to attend, and even how the conversation looked when Margie rejoined the group again in March, I saw evidence of changes in leadership that shaped and influenced the conversations during the Group Development phase in an important way. Evidence of leadership in a group manifests itself in a variety of ways — such as managing conversations, introducing topics, changing topics, questioning positions, and interrupting speakers, it is therefore helpful to identify patterns in discourse to uncover these leadership roles. Leadership can also be seen as setting the group agenda, inviting access to the conversational floor, and deference to others in a conversation. Leadership is negotiated by group members as part of their initial work establishing common goals, roles, and responsibilities and this reflects the structure of the group.

The group met again in February, and then in March, when another interesting event occurred. I interviewed each of the group members and was interested in understanding

why Margie had not attended our sessions, something she attributed to lack of time, scheduling conflicts, and personal issues. When I interviewed Margie, however, she told me she felt she was sharing her ideas with the group but not getting much from them in return. During the interview, I also mentioned that the principal was considering moving some of the computers out of the lab and putting them into the upper-grade level classrooms. Margie expressed her concern over loosing the lab and the value it provided for her students and we talked about what might happen at the school if the principal moved some of the computers out of the lab.

Another interesting event happened in March when Margie rejoined the group after missing all of our meetings since November. In this meeting, Margie and Susan had a disagreement about where computers are best used in first grade — in the classroom or in a central lab. In the segment that follows, Susan shifted her chair — which was close to Margie's — away from Margie's and turned herself to look more directly at her during this conversation. Notice in the transcript the overlapping speech and how Susan uses Margie's name, along with her use of "I", to show her positioning on this issue. Also notice in the segment below how Margie seems to back down from her challenge to Susan when she says, "I have, not since, it depends on what you want them to read."

Susan	I think so too. If you gave me my choice I, I would go straight with computers in my room.
Margie	Just because it would make them more independent in the classroom?
Martha	Um hm.
Susan	Yes.
Margie	Because of whatever you did in the lab. But if you didn't have the lab, to go and have everyone working on Math Blaster and you going around to help solve problems a couple of times, you know you would be spending
	most of your time over there. I mean maybe you get one or two students who had it at home to -
Susan	- But I think there are some programs out there
	Margie that -
Margie	for some instruction -

Susan	- I think there are some programs out there.
Margie	- I mean, maybe if you had some -
Susan	- There are pictures,
Margie	- presenters in there you
-	could go over it,
Susan	- Yes. Margie
	- there are some easy stuff on
_	that, like preschool kids
Susan	Yeah, and I think if you started out on that and then worked our way into
	harder things, you know, you've got, the majority of your kids can read.
Andy	- [to Jessie] Yeah, if you've
	got to go thanks for your time.
Margie	I have, not since, it depends on what you want them to read. But I mean -
Susan	- but I
	think that there are some first grade programs that we could preview if
	we can
Margie	I can kids of all different abilities and, you know, are the ones that are at
	your upper level doing that activities that go with the upper level or are
	they just doing?
Susan	No, you would have a variety of programs and I think that's where more
	money is going to have to be spent. We're going to have to preview some
	good programs and accommodate all kinds of learners. I mean, that's the
	goal.
Margie	And if it goes, ok, so you'd, say if a parent brought you or donated a
	program you could just put that right on your?
Andy	Well and that's other thing we'd have to talk about, because right now the
	district wouldn't let you do that. They would have to do that for you.
Margie	And if you had six computers, and one program, when you buy that one
	program does that give you the right to add it to six computers?
Andy	It's sticky. What they'd probably do would be to put that on the network
	one person using it at a time but available to others.
Margie	But that would, but how could they put, if I brought in 10 programs, and
	Susan found 12, and Jessie had, they can't put all of those programs on
	there can they?
Andy	Actually, they can the real problem is how can you share programs [he
	explains how they might do it; one child using at a time; keep tracks of
	that]
Margie	[to Susan] Susan, it sounds like you could go either way then. If the lab
~	was
Susan	Well I don't want to lose the lab, -
Margie	- Ok.

Susan	- I really don't, unless you give to give me
	more of the computers.
Andy	Well, and that's another -
Susan	- but if you're not going to give me more of the
	computers then I'm not
Andy	Right. Well and that's another conversation to have. Would we be willing
	to give up the lab, using the lab, if we could have as many computers as
	we wanted, 4 or 5, whatever we came up with in the classroom, of
	whatever type?
Susan	Yeah, I do like the lab -
Andy	- I understand that. But I'm saying, maybe we
	could collectively say if we could have computers in the classroom, that's another position we could take. We may need to make a choice, we may
	not be able to have both.

It seemed clear that even with Margie back in the group, Susan was considered the leader, and Margie deferred to her in the conversation. Note that Susan engaged in a heated discussion with Margie, but would not pick up on her challenge or accept her argument. It seems that there was no uptake for Margie's position, and Susan therefore refused to have a direct confrontation on this issue.

This text is also important because it represents a serious pedagogical discussion about an important issue for these teachers and the school: Where should limited computing resources be used, in the classroom or in the lab? This issue of computer placement is obviously important for the members of the support group, especially since they are not likely to get more computers unless they acquire them personally, a topic we talked about in prior meetings.

Talking about Technology leads to talking about teaching and learning

Talk about technology offers occasions for some of these teachers to examine their own taken-for-granted assumptions and beliefs about teaching and learning. Throughout the data collection period, the teachers engaged in a variety of pedagogical discussions around educational technology. These conversations covered a variety of topics — from student abilities to using games as educational tools — and have involved all group members. Table 2 presents a short list of the pedagogical conversations that took place, with an asterick indicating the conversation from which I will use transcript excerpts to support the claim that technology offers a site for examining teacher beliefs about teaching and learn-ing:

Date	Topics discussed
October 9, 1997	Math Blaster - teaching students computational strategies
October 9, 1997	Key pals project - whole class versus. individual e-mail
October 23, 1997	Student abilities and educational software; limited reading and writing abilities of first grade students
October 23, 1997	Quality of student work shared with others outside the classroom; surface feature correctness
November 20, 1997	Value of using games for educational purposes; coordination, patterns, etc.
January 1, 1998	Use of remedial software on Apple II computers - MECC software
*March 5, 1998	Instructional perspectives on lab versus. classroom-based computers

Table 2

This assertion about the technology support group as a forum for teachers to make their thinking public, is central to this research, with its focus on understanding the experiences of these teachers as they learn about technology, especially how their beliefs and knowledge about teaching and learning shape and are shaped by their plans for technology use. These understandings are also essential in developing a productive environment for sustainable professional growth and development. Analysis of these issues constitutes an important part of the next chapter.

There is no question that the teachers in the support group talked about technology, teaching and learning. Looking back, I saw this happen early in the early meetings when Margie talked about her ideas for technology in her teaching — the whole-class key pal writing activity — and other situations. What is important, however, is not just that these teachers made explicit their plans and assumptions, but that the other people in the room were not passive listeners while this was happening. Martha and Jessie were passive in their

listening to Margie in our early sessions — they did not question or challenge her, nor did they ask her to specify her rationale or decision making logic for her planned use of technology. Jessie's personality and her role as leader helped to establish social norms in the early sessions we had that may have influenced the other teachers to participate differently.

This issue of passive listening is critical to my research focus for the following reasons: (a) it typifies what people normally associate with lower-elementary (i.e., middleclass white female) discourse; (b) it is probably related to changes in group development and norms for participation (i.e., teachers feeling more comfortable with disagreement and dissent as acceptable parts of the conversations this group has); and (c) the teachers' discussions about non-assertiveness of lower-elementary teachers, Margie's comments about their silence in staff meetings, their unwillingness to speak up to question or challenge their principal, and her talk about the power of the group as a voice for them in the school, all suggest that members of the group may not have become as critical or thoughtful as they have if norms for participation had not changed.

When Susan joined the group in November, she acted as a critical friend to her peers by questioning them and challenging their ideas in a comfortable and safe way. The mutual respect and trust required for these teachers to engage in this kind of talk took time to develop and grow, a process that is still underway. Perhaps most importantly, Susan and Margie argued in a meeting on March 5 about pedagogical issues — the use of computers in the lab versus in the classroom — which was an instance of the kind of critical discourse I was hoping to stimulate in the group.

It was later, in the meeting I had with Martha and Jessie on October 23, that I pushed these teachers not only to talk about their plans — focusing on pragmatic issues of how they would use e-mail in the lab — but also to consider alternative perspectives. I wanted them to hold their own positions up to scrutiny and consider as valid possibilities the scenarios I was giving. I am not convinced that Jessie was able to engage in this critical reflection during that early meeting, but the segment below helps to illustrate the potential. When I met with Martha and Jessie we discussed pedagogical issues related to their planned use of e-mail as a tool for their students. In the conversation, the issue of surface feature correctness came up and resulted in some insight into what these teachers consider when they think about constructing classroom activities around technology — in this case, the use of e-mail for a key pals project. I used the meeting to try to push the two teachers to make explicit their assumptions about technology, teaching, and learning so that we might examine these assumptions within the group context.

In the segment of transcript that follows, we had begun to talk about the quality of email messages that students might write, whether parents might be involved in this process, and the possible value of e-mail as a motivator for student writing:

Martha	You know what? They were talking about having the children write what
	they're going to type in the classroom and then take it to the lab.
Jessie	Edit it before they take it to the lab?
Martha	Copy it, Yeah.
Jessie	Ok.
Martha	That would be an extra step, you'd have to run around and try to edit
Jessie	Um hm. Um hm.
Martha	then now we're going to the lab so we can type papers.
Jessie	to type it.
Martha	Then we type it. Then we're still going to have to, then maybe the parent
	could edit from there?
Jessie	Um hm.
Martha	I mean there would still might be typos, typing errors.
Jessie	That's true. That's true.
Andy	Well
Martha	The child could. Oh you think leaving the typos on there?
Andy	I, I'm, I'm understanding what you're saying completely.
Jessie	Um hm.
Martha	Yeah. Yeah.
Andy	And I'm offering another perspective, and that is if this were an
	opportunity for these students to both communicate with a peer but also
	use that as an opportunity to learn to communicate.
Martha	They might edit, they might sit there and say "Oh." You would say "You
	want that person to know what you're saying" So maybe they would take
	that extra time to look at what they've printed and say "Does it match?"
	You know, like daily oral language -

Jessie	Well I think it would be very helpful to the child to take the time to work one-on-one and say, "Now we need a comma here. Why do we need a comma here?" and use it as kind of a teaching -
Andy	- Use it as an opportunity to
Mildy	teach absolutely
Ieccie	time
Martha	- time.
lessie	I call. Off film.
162216	
	a little bit and then send it. I would hate to put the burden on the child
	because who knows, if the child receiving it -
Andy & Marth	na Um hm.
Jessie	- wasn't so good at grammar either,
	you know.
Andy	And it might be awkward too, you know, they might get a message that says ["I can't understand what you're saying."] These students
	communicating with their peers somewhere else in the world I think is a
	tremendous incentive and motivation for them to want to communicate
	effectively. And that could be used to your advantage in terms of learning
	to communicate. Because my guess is that there might be students for
	whom this would really be a factor now, they'd really get excited about it
	so they'd want to learn what is the right way to spell
Jessie	"I have something to say. I have a very important question."
Andy	Exactly! And if that's part of this whole process, then now we're talking
,	about something really exciting. So think about it.
Jessie	Um hm.
Andv	I appreciate vour concern.
Jessie	I know in first grade they're going to say "Hi. My name is. I am six years old. Do you like school?" You know, it'll be very predictable.

This conversation suggests that these teachers, when talking about the practical issues related to using technology in their teaching, can engage in substantive discussions about pedagogical issues that make public their taken-for-granted assumptions about teaching, learning, and technology. In this case, we had an interesting conversation about the nature of e-mail as a means of communication, the kind of writing that first graders might generate, whether these e-mail messages need to be "cleaned up" by someone before being sent, and whether sending imperfect e-mail messages might in fact help excite students about improving their writing skills. My role in the group during this meeting was to push these teachers in a nonthreatening way to think about and perhaps question their assumptions about teaching, learning and technology. In effect, I was trying to be a critical friend and to help them consider their assumptions about their students in this situation. I wonder how effective I was at this though, given my status as an outsider (i.e., non-teacher), the reluctance in Jessie's talk to really consider what I was saying, and the way I went about trying to offer an alternative view.

A later conversation we had on March 5, an excerpt from which appears one page 93, represents the kind of pedagogical discussion this group is capable of generating and I believe is evidence of the power of this group to encourage and support thoughtful, critical examination of beliefs. The key to helping these teachers engage in these kinds of conversations is creating a nurturing an environment in which they feel safe and can talk without fearing evaluation, to allow the social norms for communication to evolve to support these kinds of conversations, and to facilitate participation in these conversations without directly challenging these teachers or allowing them to become passive listeners.

As further evidence of the development of this safe environment for teacher talk within the group, I offer the following excerpt from the same meeting (March 5) in which the teachers talked about their uses of technology in the lab and in the classroom, and how these uses might change their teaching practices and their students' learning:

Jessie	And a lot of parents have computers so these children go home and play video games.
Margie	And, I mean, it's not that I like, I dislike, and again it sounds like it's changed but I feel like they're writing on the computer, they're using it as a tool, and they play games, you know in the classroom, and I just feel like
	I have enough going on where they're getting their exposure and
Susan	With between the lab and
Margie	Right, right. They're getting all these [<i>unintelligible</i>], they're doing some very simple word processing, they're getting to see a product, they're seeing it in school

Susan	But they could do that every day if you had some computers in your room.
Margie	well, -
Susan	- I've got kids who want to chunk out stories every day.
Margie	Yeah, I guess, right now I'm helping them so much with what they're doing, and using it more as a tool for punctuation and capitalization, and you know, let's look at it again, and then they pull it out and that's their finished product. But I wouldn't be able to do that with them if they were just kind of doing it all on their own. And they get stuck a lot, you know, like "Well somehow this line got down here"
Andy	"How did I do that?"
Margie	"I'm not sure what that is?" You know, maybe right now, and maybe after spring break, because we've done it so often in the lab, since January, that they may just sit down and do something and once they get stuck, I mean, granted it would be nice to have, and maybe a bonus to have them networked because everything you have down there would be available in the classroom but I just don't think
Jessie	<i>Well, I</i> love it, you know, I take it for granted. That's why it's a little bit scary to think it might not be here because I definitely take it for granted.
Margie	[To Susan] Do you have your kids working, are they constantly working on your computer during the day?
Susan	Pretty much so, it's on and somebody's got it most of the time.
Margie	Do you feel that I mean besides playing and getting exposure to the computer and that it's really beneficial?
Susan	Well, their favorite thing is Math Blasters, so they're learning, practicing math.
Andy	The other thing that both of you have talked about is motivation. The child who is disconnected from other types of learning may be engaged in learning, and again, the question is, if you only have one of these, that's a pain, but you could target them to specific things, then you're really talking about something.
Margie	That's a change too in your teaching style.
Andy	Right.
Margie	Because, you know my kids are at the computer and I have no idea what they're doing because I'm back in the reading group working with kids or and they're playing. I tried to set out five disks that I thought would be disks that they already kind of knew but it would be kind of great for them to have some reinforcement but they know where the other ones are, the kids who could be doing something much more difficult, and it's, so they
Jessie	Oh they're so honest, they just, they really are. They choose the things they enjoy and you can see how popular programs are, just ask them.
Margie	And that's good too, but that's just not the same learning environment.

Andy Sure, and this question of fun. It's a lot of fun but is there any learning going on? My son plays video games, and I'm sure there's some learning going on, but is it the kind of learning I want? Is it the kind of learning that people are going to say, "Well, you ought to be accountable for that" you know, learning at school. It's fun but what else ..
Jessie But there are strategies in the games so they're doing some ...
Margie They're problem solving. Yeah.

This excerpt shows again how these teachers' beliefs about teaching and learning, and their implicit assumptions about the benefits of technology, permeate their talk about the be nefits of technology as they compare using computers in the lab versus the classroom. Notice that Margie initially talks about her students using the computer in the lab as a tool for writing, which she feels is important because students are getting exposure and seeing a product of their work.

Also notice how Susan challenges Margie's position when she says, "But they could do that every day if you had some computers in your room." Margie responds with "Well, Yeah, I guess," implying that she might see Susan's point, but she clearly states the problem with classroom computers in her response to Susan: "But I wouldn't be able to do that with them if they were just kind of doing it on their own." In other words, Susan's talk about students using computers in the classroom implies a level of independence that Margie does not believe her students have yet.

Margie questions Susan about whether her students are using the single classroom computer in her room during the day and follows this up with a question about how they are using it. Notice in her comment to Susan that Margie disparages using the computer for games, but also that she turns around on her own position of the benefit of students getting exposure when she asks if that is "really beneficial?" Susan counters with a claim that her students are learning math because they are using Math Blaster, which gives them practice.

But Margie offers her own insight into the position Susan is putting forth when she claims, "That's a change, too, in your teaching style." She goes back to her opposition to

students using classroom computers with the point that she cannot keep track of or assess student learning because she is occupied in the room with other students. Margie finally brings up the issue of whether students' enjoyment of computer software is in fact reflective of learning, a point that I followed up on in my own comment about video games.

In this conversation there is some serious pedagogical talk covering a broad range of issues, but most focuses on the impact of using computers in the lab versus the classroom. This conversation was a good example of the kind of discussion that is possible when technology is brought into a school, because it allows teachers to make public their assumptions about teaching and learning as they talk about pedagogical issues and uses of technology in their teaching. These conversations represent an opportunity for the participants to examine critically their own taken-for-granted assumptions about teaching, learning, and technology in order to think about making pedagogically appropriate choices in their classrooms.

As an aside, Susan later shared with the group her work outside our meetings to bring more computers into her classroom. It seems that Susan was at a dinner and found herself sitting next to the vice president for donations at Ford Motor Company. She asked the V.P. if Ford ever donates computers to K-12 schools and he indicated that they did, so Susan asked him if they would donate 12 computers to her school. The V.P. asked Susan to write a letter to him asking for the computers and describing how they would be used, which Susan did before our March 5 meeting.

To summarize my observations and assertions from the most recent phase of group development, there is evidence of changes in the norms for participation during this phase that coincide with Margie's absence from the group and Susan's emergence as a leader. Susan's conversational style, exemplified by her cooperative and nurturing nature, allowed the other teachers in the group — Jessie and Martha — to begin to engage in thoughtful discussions about their beliefs, knowledge, and experiences with technology.

There is evidence of pedagogical conversations during all phases of group development, but the conversation the group engaged in on March 5 represents a good example of the kind of thoughtful and critical discussion of an important issue — whether moving computers from a central lab to individual classrooms is beneficial for these teachers and their students. These pedagogical conversations reflect the kinds of participation I was hoping to find in this group, which I defined in Chapter 2 as collegial interactions, and are a resource for the group members for their own professional development.

These pedagogical conversations also provide a lens through which to examine what these teachers believe and know about teaching, learning, and technology — the focus of my original research questions. In the next chapter I look more closely at these conversations, paying particular attention to the topics discussed and what was said during these discussions related to teaching, learning and technology.

CHAPTER 5 THE CRITICAL REVIEW

In the previous chapter, I described the development of the technology support group examining the patterns of participation by group members and changes in these patterns over time. I focused on the nature of the group conversations, paying special attention to the ways each of the teachers construed their interactions and the influences on the individuals who participated in these discussions. Out of this analysis came my assertions about the nature of the group and how it afforded these teachers opportunities to share their beliefs and knowledge and to have pedagogical conversations about technology and related issues. Patterns of teacher participation in the group activities were influenced by a variety of factors which in turn shaped the kinds of conversations we had in the group.

In this chapter I focus on the content of the conversations, examining how these teachers' beliefs and knowledge shaped and were shaped by their planned use of technology. My analysis draws on the conversations, the interviews I conducted with the group participants, and my field notes. This attention to what these teachers talked about brings me back to my original research questions and helps focus my analysis at another level: What knowledge and beliefs do these teachers hold about teaching, learning and technology? How do these beliefs and knowledge shape the plans these teachers made for using technology? How might these beliefs and knowledge have changed over time as these teachers participated in the group activities?

In accordance with my original research question, I developed an assertion drawing on the data I collected about teacher beliefs and knowledge.

Existing teacher knowledge and beliefs

These teachers hold beliefs and have knowledge about teaching, learning, and technology which they reveal in their talk. There is strong evidence in the literature on teacher learning and change that teachers have beliefs and knowledge that they bring to any teaching situation. For example, Richardson (1990) argued that teachers' perceptions and beliefs about themselves as teachers and learners shape their actions. In order to understand how the teachers in the support group planed to incorporate technology into their teaching, it was therefore essential to understand how they think about teaching, learning, and technology. These beliefs and knowledge were revealed in the interviews I conducted with each of the group members and in the conversations we had in the group.

Susan on Teaching, Learning and Technology

Susan exemplifies an "ethic of caring" (Noddings, 1986), viewing her role as a teacher as providing a loving and mutually respectful environment for her students. She believes that children can learn best when they are in a safe and nurturing environment. When asked to describe her teaching practices, Susan said:

Oh, I think I put a lot more emphasis on the affective than the cognitive. I believe that if that is set in place then the cognitive naturally comes. If a child feels secure and loved in the classroom, then when you present the material they are receptive. They have to have a love and respect for you. You have to have a love and respect for them. Um, I believe in taking each child where they are, whether they, for example in here I have [student name] who I'm not convinced know his letters, and I have [student name] who is reading on a second or third grade level. So, you take each child where they are and work with them and make them feel good about themselves put emphasis on their self esteem. Utmost, utmost important. So I think that I respect each child for themselves, [as an] individual.

Susan also talked about the importance of first grade for laying the foundation for future learning and described her teaching approach as open-ended where she sometimes must improvise. She sees teaching as a form of social interaction, something that is itself uncertain, and that the key to helping students learn is making them feel comfortable, encouraging them to play and explore, and providing them with a safe but stimulating environment. Susan also maintains an open and public classroom, where parents come in to help her each day and her students are a community with collective responsibility to ensure everyone in the classroom learns and grows.

Susan has a broad conception of education and recognizes the uncertainty and spontaneity in her own teaching. She also talked about individualizing her instruction for each child, even developing a specific curriculum for children with special needs, and giving those students who need it reinforcement of basic skills. This individualization is based on her assessment of the individual needs of each child in her classroom. Susan feels that an important aspect of learning is agency or control over learning, and that children learn mostly through exploration and discovery, but that individual student needs must be attended to by a teacher.

Susan shared her views in an interview when I asked her if she individualized in her classroom:

Susan Yeah, I do that, I do that kind of now, Andy. I try to individualize. I don't have reading groups. I meet with each child on their own and I've been known to rip out as many as 10 workbook pages and throw them out because a child doesn't need that, to plug through that, whereas another child not only needs that but perhaps needs a kind of reinforcement.
Andy Supplemental?
Susan Um hm, you do, you have to individualize. I think you could, there's a way, there's a way you, you can go ahead and do what's required of you in the curriculum and yet put frosting on the cake.

Regarding technology, Susan talked a lot about her sense of external pressure to use it in her classroom, feeling it acts as a motivating factor for her students' learning, and wanting her students to be comfortable and confident using technology when they leave her classroom. Susan is working to become a friend with her computer and, as with her own views about learning, she sees technology as an extension to the kind of relationships she has with people. She believes her computer "has a mind of its own" and it frustrates her when it doesn't do what she wants it to do or does something she doesn't understand:

Susan I've learned that technology can be a friend as well as a foe. It can be frustrating but if you're patient and bear with it a little bit I think that you can really, it can be an asset a real asset. I learned that teaching is entirely different with that tool than it was when I first began. We're in a whole new ball game, a whole new ball game. And I've learned that change better be a part of your thinking or you're in trouble because this is the way it is, this is just the way it is. And you're going to be left in the dust if you close your door to it and not accept it. ... It really, really could. It's funny Andy, I feel embarrassed that it's been so long in becoming an advocate for this. I had, I don't know why I had to climb over so many hurdles, that there were so many, you know everything from there's a big machine there that has a mind of it's own, to half the time it doesn't work, to Great Scott there's a world out there with a lot of evil stuff in it I don't want anything to do with let alone expose my kids to it, to what's the use there's no money for any more anyway, so psychologically, I do think after two years I'm excited. Thanks to you. You had a major, major hand in it. If you would have said last year, "You will fight for a computer in your home," I would have ... You would have laughed. Andy

From these examples, you can see that Susan views many things she does inside and outside the classroom as relational, focusing on the affective and emotional aspects of her work as a teacher. She also sees technology in a similar way she views her interactions with her students and her peers-as a form of relationship between herself and her computer. She talks above about wanting to be a friend with her computer, and in the past has said she "held the computer at arms length," indicating her relational distance from it when she was first learning to use it. This view of teaching, learning, and technology permeates her talk and her thinking and is an important part of how she sees herself as a teacher.

Jessie on Teaching, Learning, and Technology

Jessie described student learning as information gathering and believes that learning usually occurs through trial and error. She therefore focuses on practice and repetition for her students, stressing the value of learning skills such as reading, writing, addition, and subtraction. Jessie also described important elements of learning as agency or control, engagement, interest, and motivation. She recognizes that when students are having fun they are more engaged and interested in their learning, but how she connects this idea to her sense of repetition and remediation is not clear.

Jessie described her classroom as caring; she tries to help her students develop a joy of learning, and prepare them for second grade. She is disciplined, but allows for change in her teaching. Jessie stresses the importance of motivating students, finding ways to get them interested in the subject matter, and helping them pay attention to the material she is covering.

Jessie also talked about teaching as presenting information to students in a way that maps onto their own existing knowledge. When asked to compare how her own learning in the support group compared with her students she said:

Well that's so similar to the way first graders' teach, children come to school with a certain amount of knowledge and we try to motivate them to learn, and we do this by keeping it relevant, and keeping it interesting, and that's really what you've done with us.

In a conversation about technology, and how hard it is to learn to use, Jessie said:

...basically is what it comes down to if you talk with people who are really pretty proficient, it's just reading it, you know? You just have to go to the directions, open up the software, and read it. You know, and do it. But it's hard to do that, it's hard to read all those tedious steps, and then follow it.

From these comments, it seems that Jessie sees technology as a domain of knowledge comprising factual information that can be learned by reading and doing things on the computer. While she recognizes that this domain is vast, she may not see it as dynamic, changing, and uncertain. Jessie said in a meeting on November 6 that she feels first-grade teachers are "always putting out fires," and has stressed the differences between first grade students and other students when it comes to teaching.

Margie on Teaching, Learning, and Technology

Margie talked in her initial interview about the need to cover the curriculum and the importance of having a firm but caring classroom environment. She feels that her students should learn what is expected of them, based on the curriculum, and she is strict about discipline, stressing the importance of actions and consequences in her classroom. Margie also maintains a classroom open to visitors, often inviting parents in to help out. She tries to maintain a classroom environment where learning is fun, and where she recognizes individual strengths and weaknesses in her students. When asked to describe herself as a teacher, Margie said:

Well, I like to have fun while they're learning at the same time. I'm probably stricter then, I like order and I like the kids to know what's going to happen, what my expectations are, and what the consequences are. And I just feel that whether you're at fourth grade or first grade it just makes everything work better. Um, I say stricter in the sense that I follow through with consequences ... Besides that, just that I try to follow the curriculum. At fourth grade I ended up getting caught up in all fun stuff and then moving down to first grade allowed me to focus down on the curriculum. ... So that I can actually get through the required curriculum. ... But I do try to make it fun and I constantly am changing, you know as I have a plan for the day but as I can see something work or didn't work I am constantly changing the game plan for the kids.

Margie has been the most vocal person in the group in terms of sharing her beliefs about learning and the possible role technology might play in her teaching. She has said on several occasions that she learns best on her own and when she has a desire to learn something. She has also been explicit about her planned use of technology and on more than one occasion talked about her own views of learning:

Margie You learn it when you do it because you need it. It's hard to sit and learn it when you're not really doing anything. You need to learn when you do. I really just had to figure it out for myself. (10/09/97)

Margie But I think that's how we learn how to use things when you say 'Boy, at parent night I would love to present my information that way. I think it would be impressive for the parents. It would be good for me.' And then you go out and do it. (11/20/97)

Margie ... If you're driven to do it yourself, but for someone to tell you you have to do it. Or for you just to be doing it because someone else did it and it looked really cool. But if it is something you really want to do I think that's why we get in there and learn. Like with the newsletter. I knew what I wanted to do, it took a while to figure out how to get it the way I wanted it, but when it's something you want do then you go after it. (11/20/97)

These and other comments indicate that Margie believes she learns by exploring, by doing, and by figuring things out, but she does not talk about her students' learning in a similar way. I suspect that the reason for this is the age group and developmental abilities of her first-grade students. Margie thinks that her students' limited reading abilities prevent them from engaging in the kind of exploratory or guided learning that older students and adults might thrive on .

Margie has talked about teaching as transferring knowledge and skills to students and says that "sometimes you just have to figure things out and learn as you go." She has also shared her belief that first-grade activities by their nature are more teacher-based than upper-elementary activities which tend to be student-based. Margie spoke in her initial interview about her own focus on covering the curriculum and helping her students be prepared for the second grade. She believes that an important part of student learning is practice and reinforcement and has talked about the value of technology for her stu-

dents as a tool that allows them to have fun while learning. Margie also believes that teaching is contextualized and therefore her experiences and opinions may not be helpful or generalize to other teachers.

Margie views technology as a tool for her own work and for her students, often talking about the value of learning to use specific software-like a word processor-as an important part of preparing students for future learning. She also views the computer as an important tool for students because it can help them generate products of their learning, something Margie feels is important for students and for parents. She is confident with technology, but is interested in learning more about how technology can help her students. She also takes a critical stance towards technology and recognizes the limits of software for most of her students who cannot read when they enter first grade.

Martha on Teaching, Learning, and Technology

Of all the teachers in the group, Martha has been most careful and guarded about letting me know what she believes, although glimpses of her thinking emerge from her talk. She believes that teachers must take the curriculum and adjust it to fit the needs of their students. Martha also believes that students will learn when they are excited and motivated, and that part of her job is to make sure her students enjoy learning. She has talked about her belief that learning occurs when students are physically moving, because they are more attentive, which results in students being more focused and involved.

Martha strives to develop a caring, warm, and happy classroom environment for her students. She focuses on individual children and gears her teaching to their developmental level. Much of this individualization is targeted at remedial or enrichment activities. She sees her job as helping to make "the curriculum come alive" for her students and believes that children learn when they are engaged, listening, and attentive. She also
recognizes that different students have different ways of learning and she works to identify and present her materials in ways that support each child's needs.

Martha regards individual control or agency over learning as important, and she strives to help her students become more independent in their learning. She talks about the importance of options in learning, her goal of helping her students gain an appreciation for learning, and that self esteem is a key aspect of what she tries to provide for her students. She realizes that some students will learn by "just fooling around but it's never clear then, no one says 'Yes, this is the way, you know, you did it right.'"

Martha has talked about her belief that students can teach or mentor each other: "One child can teach the rest." On the other hand, Martha also talks about the need for repetition and remediation in her teaching. Although Martha did not talk explicitly about her beliefs, she says things that suggest she is reflecting on her own teaching and how technology might affect what she does. For example, on several occasions Martha questioned her own thinking about an issue and talked about needing to keep an open mind. She also said in the follow-up interview: "I guess you can learn more from listening than you can from talking."

Martha believes that technology is a vast domain: "... every time you learn one thing there's ten more things to learn. ... you could go on and on and on." Martha believes that the computer is sort of like a library, where students can choose what they want to learn, and that the Internet offers her students access to the world beyond the classroom. She also recognizes that when students learn on the computer, "...it's not so negative. There's no negative feedback. If they get the wrong answer it's not a negative feedback from Math Blaster but then they do, they go back and do it right away."

Common and Different Beliefs within the Group

Although these four teachers share some basic beliefs about teaching and learning, there are also important differences in their conceptions of teaching, learning, and technology.

For example, all the teachers talk about creating a fun, caring, and nurturing environment for their students, about the importance of building students' self-esteem, of motivating them, and the importance of attention and agency in learning. They all talk individually and collectively about their sense of external expectations placed on them from outside their classrooms to use technology in their teaching.

These teachers differ, however, in some of their beliefs about teaching, learning, and technology. Jessie, Susan, and Margie all feel an important part of their role as firstgrade teachers is to prepare their students for second grade. Jessie and Margie talk about teaching as presenting or transferring information to their students, a common belief that teaching is telling and learning is listening. Margie and Jessie both stress the importance of discipline in their classrooms, while Susan and Margie believe that learning sometimes occurs via exploration, Margie doubts that her students are capable of learning in this way.

Each of these teachers also holds unique beliefs about teaching, learning, and technology. Susan, for example, accepts the uncertainty and spontaneity in her teaching, while Martha talks about the importance of physical movement in helping her students stay focused on an activity. With regard to technology, Jessie sees it as a domain of factual knowledge and procedures that you just have to memorize or look up in a book, while Margie talks about her own beliefs that technology is simply a tool for her students to use.

These beliefs and knowledge play an important role in how these teachers make sense of and plan for technology in their teaching. This leads to my next assertion.

Teacher beliefs and knowledge shape their understandings of technology

The teachers' beliefs and knowledge of teaching and learning shapes their understanding of educational technology. These beliefs constrain and afford different points of view or possibilities for their planned use of technology in their teaching.

Putnam and Borko (1996) suggest that teachers interpret and construct new practices through the filter of their existing knowledge and beliefs. To understand how the teachers in this support group talked, planned, and thought about using technology, it is essential to look back at their beliefs and knowledge as a filter through which they might understand and construct new teaching practices with technology.

Susan's Plans for Teaching with Technology

Susan's goals for her students' use of technology are similar to her own goals for technology. She wants her students to have a healthy relationship with computers, to be confident and unafraid in using them:

I figure, if our main goal can be to have these kids be comfortable and be a friend to this computer then we will have done something that has taken me years to do. I'm just now becoming friends with this thing thanks to Andy, but if we can lay that foundation, that they are comfortable with it, they're not afraid to make mistakes, they're not afraid to use a program, they're not afraid to punch in a key, whatever, think of how far ahead they are. (11/20/97)

These goals for students reflect Susan's own experiences with technology as she has become more comfortable and confident using it:

Susan	It was a natural progression, that I had to make friends with it, that I had to conquer it. Now, now I'm ready to be the instrument to help the kids really
	learn from it but I was so hesitant. I held it at arms length, and it was like a resource that I thought, 'Gosh, what am I going to do with that thing?' Do
	you know what I mean?
Andy	Yeah.
Susan	I don't feel that way any more. I don't feel that way any more. Now, I'm
	beginning to think "Wow," you know, I've just seen [student name] who
	hasn't been enthusiastic about anything, except perhaps the keyboard.
	Wow! That's mighty. (11/20/97)

Towards the end of data collection period, when I interviewed Susan and asked her about her plans for technology for the future, she told me she had re-thought her ideas and had come up with some new ways of thinking about technology in her teaching. Susan met a Vice President (VP) from Ford Motor Company at a social gathering and asked him if Ford donates computer equipment to schools. The VP said they did and Susan asked what she might do to get some computers donated to her school. The VP asked Susan to write him a letter requesting 10-12 computers and Susan has written that letter and is now waiting to see if she gets them. This is further evidence of Susan's active stance towards resolving a key problem in her school and classroom: not enough computers to support her students learning. In the follow-up interviews, I asked Susan about her plans for those computers next year:

Andy So tell me more about how this classroom would look and feel for a student and for you if you got those computers. Susan Oh, it would be wonderful. I would have to revamp lessons in a major way. I would hope there'd be all kinds of programs that would individualize and whereas one child needs help with ... everybody could kind of go and you could present maybe a whole-class thing, and perhaps present a story, and then, there are so many neat things you could do. Another person could take off and write a chapter two for that story. Another person could perhaps develop a poem about that story. Another person could make up for example Curious George, a math program, Andy Counting program? Susan Right. It's going to take some work, I think it would really take some psychological change in your thinking

Andy	The curriculum, what do we do with the curriculum? What you're describe it almost sounds like reinventing the curriculum.
Susan	I think I might be -
 Andy	Hmm. So what would it be about the computers that would be different for these kids than what you're doing?
Susan	They wouldn't be hearing my voice all the time. They would be self- exploring, they would be learning, they would be discovering.
Andy	So they would have control, more control over
Susan	Exactly. I get tired of hearing my own voice, I know they do too. And it's not that I talk all day long but it's when you're giving instruction to one child or giving, whereas I could say to Joey who excels in math "Joey, there's a program on the computer that I want you to solve these problems for us today and report to the class and then I'd like you to write up a little thing about it," so that ok, he's got the math, and the reading, and the writing, and you're implementing all that, I would have to sort through all of that but I'm excited about the possibility of being able to do that.
Andy	So the computer would allow the student to work in an environment where they would be learning in a way that would be consistent with the way you would teach?
Susan	Yes, and on an individual basis.
Andy	But on an individual basis, whereas it would be very hard to do that without because you've got 20 kids in here.
Susan	So it would be just an outstanding tool, it would be like an assistant teacher in the room.
Andy	It would be like Kristen. Having another intern.
Susan	Right, but yet the child feels better because they are in control.
Andy	Ok. So that's a key point.
Susan	That is for me.

You can see by her comments that Susan believes bringing computers into her classroom will require changes to the curriculum and to her teaching. While her descriptions of how activities would look with technology are somewhat vague, she does seem to recognize that her own thinking will need to change and that her current way of teaching-which she describes as individualizing-will allow her to use computers to focus on the specific needs of individual students. She also talks about how students would be exploring and discovering on the computer, something she believes is an important way students learn, and having more computers in the room would be like having assistant teachers in her class.

During her follow-up interview, I pressed Susan to talk more about her plans for technology, specifically asking her about using computers for remediation:

Susan Give me one [computer for] remediation maybe. But when you think of the programs that you could put on that and then if the child chooses to get on the Internet.
Andy So you think the Internet is a key part?
Susan I really do, I really do, used in the appropriate [and] proper way. It scares the willies out of me, but ... Oh boy, there's a whole new world out there, there's a whole world out there that I better get with it and be a part of because I don't want to be left in the dust, you know, one of those fuddy-duddy teachers who doesn't know anything.

Thus, Susan sees the computer as supportive of her own ideas about individualizing her instruction to meet student needs. She also plans to use the Internet in her classroom next year in other areas, if she can get some more Windows/95 computers in her room, and she sees it as a valuable resource for her students. Consistent with her views of teaching, Susan sees technology in a relational way, with her goals being driven by her beliefs that her students should be comfortable and confident using a computer. These goals are also consistent with her own plans for her learning about technology.

Susan views her own learning, as well as that of her students, as a journey towards a better relationship with the computer. The affective aspects of this perspective come forth in her talk about her own experience with technology, as well as in her plans for her students use of technology. This is especially salient when she talks about her observation that one of her students, who has been disconnected from learning in her classroom, got excited and motivated when using the computer. This event suggests to her that the computer might be a tool for further individualizing student needs, by helping her reach those students who are otherwise missing out on her teaching.

Jessie's Plans for Teaching with Technology

Jessie talked about using technology in her classroom, and in the computer lab, as a tool to support remedial learning and as a way of keeping her more challenging students productively engaged. She also talked about her hopes of having Apple II computers in her room so she can use them for skill building activities. When I asked Jessie how she might use these computers in her room, she said:

You know, in all honesty, I think what I would find most helpful right now would be to establish in the classroom some of these extra computers for children to work on, get some really good first grade programs where they could learn, and it would be you know for remedial kinds of things, and figure out how to get the computers working in our first grade. (11/20/97)

Jessie talked about other programs she had used in another elementary school:

And there were remedial. You know, a child could go on and you know you really felt they were getting a good review of a lot of stuff that's the kind of thing in a classroom, you know we were talking about having six [computers], if you could just put them on and have them alternate it would be excellent!

Later on in the same meeting (12/18/97) Jessie talked about how she might use these remedial programs in her classroom: "Yeah. And then you put these students on who drive you crazy because of their hyperactivity, and I mean it saves the rest of the classroom while they're actually learning."

When asked in a follow-up interview how she thought using computers would help her students learn, Jessie said:

First of all, I think it would really motivate the children to learn. I think it gives children ownership, it shows that I trust them enough to work independently on their own and they become self learners. They, they're motivated to learn, they have a stake in it, they're interested, they've motivated, and they just, I mean you've seen what happens in the computer lab. I have students in here that probably know more about certain programs than I do and they figured it out all by themselves. And given the opportunity to put these children on computers it's just got to improve the whole climate of the classroom. And furthermore, the very student who is perhaps my most challenging as a discipline problem would do the best on the computer. So not only would that child be learning and self motivated, he would also not be bothering other people or disturbing others in the classroom. (02/19/98)

Jessie shared a story about a student of hers who learned to read using a computer which reflects her views of the image of a computer as a tutor for her students:

It's like the student I had once who, her father told me that she woke up one day, she wasn't reading and she said she wanted to learn to read. And her father, both parents are very supportive, and they said "Oh well, you know, let me help you." She said "No," and she got on a computer program and from early morning until late in the afternoon she was on this Learning to Read or whatever computer program, would not accept any help from her parents. By the end of the day, she had taught herself to read. And her parents were just astounded, amazed. But she was just adamant that she was going to do it herself. (02/15/98)

A conversation that I had with Jessie and Martha on October 23 revealed Jessie's assumptions about technology and showed how these assumptions shaped her plans for technology use in her classroom. During this meeting, Martha and Jessie both talked about the nature of e-mail as a medium for communication.

The conversation revolved around these teachers' assumptions about e-mail communication that their students might engage in with other students, the nature of first grader's ability to write coherent messages, and the role parents might play in helping students type these messages to be sent over e-mail. When this conversation began, Martha commented on the misspellings in an e-mail message she received and I mentioned my own opinion that e-mail is a genre of communication that is different from formal writing and speech and is less formal and less stringent about surface feature correctness. Martha pointed out that "You have to make a good impression" with e-mail, as with any other form of communication, indicating her disagreement with my position about the informal nature of e-mail. This discussion culminated in the short segment of conversation below, part of which I included in Chapter 4. During this session, I tried to encourage Martha and Jessie to consider the motivational aspects of e-mail as a tool for their students writing in an authentic forum, and thus as a way of engaging them in the reading and writing process. These ideas bumped up against the teachers' assumptions about e-mail, student abilities, and the possible role parents might play in this process:

Jessie	That's the way to do it.
Martha	Ok. Where did you get these? Did you have the children print them in the lab?
Andy	I think that's what you were saying you'd do, right?
Martha	Have them print them right in the lab?
Jessie	The tricky part is, you know in first grade you do some editing, and -
Martha	- Yes
Jessie	- So I
	was just thinking instead of a parent doing it [laughter] it might be a little
	tricky for them to try to kind of, and that's another thing. Do we just send
	it the way they wrote it? Or -
Andy	- Tricky, I'm not
Jessie	Or do we care, do we -
Martha	- Or their peers could edit it.
Jessie	- correct the spelling errors, and the grammar, and the, so
	that the child receiving it can understand it.
Martha	Oh I definitely think it should be understandable.
Jessie	[to Andy] You have to understand first graders, they use invented spelling,
	and it might be a little like a cold to try to decipher
Andy	To try to figure out what they're trying to say.
Jessie	Right! So then, maybe it would take another step in there to try and edit it
Andy	Well let me ask you this: What would happen if they sent it and the child
	on the other end couldn't understand it?
Jessie	[laughter]
Martha	They would write back.
Jessie	They would write back and say
Andy	They would say "I don't know what you're saying"
Jessie	Yes. [Pause] Yes?
Martha	And then your child would say "I guess I better learn how to spell"
	[laughter]
Jessie	My child would say I am in deep doodoo [laughter] I can't communicate.
	I have to learn to read and write. [Laughter]

Andy	Yeah, and would that be a motivating thing for them? [<i>Pause</i>] Do you see what I'm saying?
Jessie	Not exactly.
Andy	We communicate all the time, and we get good at communicating because we want to communicate the messages. I want you to understand something that's kind of how I get good at communicating. And if these
	kids want to understand what the other kids are saying, where they help that child understand what they're saying, that's an incentive for them to work really hard at writing.
Jessie	Oh it's definitely a motivation, but I'm saying what I might want to do before I type the letter is sit down with the child and say "Tell me what you wrote"
Andy	Sure.
Jessie	Have them read it to me, and then I might even want to retype it to make sure the child receiving it does understand.
Andy	Ok.
Jessie	So there's that step in there, but I'm not sure I want to give that job to a parent? I could.

This conversation reveals the kind of thinking these teachers engage in when they plan for the use of technology in their teaching. These teachers, especially Jessie, were concerned about their student's ability to write coherent and understandable sentences to their e-mail friends-called key pals. The suggestion made by Margie in a prior meeting that parents could come to the computer lab and help students write these messages on the computer was met with skepticism-unvoiced when this idea was originally suggested by Margie in that meeting-because of concerns about how parents might react to seeing grammatically incorrect text or misspelled words in the e-mail messages.

As described in the last chapter, my role in the group during this meeting was to push these teachers in a nonthreatening way to think about and perhaps question their assumptions about teaching, learning, and technology. I wonder how effective I was at this though, given the reluctance in Jessie's talk to consider seriously what I was suggesting about the possible role e-mail might play in motivating students to improve their writing.

It also seems that in the conversation, both Jessie and Martha have assumptions about the nature of e-mail importantly different from my own. I believe that e-mail is an

informal genre of communication that can be used for quick, easy exchanges between individuals who are distant from each other. This view of e-mail allows me to hold it to less stringent criteria for communication than the views expressed by the teachers in their talk.

This discussion is connected to a larger concern these teachers might have, the question of feature level correctness in products that leave the classroom and are exposed to those outside the classroom. In the case of the conversation above, it seems important to Martha and Jessie that any e-mail messages written by their students must be understandable by the recipient. This is connected to their concern about the possible role parents might play in helping these students type up their e-mail messages. The questions I raised during this discussion were to help the teachers see that the value of having their students send poorly written e-mail might give them a motivation for improving their writing-so the activity could have a broader educational purpose.

Jessie's plans for technology are consistent with her views of teaching and learning. She views technology as a tutor for her students, to provide them with remediation and practice with basic skills, and she also sees the computer as a way to occupy her more active students so she can spend more time working with the other students on classroom activities. Jessie's beliefs about learning, that it occurs through trial and error, are consistent with the technology-based activities-drill and practice programs like Math Blaster and those developed for the Apple II series of computers. When pressed to consider alternative ways of thinking about using e-mail in the classroom, Jessie had trouble understanding or appreciating the value e-mail might have for her students as a motivator for improving their writing abilities.

This last point is interesting to me because Jessie talked about the importance of motivation, ownership, and independence in student learning, all of which could become

part of a classroom activity in which students were responsible for editing their e-mail messages to their key pals. Jessie also talked in somewhat vague terms about how use of computers would help her students' learning and claimed that it would help improve the whole classroom climate.

Margie's Plans for Teaching with Technology

As with other things, Margie has talked a lot about her plans for technology use in her teaching. In her first interview, Margie talked about wanting to move beyond using the computer for her own purposes and to help her students use technology. This is understandable, given that Margie has more prior experience using technology in the classroom than her peers and that she has been outspoken about her views on the proper ways that technology should be used in the classroom.

Margie talked a lot about her own plans for a class key pals project using e-mail through which her students would communicate with key pals elsewhere in the world. As she talked about it, Margie mentioned that she planned to have her students watch her write a whole-class letter and send that along to the other teacher, which Martha and Jessie agreed was a great way to use e-mail in the first grade. Margie said that she might allow individual students to exchange e-mail messages with key pals later in the year when they were more competent reading and writing.

Margie also shared her views about the benefits of having her students' use Math Blaster and its benefit in the following transcript from the October 10 meeting, which was analyzed in the prior chapter to show evidence of a pedagogical conversation:

JessieSo the trick is to just move the little guy to the different columns ...MargieRight! And you just want to move it -
- and just .. -

Margie	- you may, you may see a number way up
-	here that you can move to make this part of the equation right? But you could just move one over in the second column to make it right and
	therefore you save all those numbers up above.
Jessie	So they have to learn those strategies?
Margie	So they're kind of learning to look at all options, I can move my answer, I can move my addend, I could
Jessie	But often I'll look at it and there'll be nothing!
Margie	Well, then, see that's usually because they've moved down too far.
Jessie	Oh.
Margie	If you do it right from the beginning, usually by the time they need help is when they've already pushed the thing down to much and there aren't solutions
Jessie	So it wouldn't make any difference which column you put the little guy in, nothing is going to -
Margie	- Right.
Jessie	- make sense.
Margie	And then what you have to do is get rid of one row, they'll take away, I noticed one time that it didn't take away all the red stuff, they just took away a little of the red stuff and then they make you start over.
Andy	Hmm.
Margie	But one time I did I said, "I wonder what will happen," and I pushed the button and all the red stuff was gone [Laughter]
[unintelligible]]
Martha	They love that, they love Math Blaster! Yeah.
Margie	And you can save it too, from week to week. When it asks you if you want to save your mission, if you say "Yes," it just saves it on the network. I said "Well try it" and they tried it and the next time they put their name in and it came back right where they left off.
Martha	So you should move your man rather than the numbers. Not always.
Margie	Well, you want to try and move it so you're using, you want to move the one that is the closest, so you're not eliminating so many numbers. That's a hard skill for some [<i>first graders</i>]. But it's a good skill, because they really have to examine that equation. And not go for the easiest one but go with the one that will help you with future problems.

Notice in her description of how best to solve the problems presented by Math Blaster that Margie indicates her belief that the skill it requires, while difficult for some first graders, is a necessary and worthwhile — "hard but good" — skill for them to learn. Although I did not explore this issue in more detail, or ask the others about their own beliefs about this kind of math skill, this episode represents an instance of how thinking about technology is connected with thinking about the curriculum and teaching. It seems clear from this talk that Margie believes using Math Blaster helps her students develop needed skills, in this case by using the best combination of symbols and numbers available to solve an equation, and therefore is an appropriate tool for teaching mathematics in her classroom. It also seems clear that Margie believes this skill to be developmentally appropriate for first-grade students.

Margie also talked about this issue of developmentally appropriate uses of technology in the follow-up interview when I asked her how computers would help her students learn:

Margie	Well, comparing first and fourth grade, [<i>the principal</i>] raised concerns for me with the article he passed around. Basically, what it did was question whether early introduction of computers is helpful for students. In addition, this question of the computers in a lab vs. in the classroom, will
	it benefit them as they move up, you know, like word processing. But at
	the same time not hurt them for not having it but develop in other areas so
	they're more ready in second grade. I see it [the computer] pushing them
	ahead and raising their ability in writing, but that's the one area word
	processing where you're serving a lot of purposes, with the computer as a
	tool, games are relevant, but it really helps them as a tool for writing.
Andy	So you see writing linked to reading and the computer as a way to accomplish that?
Margie	Right, it's phonics, it's spelling, it's learning and then they publish it and
-	present it. It's speaking and listening. It's kind of, it's actually the tool, it's
	not. When we first went we had to talk about when you make a mistake,
	you know, they had to erase everything. Eventually they discover that you
	can change it, you know, change it without having to retype it. It's
	amazing to me after fourth grade teaching word processing, how easily
	they pick it up. I see word processing as, if I had them in my classroom
	they would be more geared to writers workshops, kids at different stages,
	writing, editing, conferencing, etc. There'd be books everywhere, we'd be
	making books, writing stories, collections of work, and it would push me
	in that direction and be beneficial to them.
Andy	So you see a distinction between word processing in lab and skills
	programs in classroom.

Margie Yes, and I like both of them, but I think that the kids that need the practice would use you know get on the computer and do the practice, um, rather than if you had the computers where people were word processing everyone would be going through that step. I guess they're both, in both cases they're used as tools because one is helping with reinforcement, just as long as what is on the computer is what you're doing, where you have a program available for what it is you're doing. Because I think nowadays software is more, I mean when you create software you want, I mean there are lot's of skills, whereas those little MECC programs are really focused on one skill, you know, beginning letter sounds, and that's the whole program, is that. So you can pull it and say "This is what we're working on this what I want everyone to try this disk."

Margie's talk and plans for technology are consistent with her beliefs about teaching and learning. She sees the computer as helping her students by providing them with products of their own learning, something they can see which she feels is beneficial for learning to read and write, as well as for remediation and practice. This view of technology is contrasted with her talk above about how the computer, specifically used as a word processor, helps her students learn to edit and modify their writing. This latter view implies use of a computer, not for drill and practice, spelling, or phonics, but as a tool for learning text editing skills and reading strategies.

Margie also talked about her goal of preparing her students for second grade, something she mentioned in her initial interview, and the role technology might play in this regard. She planned technology projects in her class that were oriented around whole-class activities, especially her plans for the key pals project. This is consistent with her preference for whole-class projects, like the key pals and the word processing she describes in the lab, where she can walk her students through it step-by-step. Margie has been the most critical member of the group in regard to the limitations of most computer software, including those developed for the Apple II series, which most first grade students cannot use because they simply cannot read.

Martha's Plans for Teaching with Technology

Early on in our discussions Martha talked about using technology in similar ways to Jessie; but in later meetings she offered alternative ways of thinking about technology in her teaching. She began to consider using technology as a tool for supporting a variety of instructional goals and subjects. She shared some of these ideas in her comments below:

Martha The other thing that I would have them do is, what we used to call seatwork, on the computer. Where the rest would be doing something else that was work work or whatever was assigned. And for that day those children would do that. And then the next day it would be rotated.
Margie More of a center approach, where they might do spelling.
Martha Spelling programs, and your Science, you know, every subject. (11/20/97)

Martha talked in the same session about her plans for the year for technology and the key pals project:

Martha I want to do things like we write, I start a story, they put a paragraph in, we put a paragraph in, etc. ... So I want to start something like that. .. it depends on the child's interests, of course. But I'd like to have a lot of projects like that ...
Andy So you would make use of the journal writing?

Martha Sure and have the kids do it as part of journals.

Martha even talked about how she is now considering giving her students the

authority over setting up and using the technology:

I've just been amazed at the amount of things that I've seen happening on the computer with these kids. I don't know if it's because they've been exposed to it for more years than I, you now every year they've been exposed to it they come up with something more. Yesterday I was in the lab and I was changing all the print setups and I was just going as fast as I could, you know, and one little boy said, "You know, I've got it." he said, "You want me to help you?" And so I let him do the next person and he did it, you know, that was amazing. It was very hard. (12/18/97)

During her follow-up interview, we talked about deciding whether to use Apple II computers or the Windows/95 computers and I asked Martha how she would use the Apple II computers in her classroom:

Martha	I'd use that [<i>the Apple II computer</i>] for remedial. I'd put math games on there, I'd get specialized games like phonics, writing, and I could even match that to their ability, like Reader Rabbit. I have one little girl in here, she seems to need this program over and over again. She begs for that. I would also use it for enrichment, like Oregon Trail, although we could get that on there. Odel Lake, that has taught more children to read certain
Andu	things in lower, children who are having difficulty, they love that game.
Martha	It names five real fish, But I would use that more with remedial, and maybe do stories on that too if we had printers. Spelling, I would set up on there, on an Apple IIe where I would put in a new list every year I mean every week and maybe make it a game. I think that's the kind of thing I would use it.
Andy	Choice between these three, which would you choose? Changes to the room?
Martha	Realistically I would pick five [computers] I think, then I keep thinking three years from now would I be happy with that choice?
Andy	Well, but that's a long way away, so perhaps the next step, you know next year, what that means?
Martha	I would choose scenario #1 [5 Windows/95 computers connected to the Internet].
Andy	Right, right, but if it makes sense for you to say five would be sufficient.
Martha	Five [computers] would be perfect, would be sufficient, because I could rotate the children and I could get programs on that, and there's enough, Math Blasters, there are enough games on there so you could certainly, because this is not our whole curriculum, you know we can't spend that much time on it.
Andy	Do you see it supplementing the curriculum? Do you see it as a separate?
Martha	I see it as supplementing the curriculum, supplementing their learning, but much more than just a supplement, I see it as an integral part of it, I don't think that's the right word. Where they would get a lot more out of it, it's more interactive? So if I gave them something on George Washington, which everybody does, I have this booklet that they do, but they could go to the computer and actually do a little report on it and find things on Encarta, or at this age I really see it as a big part of it if they were available, but if they aren't we work around it.

The examples above show that Martha's plans for technology are consistent with her own beliefs about teaching and learning. She plans to use computers for basic skills development — spelling, math, reading, and games — and these fit her model of individualizing her students' needs with remedial instruction. This view of technology is contrasted with her talk about using the Internet for a story starter project — where students from around the world contribute paragraphs to an ongoing story which are posted to a web site or sent via e-mail.

Martha also talked about her students acting as tutors or mentors to other students in her classroom in the area of technology, something that other teachers in the group have not really picked up on. She also sees technology as supplementing her existing curriculum, and is uncertain about the best uses of technology in her teaching. Her talk about the value of games and remedial software for her students connects to her assumptions about students learning better when they have agency and control over their learning, but I'm not sure how these beliefs support her plans for a story starter project.

As I reviewed the data I had collected, I saw differing ways that these teachers were thinking about technology that come out in their talk. For example, Jessie thinks about the computer as a tutor for her troublesome students — she talked about it being like another set of hands for her in the room — and her views of technology are consistent in her talk and her assumptions about teaching and learning. Susan talked about technology as a motivator for her students — to help them get more excited and enthusiastic about learning — and this is also consistent with her own views about technology as personal, like having a friend. Martha talked about the computer in similar ways, but also talked about it as more-a tool for her students to use to learn to write, a theme also echoed by Susan where the products of students' writing become reading material. Margie talked about the computer as a tool for her students learning, but doesn't feel first graders are capable of learning in a guided or discovery way, and instead must be directed by a teacher or software program.

Margie, Jessie, and Martha seem to recognize the value of whole-class technology projects and have been resistant to seriously considering using technology to individualize instruction, beyond remedial software that performs like a tutor. While Susan talked about her own plans to use technology and the Internet to individualize her instruction, the overriding issue for this kind of use is access in the classroom with more than one computer. Susan's actions to resolve this issue lead me to believe that she might follow up on her plans next year if she can acquire the necessary equipment.

The issue that came up in our meeting on March 5, 1998 provided more insight into the ways these teachers think about technology in their teaching. During this meeting, we spent much of our time talking about the efforts by the upper-elementary teachers to move some computers out of the lab and into their classrooms. This became an emotional issue for the teachers and we spent lots of time during this meeting talking about the impact of such a change and how these teachers might work to prevent such a change.

Margie talked about her own views of the difference between using computers in the lab and in the classroom and said:

I think when we go to the [computer] lab, K-3, you're actually teaching them how to use the tool. The best instructional way to do that is if everyone is sitting someplace and listening and watching, whereas when you're word processing at the fourth or fifth grade level, you don't, you already have the previous instruction so you don't need that kind of [classroom] setting.

During this meeting, Margie wrote down some of the justifications the group came up with for why lower-elementary students can be better served in a computer lab than in a classroom: "the lab has less distractions and supports early or young learners." Martha agreed with what Margie said about teaching students to use the computer tools.

Margie talked more about her sense of the instructional differences between a lab and classroom:

It could be at their expense too in the end because I'm not sure what kind of instruction I would be able to give if it I just had three computers in the classroom compared to the instruction I can give this way [*in the lab*] which has to bubble up to the upper grades eventually.

While these teachers have spent time discussing how they will use technology, and their plans for technology are shaped by their beliefs and knowledge of teaching, learning and technology, they have spent less time explicating their pedagogical decision making processes. This leads to my sixth and final assertion.

Lots of talk about "how" to use technology, little talk about "why"

Most of the group conversations focused on issues of "how" to use technology, especially specifics about classroom tasks and strategies, and not on justifications for the use of technology — "why" technology might be beneficial for students.

This final assertion is related to the analysis described in the last chapter and is influenced by the nature of the group dynamics and the conversations that we have engaged in over time. As I stated in the previous chapter, there is plenty of evidence in the data that these teachers engaged in substantive pedagogical conversations stimulated by talk about technology. What is often missing from these conversations, however, is explication of their justifications for using technology and how these uses benefit student learning.

The group members have begun to question their own beliefs about when and why technology should be used in the classroom and possible pedagogical benefits of use, but more work is needed if this group is to help these teachers examine their own assumptions and justifications. This slow development towards justifications could be reflective of the evolving ownership these teachers have over the technology itself and the nature of the discourse they are comfortable with — that is, non-confrontational. It could also be that these justifications are implicit in the teachers' plans and they assume

these justifications do not need to be made explicit or public in a group of their peers. Or it might be reflective of a general lack of interest in sharing their justifications in the talk since they may believe these are commonly held by their peers.

I mentioned to the teachers in my follow-up interviews that I thought we spent much of our time talking about the logistics of how they might use technology but not much time talking about why they use technology the way they do or the pedagogical choices they make when they plan for technology use. I asked them whether they agreed with this observation, and if so, why they thought it was true. Susan shared her view that members of the group needed to put aside prior conflicts in order to begin sharing their justifications or asking philosophical questions:

The rest of us may feel uncomfortable with each other but put that aside for a minute and see if we can overcome that for the sake of learning about the computer. There are still feelings there but not enough to prevent us from learning.

Jessie made a similar comment in her interview when she talked about the benefits of being in the support group:

Jessie	Oh it's much, much better [than an in service workshop], because it's
	more personal. It's more tailored to what we really want to know and
	learn. I probably wouldn't have asked the questions in a large group.
Andy	It would be hard to ask those questions?
Jessie	It would have been, I would have just
Andy	Not said?
Jessie	Said nothing.
Andy	Um hm.
Jessie	So it made it a lot easier to ask questions, get feedback, and to uh, kind of
	custom make it to our needs.

Martha made a slightly different observation on this issue:

Maybe we just simply aren't clear. Maybe that step didn't come first, the other step came first, so we haven't had time to thoroughly think about it. I think the majority of people in this building know that it's [technology] valuable and whether or not they've thought it through I don't know. So I think maybe we jumped over that one.

In her follow-up interview, Margie disagreed with my observation and offered her

own views on this issue:

Margie	I think that we didn't talk about it as a philosophy, or in that sense, but I think that everything we discussed at least in our minds was because we were thinking about how it was best going to benefit the kids and I think that's what teachers naturally do, when something comes through the mail you constantly think "Well how is this going to be used with and help kids?" So it's kind of, you know we didn't actually discuss what we wanted as far as a philosophy, maybe we should have started that way but I think everything we did was leading to that. It was kind of a beginning, something you almost need to do
Andy	Before you can
Margie	before you can get to that part. And I think, in my mind it was constant, everything I discussed was, we've done lots for us, which has been good for the building, and I guess those things somehow benefit the kids, but I'm concerned when we go to the lab, what do I want my kids to learn and do, and no one has told me that part yet. So everything I was thinking about during our group was how computers in the classroom is going to benefit the kids. And I think Susan and Jessie did the same. Everything we did
Andy	Is it because it's so implicit in the thinking it doesn't need to be voiced?
Margie	I think it was. Susan stated she thought kids needed to play and explore and I felt differently. I feel like I have a good feeling about where they want to go so yeah everything we do you automatically think, my day to squeeze it in
Andy	Maybe I'm not seeing it
Margie	Those kinds of things always change, especially by discussing with people. Maybe people's visions change for what kids are doing as you talk about it.
Andy	Well we A couple of times the games, 1st grade uses vs. 4th or 5th grade uses, those were the only examples I could find.
Margie	When we talked about Susan getting a hub how that would work logistically it would be a nightmare, even though it's not true curriculum those are all things that affect kids, so in essence everything we discussed, I feel, had to do with you know how it's going to affect children and

	they're learning and if my kids have to go to Susan's room how's that
	going to affect her kids? So everything kind of relates to how it's going to
	affect kids we could have stated our beliefs, what we initially thought,
	but that's going to change based on what we discuss
Andy	Has it changed for you?
Margie	Um, I don't think it's changed my own self discovering because of what's evolved from my class has really changed my expectations for my kids.
Andy	So the class experience has allowed you to see it differently.
Margie	Yeah, and what they've done, they've shocked me. But you know it was
	very helpful to hear what other's think.

It seems that in the text above, Margie is arguing that even if the teachers in the support group were not explicit about their reasons for planning to use technology, these reasons were part and parcel of the way they always think and act as teachers. This might be true if these teachers had a common or shared set of beliefs about teaching, learning, and technology, but I'm not sure the data I have collected supports this idea. The fact that their beliefs are shared on some level, but also different on other levels, leads me to question how much commonality there is between the implicit assumptions and justifications the individual teachers in the group have regarding using technology for pedagogical reasons.

One of my goals for this work has been to try to help these teachers be more explicit about their justifications, and I believe that they are only beginning to make public their assumptions about teaching, learning, and technology. Questions of why a specific use of technology is beneficial require reasons and justifications for pedagogical choices that these teachers may assume they hold in common. This is an essential element of the kind of critical discourse that I think can be a powerful form of teacher professional development.

If, as Margie claims in the transcript above, these teachers made statements in the group meetings that had implicit in them assumptions about teaching and learning that they believed were consistent with the goal of helping their students learn, there is still the question of how common or shared these underlying beliefs and assumptions are

among members of the group may be less shared beliefs and knowledge than they originally thought. These teachers may in fact believe that there is more communality and sharing of basic beliefs about teaching and learning, and thus similarly shared pedagogical choices made regarding use of technology in their teaching, than may actually be the case. It could be that more time is needed for the members of this group to realize that their beliefs are in fact different in important ways and this may also be dependent on their perceived level of comfort within the group sharing their beliefs.

This final assertion is also closely tied to the nature of this group, the changing conversational qualities of the interactions, the emerging ethos of the individuals who participate, and the roles we all play in these conversations. My hope is that as this group continues to grow and change, some of these take-for-granted assumptions might be shared and this may in turn lead to more conversation about justifications for the use of technology based on a growing awareness of differences among these teachers.

CHAPTER 6

SUMMARY

By participating in this technology support group and observing the conversations and collaborative work we did as a group over the months we were together, I came to view the ways these teachers thought about technology, teaching, and learning in new ways. These understandings, described in the prior chapters, were informed by my analysis of the talk we engaged in during our regular sessions, my observations described in my field notes, and my interviews with the group members. Although I focused on what the teachers talked about in our sessions, I made sense out of these conversations in the context of the professional and personal lives of the teachers situated in the school setting.

Through my field journal, and with the ongoing support and help from my committee members, I began to see the complexity of these teachers' professional lives and the impact technology was having on their thinking and planning. The evidence presented in the prior chapters supports a set of assertions that provide insights into the connections among teacher beliefs, knowledge, and technology:

* Talk about technology is contextualized in the wider school culture, especially external expectations placed on teachers, and therefore is influenced by these factors. Introducing technology into a classroom brings with it external expectations of parents, administrators, peers, and community members which in turn influence how teachers make sense of and use this technology. In many cases, discussions about technology broaden to include larger pedagogical and contextual issues that are influenced by a variety of external factors, such as administrative support, available resources, and district and community preferences. Teachers think and talk about these issues in ways

that show how they are connected in their minds. In the case of these teachers, parental expectations about the quality of student work that leaves the classroom represent one example of this kind of external influence.

* Patterns of participation in teacher talk about technology are subject to influences from within and outside the support group. These factors not only shape what happens in the group, but the activities in the group also shape what happens in the larger school context, suggesting a recriprocol relationship between group and school activities. Conversational patterns are affected by personal and professional factors, such as evolving authority and leadership, and shape the ways in which members of the group participate in these conversations and the benefits they derive from this participation. In the case of the lower-elementary teachers in this study, changes in participation eventually led to opportunities to discuss pedagogical issues connected to technology use in the classroom. In this case, changes in collegial conversations around technology were probably based on differences of purpose or goals as perceived by those who managed the conversations.

* Talk about technology affords teachers opportunities to make public their own assumptions about teaching, learning, and technology. These conversations can provide a supportive setting for examining these assumptions as a form of professional development if the members of the group feel safe and the environment for conversation is nonthreatening but challenging. Some teachers may be hesitant to ask questions or admit they lack knowledge or expertise in traditional in-service workshops and may participate in more meaningful ways in a support group setting like the one described in this text.

* Teachers bring their existing beliefs and knowledge about teaching, learning, and technology to their interactions with technology. These beliefs and knowledge shape, and are shaped by, their learning about technology. Planning for technology will be reflective of teachers' assumptions about teaching, learning, student abilities, and external expectations, and activities will likely be consistent with their existing preferred modes of teach-ing.

* Teachers' beliefs help them understand and make sense of their experiences with technology by constraining and affording ways of talking, thinking, and planning technology in their teaching. By learning about technology in a supportive social setting, some teachers may begin to question or examine their own taken-for-granted assumptions about teaching, learning, students, and technology. These opportunities represent perhaps the most significant aspect of this form of teacher professional development around technology adoption as a sustainable forum for teacher learning.

* Much of the talk in the support group was about "how" to use technology, especially focused on the practical issues of using technology in a classroom or lab, and less talk was about "why" specific uses of technology might be beneficial for students. It seems that teachers' pedagogical decisions are implicit in their talk and actions, may even be hidden from their thinking, and may benefit from facilitation by an outsider. This represents a challenge in the formation of these kinds of support groups if they are to become environments for sustainable teacher learning.

During the time we spent together, I also saw evidence that some of the teachers in the technology support group were changing in ways other than those described in the prior chapters.

I heard Susan talking differently about her plans for technology when I interviewed her in early 1998 than when we talked in the fall of 1997. In the early interview she talked in ways that were consistent with Jessie's planned use of technology — as a tool for remedial purposes and for practicing basic skills. In the later interview, Susan talked about technology, including the Internet, being part of regular classroom life, from reading and writing to art and mathematics. She began to recognize the complexities that using the Internet brings to her teaching, issues she talked about in her interview, but was nonetheless able to envision a very different classroom environment with up to six computers.

An unexpected but beneficial outcome from this work was that the teachers who participated in this support group began to take a more active role in technology adoption issues outside their own classrooms. I saw Margie, for example, begin to take a more active role in school decision making — she joined the school improvement committee in November 1997. This is consistent with Margie's comments about the safety of a group setting, her fear of being seen as a complainer within the school, and her institutional position vis a via her status and seniority within the school. Susan especially was instrumental in her role as representative for the lower-elementary teachers when she attended the school technology committee meetings. I watched Susan's role in this technology committee change from a passive listener who was afraid to ask any questions or admit her own ignorance to someone whose items dictated the agenda and whose voice was heard often in the most recent meetings.

The group members felt that being part of this collective was helpful by providing them with a voice and some authority to speak about technology issues with their peers and the administration. I think this group, in a small way, helped empower these teachers to take more ownership of technology in their school, to begin to think critically about issues related to technology use in the classroom, and to want more control over their own situations with relation to technology. Our conversations about technology offered me glimpses of these teachers' insights into pedagogical opportunities afforded by computers and the potential this kind of group might have for supporting meaningful changes in teaching.

Connecting the Assertions

Although these findings are important on their own, they also must be examined together to make sense of the complexity of my observations and analysis. Changes in participation within the support group were connected to changes in the content of the talk I observed in a fairly direct way. First and foremost, changes in participation may

have afforded the participating teachers opportunities to engage in thoughtful and critical discussions about pedagogical issues without fear of reprisal or direct challenge from Margie.

In the early conversations we had, when Margie was the leader of the group and Susan was not in attendance, the members of the group did not challenge Margie's ideas or opinions, nor did they ask her to make explicit her thinking or her justifications for her planned uses of technology. Since Margie was the expert in the group on using technology in the classroom, it seems likely that Jessie and Martha in those early meetings simply accepted Margie's comments without question. As a result, I believe much of the early talk, which included some pedagogical discussions, did not bring to the surface teachers' assumptions of why using technology is beneficial for students.

When Susan joined the group, which coincided with the venting session in early November, the conversation resulted in an emotional exchange. Susan later indicated that she was unhappy with the tone of this session and used her personal relationship with the principal to resolve the issue Margie had pushed the group to address — asking the principal if they were required to engage in a key pals project — thus usurping Margie's authority and power in the group without turning the issue into a confrontation between the group and the principal.

Margie may have seen this action by Susan as undermining her authority, and based on her own fragile relationship with the principal at the time, may have felt the power of the group to support her position on the issue was negated. This is conjecture on my part but I believe is consistent with the evidence in the data. Regardless of the reason, Margie subsequently was unable to attend any of the groups sessions until March 1998 and Susan assumed leadership at that point in the group.

This change in group leadership I believe allowed the other members of the group, Martha and Jessie, to develop a sense of trust in each other and allowed them to begin to make public their own questions and thinking about how they might use technol-

ogy. The resulting norms of participation within the group provided the members with opportunities to begin to examine and question their own assumptions and beliefs about teaching and learning in the face of their plans and experiences with technology.

So it seems that the changes in participation in the support group are linked to the evolving pedagogical conversations that took place, and specifically that the changes in leadership in the group provided opportunities for the teachers to question each other, and themselves, about what they know and believe about teaching and learning. This is contrasted with the early sessions when the members of the group were passive listeners who did not challenge or question Margie's ideas or opinions for technology.

Most importantly, it took time for the members of this support group to develop the level of trust necessary to share their ideas and opinions as well as to define shared goals and individual roles. This time was an important, perhaps essential, ingredient in the success of the group and allowed the members to resolve any prior personal or professional differences of opinion so that the important work of collaboration and collegiality could begin.

Individual and Collective Growth

Although not specifically a focus of my analysis, and not discussed in this dissertation until now, there is an obvious unasked question regarding this type of intervention for technology adoption: Where is the evidence that these teachers actually learned and grew professionally as a result of participating in this support group? I find evidence of individual development and learning by the participating teachers in a number of areas.

1. The members of the group developed web pages (all except Jessie) on the school's web server; in fact, two of the group members, Susan and Martha, along with Blaine were the first teachers in the school to have web pages on-line. Prior to our work together these teachers would likely have felt they would be the last teachers in the school to develop web pages.

2. All of the teachers became more proficient with and used e-mail more often as a result of being in the group. The most interesting example of this is Jessie, who when the group first began to meet in September was anxious and afraid to use e-mail and indicated she didn't know how to use the e-mail program. By March, Jessie was using email every day to communicate with her collaborating teacher in another state on a project they were doing in their classrooms. Susan also showed developing leadership skills and dispositions within the technology support group, resources that may spill over to the broader school context as she continues to experiment with technology in her teaching.

3. All of the teachers in the group seriously pursued applying for additional funds through a variety of grant programs. Margie applied for a state grant for up to \$10,000 to expand her use of technology in the classroom next year.

4. Changes in the early elementary teachers' participation in wider school decision making and conversations about technology took place. The most striking example of this change is Susan, who I observed in an early school technology committee meeting as a silent observer but who eventually became one of the leaders in the school, providing on more than one occasion, the school technology committee with an agenda for discussion.

5. All of the teachers became more confident and interested in the possibilities of technology in their classrooms. There is evidence of this interest in their talk and in their actions-in the classroom, in the computer lab, and in the conversations they have with their peers in the hallway. Susan used money she received for excellence in teaching to purchase a home computer and wrote a letter to the superintendent justifying her use of this computer for her students' benefit.

Together, I believe these changes reflect a growing thoughtfulness and critical stance towards technology that will help the members of the support group cope with the changes in the future related to technology use in their school. These changes also help the larger school culture change because of the activism now shown by each of the teachers in the group who are now influencing their peers as they continue to learn about and use technology. I look at these teachers, especially Susan, as leaders within their school who can provide examples of successful technology use in their teaching that their peers might emulate.

CHAPTER 7 CONCLUSIONS AND FUTURE RESEARCH

From the preliminary work done in this study, there does seem to be evidence that a conversational forum for teachers to discuss technology adoption affords opportunities for them to engage in substantive talk about teaching, learning, and technology. These kinds of conversations may represent a powerful tool for these teachers to reflect on their own teaching practices while learning about technology. Simply getting teachers together, however, will not guarantee that these kinds of substantive pedagogical conversations will emerge in the normal development of the group. As identified in this work, there are many complicating factors which might prohibit or constrain the efforts to create such a learning community around technology adoption. These include preexisting professional relationships, release time, commitment of participants and administrators, school culture, district and community influences, and external expectations for classroom technology.

The inherent complexity in any school setting is compounded by the introduction of technology and should not be oversimplified as both a resource and a burden for the teachers involved. Alternative forms of teacher professional development — such as dialogic inquiry and support groups — may offer a productive long-term avenue for helping teachers learn about technology and construct new teaching practices that take advantage of the pedagogical tools technology affords in the classroom. Such forms of professional development may also provide teachers with collective authority and power to become more active and engaged in the larger contextual decisions that affect their professional lives.

What did I learn?

When I began this project, I had several goals which I now review in light of what I have learned:

1. A technology support group might provide a way for teachers to talk and think about technology while making public their existing beliefs and knowledge of teaching and learning. By examining these beliefs, we might begin to better understand the relationship between these beliefs and the plans these teachers made for technology in their teaching.

The members of the support group did in fact talk about technology, teaching, and learning, and combined with the interviews and field notes I collected, allowed me to examine in more detail the complex relationship between these beliefs and their plans for technology. I described my findings related to this in the prior chapter but it seems that the literature on teacher beliefs offers important help when we consider how technology is being used, or perhaps not used, by teachers in K-12 classrooms. More work is needed to help understand the complex relationships between technology and these teachers' beliefs and knowledge of teaching and learning.

I learned that teacher's existing beliefs and knowledge about teaching, learning and their students, combined with external factors, shape their plans for using technology in the curriculum. I also learned that teachers have their own assumptions about their students' abilities, which constrain their ideas of what is possible with technology, and that in the case of these teachers, the products that are generated in the classroom are held up to a high standard for quality. These teachers also have different views of their own as compared to their students learning, and how much direction and exploration is possible given their age. These factors all play important roles in how the teachers I worked with in this study understood and acted on the technology made available to them in the school.

The process of helping facilitate these substantive pedagogical conversations, and the inherent trust required for teachers to engage in these kinds of conversations, takes considerable time and effort, and may require an outside facilitator. Given the professional culture in many K-12 schools, it may be impossible for a teacher or principal within a school to facilitate the kind of group setting with norms for participation that I believe were essential for the group to engage in these conversations. The evaluative professional relationships and the competitive institutional interactions that may teachers find in their schools might make it impossible for a teacher to facilitate these kinds of conversations.

2. A technology support group might provide teachers with a sustainable form of ongoing professional development and growth that draws on their experiences incorporating technology into their classrooms. If such a group were focused specifically on teacher learning, and if teachers in the group could bring their own questions and issues forward to connect with their experiences, the members of the group would collectively construct their own sense of benefits for technology for their students. This view of professional development is consistent with calls to support teachers as pedagogical decision makers in their own classrooms through sustainable opportunities for learning through inquiry.

There is no doubt in my mind that these teachers benefited in many ways by participating in this support group. I believe that being part of the group was an important way for these teachers to develop their own sense of the value of technology for their students, that during the group meetings these teachers were able to ask questions and discuss issues they wouldn't normally be comfortable discussing in traditional workshops, and that there was an empowering aspect of the group that helped all these teachers take a more active role in the technology decision making processes within their school. I also think that these teachers have shaped the larger culture of the school, around technology

but also in other ways, and their students will ultimately benefit as these teachers continue to think, talk, and act thoughtfully with technology.

3. As a participant observer within this group, and with a focus on teacher beliefs and knowledge, I have a powerful (but untapped) perspective on the experiences of these teachers as they incorporate technology into their teaching practices. These teachers' experiences can be a resource for other teachers who are facing similar circumstances and have similar concerns and perspectives.

One reason I am sharing these teachers' experiences is that I believe other teachers may find connections with these experiences and the insights of the group members. The nature of the support group itself might also represent an alternative forum for technology training and support and provide benefits for the teachers involved as well as others who are or soon will be undergoing similar struggles.

4. The opportunities afforded to these teachers by participating in the group activities might also provide the members with a chance to examine and question their own taken-for-granted assumptions about teaching, learning, and technology. I was hoping that these opportunities might be taken by members of the group to begin to think critically and act thoughtfully about the possibilities technology affords and that the members might engage in substantive pedagogical conversations that would create a learning community around technology adoption. I saw evidence of this in their talk as they moved beyond technical conversations to pedagogical discussions about technology connected to other issues — including literacy, classroom management, and assessment.

This study, which takes an interpretive perspective of the experiences of the teachers in the support group, provides an important viewpoint that is often absent from the literature on technology adoption. Combined with the focus on teacher learning within the context of a sustainable social setting, I think this work provides helpful guidelines and suggestions for alternative forms of professional development that might be beneficial when technology is introduced into a school culture.
Limitations of the Study

While this study provides an important perspective on the ways that elementary teachers make sense of technology when it is introduced into their classrooms, it is not without it's limitations.

First of all, since this study included only four teachers, all drawn from a single school, it is limited in its scope and generalizability. The teachers who participated in this study shared much in common, since they work in the same school under the same administration. They also volunteered to be part of the group and had their own reasons for participating. I'm not sure what I can say about teachers who might be drawn from different schools, or about those teachers who opt not to participate in such a support group.

The members of the technology support group were first and second grade teachers, and therefore I cannot talk in confidence about how their experiences might relate to upper-elementary, middle school, or high school teachers. My sense from the conversations we had in the group is the lower-elementary teachers feel and act differently from other teachers, that their perspectives on problems and their approach to interacting with students are importantly different from other teachers.

All the teachers in this group are white middle-class women, and so there is the question of how their talk, thinking, and actions in this group might be different from teachers of other races, ages, or genders. Given the nature of the conversations these teachers engaged in, and my own analysis of their patterns of participation, my hunch is that their preferences for discussion may be importantly different from other, male-dominated teacher groups.

The school where these teachers work is a technology rich environment with a supportive principal and extensive district resources which many other schools may not have access to. The principal is especially supportive of teachers in the school taking

ownership of programs and being involved in decision making, and also has a strong commitment to teacher empowerment. His offer to provide the teachers in the group with substitutes and time out during the school day are evidence of his commitment to supporting teachers adoption of technology.

Perhaps most importantly, this group is really just getting started, having only been meeting regularly since September, 1997. I think that it will take a long time for members of this group to develop and sustain the kind of supportive but challenging environment that will allow them to begin to not only question their own beliefs and knowledge of teaching, learning, and technology, but to start taking risks in their classrooms with technology. The next year will likely provide even more changes in the group, both because of classroom and grade reassignments and because these teachers now have some practical experience with technology they can draw upon when planning for the future.

Implications for educational technology

While this research has been fruitful and rewarding for myself and the participants, the results have implications for future work in the area of K-12 classroom technology use, professional development for teachers, and the kinds of support needed to help teachers learn and grow as they are exposed to technology.

* The complexity of teaching and classroom life is increased when technology is introduced.

Technology brings with it a new set of complexities and uncertainties that many teachers may be unable to accept or deal with productively without opportunities to engage in long-term, sustainable learning. The external factors these teachers talked and thought about played a major role in the sense they made of technology and their subse-

quent plans for its use in their teaching. They need time to understand the possible benefits of technology based on their existing knowledge and beliefs about teaching and learning.

* Training and traditional forms of professional development are insufficient for the kinds of sustained learning and critical examination of beliefs that accompanies technology use.

The technology support group described in this study helped to provide an environment where teachers were comfortable admitting they do not know how to think about technology, where they could learn about it based on their own interests and purposes, and where they could begin to ask questions of each other and themselves about issues that are connected to technology use in teaching and learning. Short-duration technology workshops rarely provide neither the time nor the opportunity for this kind of thoughtful and critical discussion.

* A long-term view and commitment are necessary to support teachers use of technology.

The process of learning about technology and incorporating it into teaching practices represents a change in the way teachers think, talk, and act in their classrooms. For this kind of change to occur, there must be a commitment to sustainable, long-term learning for teachers as they embrace technology. Without this kind of supportive environment, teachers may suffer in silence, not ask the important questions, and ultimately return to their classrooms without a true sense of how to use technology to help their students learn.

* Administrative support is also required, along with necessary resources.

Without a supportive staff and administration, this kind of serious learning and change cannot succeed. The administrators at Oaktree Elementary are to be commended for their support of the teachers in this study and represent a model for what is possible in a school with the right resources and attitudes.

Future Research

I plan to continue working with the teachers in this study through the end of their current school year, and hold open the possibility of continuing this work through next year to see how the experiences these teachers had this year inform their talk, beliefs, knowledge, and plans for technology use next year. Next year in Oaktree Elementary school will bring lots of changes to the individuals in the group and to the school itself.

Oaktree Elementary has agreed to act as a pilot school for a major teacher education university and each teacher will have a fifth-year intern, senior and junior Teacher Education students in their classroom. There will also be changes in teaching assignments: Margie will not be teaching first grade next year but will probably teach a second grade classroom. Susan has plans to place four or five more computers in her classroom and has talked about redesigning the first grade curriculum to accommodate these computers.

I expect that next year will be spent learning from this year and I hope the support group can be a resource for these teachers thinking about how their use of technology and their experiences with technology can inform their practices. Specifically, I will try to help these teachers develop criteria for evaluating their experiences this year so they can plan for next year with an awareness of their own practical knowledge of technology in teaching. I also hope the pedagogical discussions we have had will continue and will lead to continued critical thinking about using technology in the classroom.

The teachers in the group actually got a late start trying to use technology in their teaching, and I believe they will be better prepared in the year ahead:

Margie talked about maintaining the status quo and continuing to use the computer lab and not asking for more computers in her classroom; Susan talked about the changes she plans to make in her classroom if she can acquire more computers;

Jessie is interested in getting some Apple II computers, and the school may provide her with three or four of these, so she can use remedial software with her students;

Martha wanted to do a story starter project this year but didn't get around to it so I expect her to try this next year along with a key pals project.

Next year will hopefully continue the work we've done this year individually and collectively, and I look forward to following the experiences of these teachers as they prepare to integrate technology into their classrooms. And so, the story continues

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APPENDICES

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APPENDIX A Pre-Interview Protocol

Questions about teaching

- 1.1 Describe yourself as a teacher. How would you describe your teaching practices?
- 1.2 What are your aspirations as a teacher?
- 1.3 What do you like most about being a teacher?
- 1.4 What do you like least about being a teacher?
- 1.5 What do you think constitutes good teaching practice?

Questions about the school

- 2.1 How would you describe Oaktree Elementary as a professional community?
- 2.2 What is your sense of the cooperative or collaborative work you do with your peers?
- 2.3 Describe the last cooperative work you did with another teacher at Bennett Woods.

2.4 On a scale of 1 to 10, where 1=Poor and 10=Excellent, how would you rate the staff development opportunities at BW?

Questions about technology

- 3.1 What is your assessment of your own technology expertise?
- 3.2 What kinds of things do you regularly use technology for?
- 3.3 How do you think technology should be incorporated into the BW curriculum?
- 3.4 Describe your wost experience with technology.

Questions about the support group

- 4.1 What are your expectations for being in this group?
- 4.2 What do you hope to learn?
- 4.3 Why do you want to be part of this group?

APPENDIX B Post-Interview Protocol

Teaching with technology

Imagine the following scenarios and answer these questions: how would you use the technologies described below, if they were available in your classroom, and how do you think using these computers would facilitate or support student learning?

Scenario #1: You have been given five (5) additional Compaq Windows/95 computers which are connected to the school network, providing access to all the programs in the Computer Lab as well as school network printers and the Internet - with e-mail.

Scenario #2: You have been given five (5) Apple II series computers (IIc, IIe or IIgs) with color monitors and printers as well as any Apple II software you request. These computers are not connected to the school network or the Internet.

Scenario #3: You have been given enough computers, of any kind you choose, so that every-other student has access to one in your classroom - i.e., each computer can be shared by two of your students. In addition, any software you request is also available on these computers, as well as printers and other school network resources (including access to the Internet if you want it).

Briefly describe how you would use the technology in scenario's #1, #2, & #3 above.

My question during the interview

I will select one of the scenarios above and make the following statement: Imagine I am the principal and that I am considering purchasing technology for school use. You are trying to convince me of the benefit of purchasing this technology for your students. Justify for me, as a principal, why purchasing the technology above will lead to improved student learning.

Purpose of probes: to push the teachers to talk about their beliefs about the role of technology in their students' learning.

Possible probes: How would students use technology for their learning? What specifically would students do with the technology that might help them learn? Why is this a good use of technology for education? How is this approach to learning better than the way we're doing things now?

Interview Questions

1. What have you learned about teaching, learning, and technology (if anything) this year that you didn't know last year?

2. We've talked a lot in the group about using the computer(s) in your classroom as well as using the computers in the computer lab. We've also talked about getting more computers in the classroom. How do you think student use of the computers in the lab differs from their use of the computer(s) in your room and what difference would it make if you had more computers in your room?

3. When you think about educational technology, and it's value to students in your classroom, what role or purpose do you see computers playing in their learning? Why should we put technology into the school? Imagine I'm a parent who has a son or daughter in your classroom and I'm asking you these questions. Select as many of the following as you think apply. (What is the role of technology in student learning?)

A) Computers are like tutors for my students, helping them learn specific skills like reading and math that I may not have time to teach them
B) Computers and the Internet are another information resource my students should have access to, like the library and the encyclopedia
C) Computers provide my students with tools they can use to create products - like reports, poems, etc. - for classroom projects
D) Computers provide a way for my students to communicate with other people - i.e., e-mail or the Web
E) Computers help my students learn basic technical skills - keyboarding, mouse, etc.
F) Computers help motivate my students to learn
G) Other - please specify

4. When you think about why your students should learn about technology, which of the following are the most important? Select as many as you think are critical.

A) Learning to use a computer is something everyone in our society will need to know in the future and students need to be prepared for that future

B) Parents, teachers, administrators, and others expect our students to use technology

C) Because we have technology in our school - in the lab and in the classroom - people expect us to make good use of it

D) Using the Internet opens up a world of information for students that offers learning opportunities

E) Computers allow students to learn necessary skills

F) Technology has the potential to change the way students learn existing subjects

G) Computers provide powerful opportunities for learning existing subject matter

H) Other - please specify

5. What factors or circumstances do you believe are preventing or prohibiting you from using technology more effectively in your teaching?

6. How do you think you compare with other teachers in this school and elsewhere when it comes to:

- A. Using technology in the lab or in your room
- B. Technology knowledge and skill (proficiency or competence)
- C. Confidence with technology (dispositions)
- D. Learning about technology on your own

7. Do you believe that being a member of this group has helped you use technology this year? If so, in what ways? If not, why do you think it hasn't?

8. How do you think your plans for technology use in the classroom have been influenced by the things we've done in this support group?

9. Do you feel that you have grown professionally so far this year? If so, how?

10. Choose one thing that has happened during our time together that you think is significant, exceptional or important to you. Describe that event and why you see it as important.

11. Do you think your relationships with your peers have changed this year? If so, how?

12. What is the most important thing you've learned from being part of this group?

13. Imagine that you were trying to describe the support group to a new teacher in the school, assuming she asked what we do and why you participate in the group. What would you tell her about the group and why?

14. I've observed that in our discussions about technology, we spend lots of time talking about how we plan to use technology and what type of technology we might use - including computers, printers, and software - but we haven't spent much time talking about why we might use technology or how technology might help or hinder our students learning - i.e., pedagogical discussions. Why do you think this is the case?

15. If you were conducting this research what question(s) would you ask me?

16. This work that I'm doing is to help me learn about your experiences as a teacher integrating technology into your teaching. Do you have any questions you'd like to ask me about my study or any observations you'd like to make about our work together?

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