UNDERSTANDING A TEACHERS' COMMUNITY THAT USED A PARTNERSHIP

by

NA YOUNG KWON

(Under the Direction of Denise S. Mewborn)

ABSTRACT

The purposes of this study were to understand teachers and teacher educators in the context of community and to contribute to the research on professional development using a partnership between a high school and a university. I examined how teachers in a learning community each perceive their practices and community, what they learn from their learning community, and what struggles the teachers had in building the learning community. As intervention research (Krainer, 2003), this study helps researchers understand the development process of the mathematics teachers in the community and the process of building a mathematics teachers' community.

As part of the project, Partnerships in Reform in Mathematics Education (PRIME), this study was conducted during a ten-week student teaching period in a high school. Three student teachers, three mentor teachers, and a university teacher participated in this study and worked together in cluster meetings. Data sources included cluster meeting observations, interviews, and documents (such as open-ended surveys and e-mail responses). Data were analyzed using case study and narrative analysis methods.

I used the written data to construct three narratives based on the research questions. These narratives show how the participants perceived their community activities. The results showed that the participants valued their learning and other member's learning in the community.

The learning came from different perspectives, different environments, new materials, and students' work. The participants had difficulty building the learning community. Power issues among members came up as one of the difficulties. In addition, the members addressed issues about selecting topics to discuss, criticizing others, sharing goals, and managing time and the number of members.

INDEX WORDS: professional learning community, partnership, professional development, mathematics teachers, high school student teaching, teacher educators, qualitative research, case study, narrative analysis

UNDERSTANDING A TEACHERS' COMMUNITY THAT USED A PARTNERSHIP

by

NA YOUNG KWON

B.S., Korea University, Korea, 1998

M.S., Korea University, Korea, 2002

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2007

UNDERSTANDING A TEACHERS' COMMUNITY THAT USED A PARTNERSHIP

by

NA YOUNG KWON

Major Professor: Denise S. Mewborn

Committee: Jeremy Kilpatrick
Patricia Wilson
Paola Sztajn
Sybilla Beckmann-Kazach

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
December 2007

DEDICATION

To

my husband Dong-Hoon

and my friends

for their constant support and encouragement

ACKNOWLEDGEMENTS

My doctoral study was an exciting opportunity for me to know who I am and what I can do for my future. My time at the University of Georgia was an unforgettable experience both personally with my husband and friends and professionally with my colleagues. This was possible only because they have been with me.

I first would like to thank my major professor, Denise S. Mewborn, for her encouragement and continuous support. She always encouraged me that I could get through even the hardest time during my doctoral studies in the United States. She also helped me reflect on my thinking, and her guidance helped me choose the best way for me whenever I was in difficulty.

I am grateful for my doctoral advisory committee, Dr. Jeremy Kilpatrick, Dr. Patricia Wilson, Dr. Paola Stzjan, and Dr. Sybilla Beckmann-Kazach. I appreciate all the time and valuable comments and critiques that my committee gave me to make me craft a better study.

Thanks to the PRIME project members including the graduate students and high school teachers who provided great support for this study. My special thanks go to Dr. Jeremy Kilpatrick and Dr. Patricia Wilson for allowing me to join in the project and to participate in a conference. Without their help, this study would not have been possible.

I cannot forget my devoted husband, Dong-Hoon. He has always been with me throughout the hard times in my doctoral study. As a doctoral student who studies mathematics, he tried to understand my major, mathematics education, and my study

through continuous conversation with me. This gave me valuable insight sometimes. I am grateful for his constant support and sacrifice.

Finally, I wish to thank my family in Korea for their prayers and unconditional support throughout my doctoral studies. They endured such a long and difficult time with their love and prayers. I also thank many new Korean friends in Athens who helped me with their prayers and kindness.

TABLE OF CONTENTS

Page

LIST OF TABLE

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

While research on teacher learning is relatively young, we have evidence that high-quality professional development programs can guide improvement of teachers' instructional practices and student learning (Borko, 2004). Based on research findings on teacher development, teacher educators have created various professional development programs to find more effective ways for teachers to improve their teaching. In thinking about professional development programs and their impact on teacher learning, Borko (2004) identified four key elements: the professional development program, the teachers who are learners in the program, the facilitator who guides the teachers, and the context in which the professional development occurs. As one of the key elements, the context of communities has lately attracted considerable attention from researchers and teacher educators. For example, research has examined the characteristics of communities for teachers (Hord, 1997) and processes of building communities of teachers (Grossman, Wineburg, & Woolworth, 2001). Given the increasing interest in this area, this study focused on a teachers' community and its members.

Teacher educators generally make distinctions between teacher education and professional development. For example, Lerman (2001) used the term *teacher education* to refer to pre-service teacher preparation, such as methods courses and field experiences, whereas professional development and teacher change are associated with in-service teachers. However, the National Science Foundation (NSF) uses the term *professional development* to refer both to teacher preparation and to the development of in-service teachers (Sowder, 2007). Professional development means improving professional identity and knowledge. Hence, it does not need to

be limited to in-service teachers. In light of the NSF's definition of professional development, in this report, it was appropriate to discuss a teachers' community that included both pre-service and in-service teachers.

A key reason for focusing on community is to understand what kind of learning teachers find meaningful for their professional development. For example, one study showed that teachers who participated in a professional development project became better at describing students' mathematical reasoning and understanding their problem-solving strategies (Franke & Kazemi, 2001). Other research showed that when teachers participated in some professional development programs, some teachers changed more than others (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996). If teachers are not changed by professional development programs, it may be because they have not experienced meaningful learning. As teachers' learning is considered an important element in their professional development, research has begun to focus on teachers' daily practices in their classrooms, schools, and other communities. Sometimes the learning communities are found in professional development programs or department meetings. By considering a teacher as a member of a professional (learning) community, teacher educators engage in the novel conceptual task to make sense of teachers' work (Shulman &Shulman, 2004). Studies about learning communities provide ways to investigate teachers' meaningful learning.

Studies about various communities are increasing in teacher education. In contrast to the traditional belief that teachers work individually, collegiality and collaboration are now emphasized, so researchers are attempting to investigate the context of groups or communities in research on teachers. For example, there are "teacher inquiry groups" (Hammerman, 1997), "study groups" (Birchak et al., 1998), "networks of critical friends" (Krainer, 2001), and "professional learning communities" (Hord, 1997). Although these researchers used different

terms, they all described teachers' professional development through groups or communities. In particular, studies of community have focused on collaboration for teachers' learning, not on isolated efforts for teacher development. Therefore, the present study of a learning community of mathematics teachers can help teacher educators understand mathematics teachers' learning and development in the context of community.

In spite of rising interest in professional learning communities, there is little empirical research in mathematics education about such communities and their members' learning. Moreover, the research on professional learning communities has emphasized the principles or the characteristics of the communities, such as collaboration, or has focused on the impact of the community on students' achievement. There is no consensus about the definition of professional learning communities or about the members; however, I believe the results of earlier studies about professional learning communities can inform the study of a mathematics teachers' learning community.

A Professional Learning Community

While a professional learning community (PLC) is an interesting context, there is no consensus about its definition. For the purpose of present study, it is important to define what a PLC is. We belong to diverse communities. People have many kinds of relationships within communities and among communities. They belong to many different communities and interact with other community members. Through those interactions, community members become aware of their identities and get to know the communities to which they belong. I consider those interactions as learning and regard the community that comprises those interactions as a learning community.

A Learning Community

I use the term *a learning community* to mean an education community consisting of students, teachers, parents, administrators, and professional teacher educators. Basically, each learning community has its members and shares interaction within the community. The concept of a learning community stems from Wenger's community of practice (1998), which is a group of people who share concerns about something they do and learn how to do it better by regular interaction. Hence, a learning community is a group of people who are involved in education and who share concerns about teaching and learning as they interact regularly.

Multiple-Membership

Like a community of practice, a learning community allows members to have multiple-memberships in different learning communities. For example, there are various learning communities such as a mathematics teachers' department meeting, a mathematics teachers' study group, or school project group, a parents' community, district meeting, and so on. A teacher can participate in his/her subject department meeting, a project group, and a parents' community at the same time. He/she is involved in learning communities for various reasons such as personal interest, special purpose, or requirement of career. This multiple-membership can be described by Figure 1.

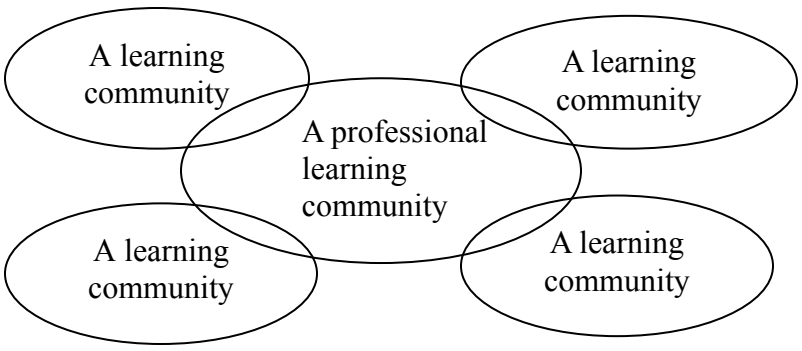

Figure 1.1 Multiple-membership in a PLC.

In the education area, educators are involved in educational networks so that we can barely think about a learning community existing alone. In other words, learning communities are connected within a system of education. In that sense, the members in learning communities basically have a multiple-membership.

Identity development

Learning community members learn from social interactions within the community and with other communities and develop both themselves and their community. During the process of learning, the members can form and develop their identities. In the discussion of education, Wenger (1998) explained that the formation of a new identity is not only an individual process but also a social process shaped by the communities in which a person practices. He claimed that education is associated with the issue of identity, which forms through a lifelong process.

> From this perspective, we need to think about education not merely in terms of an initial period of socialization into a culture, but more fundamentally in terms of rhythms by which communities and individuals continually renew themselves. Education thus becomes a mutual developmental process between communities and individuals, one that goes beyond mere socialization. (p. 263)

Hence, a learning community enables individuals to develop their identity through social processes in the community.

Practice

Engagement in practice is also essential in a learning community. Wenger (1998) stated that the boundary of a community of practice does not necessarily follow institutional boundaries, and an institutional boundary does not necessarily mean the boundary of a community of practice. The boundary is defined by engagement in practice. Therefore, a work group may consist of

multiple communities of practice or may not involve a community of practice because the group has insufficiently developed its own practice. A learning community also outlines its boundary based on its practice. For example, department meetings of teachers may or may not be a learning community. Although the meetings regularly occur, teachers may not do anything in the process of meetings, or they may prepare things to discuss and have productive discussion in the meetings. Hence, a learning community is related to getting things done and engagement in practice.

A Purpose

It is not always necessary to have a purpose for interacting with other people. People get together just for fun sometimes. However, learning communities are created for attaining some purpose. Learning in a PLC should have a purpose because the community's reason for being is to create and develop professional knowledge and skills. Hence, all interactions in the PLC should support the members' professionalization. Teacher educators are also learners in the PLC that I discuss. Thus, the learners in the PLC include not only inservice teachers, but preservice teachers and teacher educators as well. All members interact with each other and make an effort to develop their knowledge about their profession or their abilities as professionals. When the members of a learning community interact with the purpose of developing themselves as professionals interacts, it becomes a PLC.

Learning and Development

Wenger (1998) argued that the development of individuals and communities is not a separate process but a mutual process. In that sense, a community can "progress" the development of its members. Here *progress* means a positive impact for the community; in other words, the community is changed in a better way and recognized as an improved organization in

a society. If there is some progress of the learning community through its members' learning, then I claim that learning by its members leads to the development of the community. With this continuous and mutual process of the development of communities and individuals, a society changes and spawns new communities.

So far, I have discussed a general notion of learning communities. Briefly, I define a PLC as having the purpose of members' professional development through shared activities in regular meetings. The studies about PLCs need to focus on teachers' learning and their professional development according to the primary purpose of PLCs. Students' improvement can be realized by the teachers' development. Hence, studies about teachers' learning in the context of the community need to precede studies about influence of the community on students. In this research, I investigated a learning community of mathematics teachers, in particular, a mathematics teachers' community using a partnership between a school and a university to improve a PLC.

Research Questions

Teachers are involved in several communities without being aware of it. Basically, teachers are the members of a school community whether they recognize or not. However, when they participate in workshops or programs, they are aware of their memberships and identity. For example, in previous research (Kwon, 2005), I investigated two middle school mathematics teachers, asking them about the culture of their faculty room in Korea. They shared a space with the same subject teachers all the time and shared ideas about teaching and learning mathematics any time they wanted. They generally met once a month in department meetings. However, they did not believe that they were members of the school community or the mathematics teachers' community in their school. Teachers sometimes do not recognize that they are involved in

communities. In the present study, I focused on a community that had the purpose of teacher development and not on the communities that teachers just belong to without being aware of it.

I think that many kinds of PLCs exist. Among them, I investigated a learning community and its members in the project PRIME, whose aim was to make a PLC. In this community, inservice teachers, preservice teachers, and teacher educators worked together toward their professional growth. Lanier and Little (1986) claimed that teacher educators are overlooked in studies of teacher education; for example, what teacher educators believe and what they do. There is still little research on teacher educators. If teachers need to change as part of educational reform, teacher educators also need to improve their knowledge about reform and teachers' change following the reform. In my research on a teachers' community, teacher educators were considered community members, and they were as significant as teachers pursuing professional development.

This study focused on how the community members perceived their learning community, what aspects of the community made members' activities meaningful, and how the members struggled in their learning and supported the other members' development within the community. Generally, previous studies of community emphasized members' shared experience and knowledge; however, I investigated the different perceptions and values of the experience for each member by finding answers to the following questions:

1. How do the members perceive their learning community?
2. What do the members find valuable in their learning community?
3. What struggles do the members have in building the learning community?

As people interact with each other, they shift their activities in some way. If they are involved in the community, then I would say that the members shift their participation. That is,

the members are learning in the community. For example, think about a meeting including high school teachers and university faculty together discussing teaching and learning using a journal article. While discussing, they interact with the journal article by reading and criticizing, and they interact with other members by discussing with each other. Participating in discussion makes the members learn even though their learning is different because of their different participation. Then how can we see their learning? The best way is by participating in the meeting and experiencing with them. However, this is difficult because the members' interactions are intertwined with every other member so that investigating two members or three members may not show their learning fully. Hence, in the present study, I tried an alternative way of investigating members' perceptions to understand a community and its members' learning in community activities. The members' perceptions about their community show us not only what happened but also what was valuable in what happened. Although the perceptions do not fully describe the learning as it was, they imply that the members engage in various levels of learning, which involve different shifts in participation, in a community. Therefore, I investigated teachers' perceptions about their community to understand the community.

It is crucial to investigate both what teachers found valuable and what they found difficult in professional development activities in that the meaningful instances and difficulties indicate ways to improve teacher development. Sowder (2007) stated that the success of professional development programs is usually measured by four aspects: changes in teachers' knowledge of mathematics, their beliefs about mathematics, their instructional practice, and increases in students' learning. However, these four aspects of success are not enough to find meaningful learning for teachers because they do not show teachers' learning in a professional development program. Although the measurement of a program success is evidence of the participant

teachers' changes and of the impact of professional development program, it does not illustrate what specifically is meaningful for the teachers' learning. The answers to the research questions can help researchers understand, first, the meaningful instances in teachers' learning, second, how the context of such communities influences the members' learning and development, especially mathematics teachers' learning and development, and finally how the community and the teachers influence students' learning.

CHAPTER 2

LITERATURE REVIEW

Research on teacher education has effective models of teachers' professional development for a long time and has focused largely on developing content knowledge through professional development programs. Recently these research interests have extended to studying the role of a community in supporting teachers' professional development as well. Scholars in the field have tried to define and characterize a professional learning community (PCL) so that the community can help teachers' professional development and can also help students' learning. Although educators still do not agree on the definition of the term, *a professional learning community*, we use the term often. In this section, I first discuss different perspectives about learning, how the concept of community has been described and related to teachers' professional development, and how the partnerships between schools and universities can be used for creating communities from reviewing literature.

Perspectives About Learning

I assume that all human beings are basically learners. From birth until death, we are learning. We learn how to speak, how to think, and how to live in this world. Whenever we meet a new environment, we are aware of new things, we perceive what they mean to us, and we understand how to deal with the new meanings. All those processes are learning.

Psychological Perspectives

There are various learning theories that take different perspectives on learning. Here I discuss Wenger's perspectives about learning (1998). Learning has traditionally dealt with psychological perspectives, and Wenger divided psychological theories of learning into four

categories: Behaviorist theories view learning as changes in behavior produced by some stimuli (e.g., Thorndike, Skinner). Since their pedagogical focus is on control and its response, they ignore the issues of meaning, so their studies are useful only in cases that are not relevant to issues of social meaning. Cognitive theories consider learning as an internal mental process and transformation in cognitive structures (e.g., Wertheimer, Köhler, and Koffka). The pedagogical focus of these theories is on processing information through communication, explanation, and problem solving, so these studies are useful for investigating conceptual changes or the process of building upon the cognitive structure. Constructivist theories view learning as a process in which learners build their own concepts and knowledge from their experiences (e.g., Piaget). With their focus on task-oriented pedagogy, these theories emphasize hands-on and self-directed activities and are useful for creating learning environments. Social-learning theories emphasize interactions in the process of learning (e.g., Bandura). Since such theories focus on interpersonal relations and study cognitive processes by observing the social interactions, they are useful for understanding information-processing mechanisms. To sum up, psychological perspectives explain learning in terms of the process of changes within an individual. Then what if learning involves factors outside an individual? Is there a different explanation of learning in terms of humans as social beings? As we are interested in social relationships among people, different perspective on learning occur.

The Sociocultural Perspective - Communities of Practice

In this section, I focus on a sociocultural perspective on learning, the perspective I used in the present study. The biggest distinction between sociocultural and other psychological perspectives on learning is what makes changes in the learning process. From psychological perspectives, behavior and thought are determined by factors within an individual. In contrast,

from the sociocultural perspective, learning involves interactions including the social or cultural context. In this sense, people may think that Bandura's social learning theory is close to the sociocultural perspective, but his theory focuses on the study of the individual cognitive process produced by social interactions (Wenger, 1998).

There have been many efforts to understand learning from a sociocultural perspective and, from about 1990, Lave, Rogoff, and Wenger provided a way to think about learning as shifting participation. Lave and Wenger (1991) developed the notion of *legitimate peripheral participation* as "a descriptor of engagement in social practice that entails learning as an integral constituent" (p. 35). From this view, learning implies becoming a different person in relation to new activities, tasks, functions, and understanding. While talking about schooling and learning, they stressed that legitimate peripheral participation is not an educational form or a pedagogical strategy, but a way of understanding learning. They emphasized the shift of analytic focus from the individual learner to learning as participation in the social world and from the cognitive process to the process of social practice.

Rogoff (1994) examined three different models of learning: *adult-run* instruction, *children-run* instruction, and a *community of learners*. She asserted that the model of community of learners contrasts with other models based on one-sided notions of learning. Although the perspective of adult-run instruction views learning as a product of transmission, and the perspective of children-run instruction views learning as a product of acquisition, both are one-sided learning. In contrast, the community of learners assumes that "learning is a process of transforming participation in shared sociocultural endeavors" (p. 210). Even though the two one-sided instructional models are characterized by control and freedom, the community of learners is not made up of a balance of control and freedom. Rogoff argued that participation in different

models involves different relations of the learners in sociocultural activities. She also noted that people who have other perspectives of learning without understanding a community-of-learners model cannot understand the learning and interactions among members within the community of learners.

Wenger (1998) described the notion of "community of practice" within the broader context of learning. He considered a community as a component of learning characterized by social participation. He described the community as "a way of talking about the social configurations in which our enterprises are defined as worth pursuing and our participation is recognizable as competence" (p. 5). Wenger's concept of communities of practice refers to an integral part of our daily lives. However, the community does not mean that everything everywhere is defined by practice. He stated that, for example, a neighborhood can be called a community, but it is not a community of practice. Also, playing scales on the piano can be called practice, but it does not fit his definition of community of practice. He combined practice and community by describing three dimensions of practice: mutual engagement, a joint enterprise, and a shared repertoire. The community that Wenger (1998) discussed is not merely an aggregate of people defined by some feature. Mutual engagement organized by members, a joint enterprise as a result of collective negotiation, and the development of shared resources among members are significant characteristics necessary to create the community of practice. He thought that people participate in various communities of practice; thus the community of practice is an important concept for learning because of its ability to initiate meaningful experience.

Although there has been much research on individual teacher learning from psychological perspectives, according to Stein and Brown (1997), educators need to consider a sociocultural perspective, not to compete with psychological perspectives but to assist in understanding

teachers' change. I would like to understand the process of teachers' learning and their professional development from the perspective of community of practice. To do so, I first review studies of the concept of a teachers' community and then review studies about teacher learning related to professional development in communities.

Community of Profession vs. Teachers' Community

Community of Profession

There was little research on teachers' community until the 1980s. William Goode (1957) linked the concept of community to the issue of professionalism. He discussed the *community of profession* using professions such as law and medicine. Each profession is a community contained within a larger society having these characteristics: sharing a sense of identity and values, role definitions both for members and nonmembers, common language, and controlling reproduction of members. The professional communities that Goode described were groups of professionals that reproduced their members through training and education. Although the concept of a professional community is comparable to a teachers' community, there are several differences. According to Grossman, Wineburg, and Woolworth (2001), teachers have various understandings of the goals of teaching, curriculum, and anything related to teaching depending on their grade level, subject area, education level, and type of students. A few teachers are involved in recruitment of new teachers in their schools, but except for daily classroom teaching, visions or tasks (such as deciding curriculum) rest in the hand of administrators. As a result, there is an attempt to create a professional vision for teaching, but no such professional community for teachers exists like the community of law or medicine. Hence, researchers need to approach the concept of community in education in different ways.

Teachers' Community

Little and McLaughlin (1993) used collegiality to develop the concept of teachers' community. They considered collegiality not only as the counterpart of individuality and privacy but also as the foundation of teachers' cultures. They stated that school studies tended to overstress the school as a professional community site and to define community by school-level goal consensus. They pointed out that teachers can work collaboratively out of school if they are actively involved. Since teachers hold multiple memberships in collegial contexts, the occasions, sites, and boundaries of collegial interaction can be various. Therefore, Little and McLaughlin suggested studying subgroups within the school setting to provide a lens to view school culture. In addition to taking their suggestion to study teachers' community within school settings, I looked at community for teachers not just within a school but also in the context in which the school had a partnership with a university. My research focused on looking at teachers' community locally, in particular, using a partnership between schools and a university rather than looking at a professional community for teachers at large.

Grossman, Wineburg, and Woolworth (2001) proposed a model of teacher community through a professional development project. They used the definition of *community* from Bellan, Madsen, Sullivan, Swidler, and Tipton (1985): "a group of people who are socially interdependent, who participate together in discussion and decision making, and who share certain practices that both define the community and are nurtured by it" (p. 333). By creating a community of teacher learners from two departments of history and English in a high school, Grossman and her colleagues attempted to discuss how a group of teachers form a community. Their interests focused on the concept of teacher community, the process of building group norms, and the formation of professional community among teachers. They provided a schematic

of community formation and of the growth of its members in four dimensions: (1) the formation of group identity and norms for interaction, (2) the navigation of fault lines, (3) negotiating the essential tension, and (4) the willingness of its members to share responsibility for colleagues' development. Figure 2 shows their schematic model of community.

Beginning	Evolving	Mature
1. Formation of Group Identity and Norms of Interaction		
Identification with subgroups	Pseudocommunity (false sense of unity: suppression of conflict)	Identification with whole group
Individuals are interchangeable and expendable	Recognition of unique contributions of individual members	Recognition that group is enriched by multiple perspectives (sense of loss when member leaves)
Undercurrent of incivility	Open discussion of interactional norms	Developing new interactional norms
Sense of individualism overrides responsibility to group	Recognition of need to regulate group behavior	Communal responsibility for and regulation of group behavior
2. Navigating Fault Lines		
Denial of difference	Appropriation of divergent views by dominant position	Understanding and productive use of difference
Conflict goes backstage, hidden from view	Conflict erupts onto main stage and is feared	Conflict is expected feature of group life dealt with openly and honestly
3. Negotiating the Essential Tension		
Lack of agreement over purposes of professional community; different position viewed as irreconcilable	Begrudging willingness to let different people pursue different activities	Recognition that teacher learning and student learning are fundamentally intertwined
4. Communal Responsibility for Individual Growth		
Belief that teachers' responsibility is to students not colleagues, intellectual growth is the responsibility of individual	Recognition that colleagues can be resources for one's learning	Commitment to colleagues' growth
Contributions to group are acts of individual volition	Recognition that participation is expected from all members	Acceptance of rights and obligations of community membership (e.g., "intellectual midwifery." "press for clarification")

Figure 2.1 Model of the formation of the teacher professional community.[1]

[1] From "Toward a theory of teacher community," by P. Grossman, S. Wineburg, and S. Woolworth, 2001, *Teachers College Record, 103*(6), p.988. Reproduced with permission of the author.

I believe that Grossman et al.'s (2001) vision of teacher community encompasses both changes in individuals and in the social settings in which the individuals work. Some research (Franke & Kazemi, 2001) on professional communities focused only on the individual members' improvement, but Grossman et al.'s study fully investigated the teachers' community evolution including both individual growth and community formation. In other words, they recognized the synergistic effect between the community and its members. As individuals come to understand community and their learning, their change helps the interactions of the members, and accordingly, the community and members become more mature. In this sense, Grossman et al. pointed out that a community and its members cannot be dealt with separately and one side alone cannot be emphasized. I agree with their idea that a community of teacher learners is an integrated one of members and their community. The change that members undergo shifts their community; thus I considered the community itself and the members in it simultaneously in this study.

Learning Communities and Teachers' Development

As the sociocultural perspective on learning was introduced, researchers began to take an interest in teachers' community and PLCs. Collegiality and a PLC were fresh ideas in studying teachers, in contrast to the individualism of American culture (Little & McLaughlin, 1993). Two trends in studying teachers' community emerged. Some researchers (DuFour, 2004; Hord, 1997; Kruse & Louis, 1993) studied communities focusing on the principles or characteristics of PLC, that is, the context itself. Other researchers (Arbaugh, 2003; Franke & Kazemi, 2001; Kazemi & Franke, 2004; Grossman et al, 2001; Hammerman 1993; Little, 2003; Nelson & Hammerman, 1996; Secada & Adajian, 1997; Sherin & Han; 2004) focused on teachers' learning and development in the context of community.

Studies of the Context of Professional Learning Communities

Early attempts in studying communities involved defining and characterizing PLCs to apply the PLC model to school improvement. Kruse and Louis (1993) suggested five characteristics of a school-based professional community after reviewing the literature on professionalism and on community: reflective dialogue, de-privatization of practice, focus on student learning, collaboration, and shared values. Hord (1997) considered a PLC as an organizational arrangement, a potent staff development approach, and an influential strategy for school improvement. She found five attributes of the PLC in the literature: supportive and collective leadership, shared creativity, shared values and vision, helpful conditions, and collective personal practice. DuFour (2004) pointed out that people used the term PLC too often and too generally and thus lost the meaning. He suggested applying three core principles of PLC for improving schools: focusing on learning, working in a culture of collaboration, and using data based on student achievement.

Huffman (2003) emphasized shared values and vision in creating PLCs in schools. She reported findings from a national study, and they recommended support from principals for reform efforts. She regarded schools as organizations that could improve to become PLCs. Using research conducted by Southwest Educational Development Laboratory, she stressed that developing a vision statement is a crucial step for school improvement, and all of the stakeholders—including district personnel, faculty and staff members, parents, and in some cases students—need to have responsibility for that. She also pointed out barriers such as inadequate time and insufficient efforts to develop a vision. Although Huffman discussed only school improvement for PLCs, her work implies that teachers are essential members in school improvement so that developing learning communities of teachers is difficult.

The previous studies on PLC have much in common. First, most researchers considered a school as a PLC or the school developing to be a PLC. They supposed that if a school were a PLC, then people would find various characteristics of PLCs. They suggested that studies of a PLC model help to define a school or to improve the school because the characteristics of a PLC are helpful to the sustained improvement of any organization (Eaker, DuFour, & DuFour, 2002). Hence, the researchers regarded applying a PLC model to a school as a way of improving the school and, as the result of improving the school, they expected that students' achievement would improve.

Second, the studies of a PLC highlighted students' learning. Previous studies argued that a school shifting to a PLC would ultimately improve students' achievement by focusing on their learning. Although the studies did not elaborate who were the members of a PLC, teachers would count as central members. In fact, when teachers discuss and support each other in working with students, cooperative relationships have been observed (Kruse & Louis, 1993). Focusing on students' learning is essential because it is an aim of a PLC, and a school as a PLC can provide cooperative environment for teachers by focusing on that.

Third, research on a PLC emphasized collaborative environments. As a sociocultural perspective was introduced, researchers became interested in social and collective affairs rather than individuality and isolation of teachers. In addition, since the concept of community starts with a group of people, most researchers stressed collaboration as a basic principle of a community. Hence, the studies about a PLC naturally highlighted collaboration and regarded the relationships and trust among members as important.

In contrast, there are shortcomings in the research on a PLC. First, there was no clear definition of a PLC. The above studies considered schools to develop PLCs only for school

improvement so that most PLCs were K-12 schools. However, teachers can be members of various PLCs depending on how a PLC is defined. Second, the members of PLCs are poorly identified. If a school is regarded as a PLC, then who are its members? There are administrators, staff, teachers, and students in a school. Moreover, parents sometimes are involved in school affairs. Then who should be counted as members of the PLC? Since no research has clearly defined the members in a PLC, it is difficult to imagine a concrete vision for a PLC. Finally, the second shortcoming implies that the above research on a PLC focused on the community itself and not its members. I believe that a community and its members cannot be regarded as separate. The characteristics of PLCs originate from their members' interactions so that research on PLCs should include research on their members' learning. When studying PLCs, we need to consider the shortcomings of earlier studies.

Studies of Teachers' Learning and Development in Communities

The other approach to studying communities that has emerged is related to teachers' learning in small groups not limited by a school system. Researchers have studied teachers' communities because they provide a context for ongoing teachers' learning. In many efforts to understand teachers' learning and development, researchers suggested that teachers' communities such as *study groups* or *video clubs* are useful to support teacher learning and professional development (Birchak, Connor, Crawford, Kahn, Kaser, Turner, & Short, 1998; Brahier, & Schäffner, 2004; Hammerman, 1997; Secada & Adajian, 1997; Sherin & Han, 2004). Lesson study is also a kind of effort to investigate teachers' professional development in the context of communities. In this section, I review studies of teachers' *study groups, video clubs,* and *lesson study* related to teachers' learning and development.

Study Groups

Brahier and Schäffner (2004) believed that a study group would assist reform processes in teaching and learning mathematics because it gives teachers opportunities to learn and grow professionally according to previous studies of study groups. They used mixed methods to examine the effects of study groups to reform teaching practice in mathematics. They investigated the progress of three study groups consisting of total 16 teachers coming from different elementary schools to participate in the SUCCESS (Suburban-Urban Collaborative for Classroom Educators in a Study-group Setting) program for three years. Using data from pretests and posttests of teachers' knowledge and attitudes toward inquiry-based teaching, classroom observation, and focus interviews, they found the following: The participant teachers gained an understanding of inquiry-based learning; the teachers had improved confidence in their teaching mathematics; and sharing ideas and concerns in the study group was helpful to the teachers. They concluded that "the study-group approach to professional development appears to be a promising tool for providing teachers with the information, experiences, and support necessary to make change" (p. 176).

Whereas the above researchers studied teachers' change in the context of study groups, Arbaugh (2003) attempted to understand the context of the study group itself in which teachers' learning occurred. She focused on understanding the value of mathematics teachers' participation in study groups and on important organizational aspects influencing continued participation. In a school-based study group, seven high school mathematics teachers discussed various topics about geometry teaching and learning and shared activities in their classrooms. Results indicated that the teachers believed that having the opportunity to cooperate with their peers was valuable for their professional growth, and some teachers showed increased self-efficacy as a result of

study-group participation. Arbaugh's study illustrated the participant teachers' thinking about their experiences in the study group. In addition, the teachers' opportunity to collaborate with their peers on a regular basis suggested the possibility of using study groups as a form of professional development for high school mathematics teachers. This research helps teacher educators understand teachers' thoughts about their participation in study groups.

Many different terms are used to describe teachers' communities: "teacher inquiry groups" (Hammerman, 1997), "professional study groups" (Mitchell, 1989), "teacher support groups" (Rich, 1992). However, the purpose of those groups coincides with the purpose of PLCs. Arbaugh (2003) defined *study group* as "a group of educators who come together on a regular basis to support each other as they work collaboratively to both develop professionally and to change their practice." The difference between her notion of study group and the PLC that earlier researchers looked at is the extent of the community. Arbaugh's study group means a group of educators who work together, but it is not limited to members of the group in a school. Although she investigated a school-based study group of mathematics department teachers in her study, according to her definition, the study group can consist of teachers from different schools or different districts. In this sense, the study group that Arbaugh (2003) defined is a kind of learning community of teachers and is not far from the notion of a PLC that I defined earlier.

Video Clubs

Sherin and Han (2004) investigated a video club as a context for teacher learning. They discussed changes by the teachers who participated in the video club. To examine how teachers' change occurred through participating in the clubs, they investigated ten video club meetings that took place once a month during an academic year. The club consisted of four middle school mathematics teachers and two researchers. Sherin and Han described the first and seventh video

club meetings to show what happened in the clubs. In the first meeting, the video club teachers watched two of the teachers' lesson videos after school, and they commented their notices about interactions in the lessons. In the seventh meeting, the teachers had a day-long meeting to talk about teaching and learning using their lesson videos. In their results, they claimed that participating in video clubs prompted teachers to think more about pedagogical issues related to student conceptions and understandings compared with focusing on only pedagogical issues in the initial meetings. By having teachers analyze their classroom interaction in a video club, the researchers found that the teachers became more analytical about students' thinking and about classroom interaction.

Sherin and van Es (2005) also used video club meetings to discuss video's usefulness as a tool to help preservice and in-service teachers *learn to notice*[2] in their classrooms. They reported two related studies that used video and discussed changes by using video. The first study came from the video club meetings of four middle school mathematics teachers, and the second study came from six preservice teachers' participation in three hour-long sessions. From two studies, they found changes in what the teachers noticed: The first study found a shift of discussion topic from pedagogy to student thinking, and the second study found that teachers became able to identify crucial aspects of the video segments of classrooms. They claimed watching video with other teachers together helped teachers *learn to notice*. Their study showed not only how to use video in teacher education but also how to use video clubs for teachers' professional development.

---

[2] They defined a notion of "notice" as those things teachers identified as noteworthy in a teaching situation, those instances in which teachers made connections between the classroom events and principles of teaching and learning, and those instances in which teachers used what they knew about the classroom context to reason about the situation in the video.

Lesson Study

Japanese teachers engaged in lesson study to improve their teaching and to help their students' learning experiences. Teachers planned lessons together, observed those lessons conducted in actual classrooms, discussed their observations, and revised the lesson plans through lesson study (Fernandez & Yoshida, 2004). After Makoto Yoshida used *lesson study* as a subject for his dissertation in the early 1990s, researchers in the United State had a growing interest in it s. Since *lesson study* has been valued as a form of professional development for teachers in Japan, the efforts were made to apply it to American teachers and schools so that they could also benefit from lesson study. Since it involves in teachers' professional development and collaborative efforts, *lesson study* can be considered as creating a learning community of teachers. For example, Fernandez and Yoshida (2004) identified six steps of the lesson study process: collaboratively planning the study lesson, seeing the lesson in action, discussing the lesson, revising the lesson (optional), and teaching the new version of the lesson (optional). Those steps included characteristics such as collaboration and shared vision and activity. Hence, lesson study has elements of a learning community of teachers. Moreover, since lesson study traditionally was conducted by teachers regularly in schools for their professional development, it is also a kind of PLC.

Other Studies about Teachers' Learning Communities

Using the various terms about learning communities of teachers, researchers obtained meaningful results for teacher learning. For example, Little (2003) investigated the intellectual, social, and material resources of professional communities through teachers' interactions in a community. She pointed out that there were few studies focusing on the teacher development that exists within ordinary daily work and few studies investigating teacher learning in the

ordinary interactions of working together. Thus, she planned to find the resources for professional communities through investigating teachers' daily learning. She attempted to describe teacher learning in workplace collaboration and explained the specific interactions and dynamics of the professional communities, for example, through an English department meeting, an Algebra Group of mathematics teachers, and a weekly meeting of the Academic Literacy Groups in two high schools. She investigated representations of classroom practice as resources for a professional community. This research showed how teachers make instructional improvements outside the classroom and claimed that professional communities contribute significantly to instructional improvement and school reform. This research is meaningful in that it focused on teacher interaction in ordinary workplace contexts, not on formally organized professional development activities.

Previous research on teachers' communities not only provided information about teachers' learning and development but also pointed out concerns and difficulties in creating a teachers' community. For example, Arbaugh (2003) addressed this research question, "What organizational aspects of the study group were important for continued participation?" She summarized the responses of the teachers in study group meetings according to four aspects: released time, requirements outside of study group meeting time, frequency and length of study group meetings, and number of study group members. Those responses reflect not just organizational aspects of the study group but also difficulties in creating a learning community as an organization of teachers.

Hammerman (1997) examined the experiences, beliefs, and concerns of seven teachers who participated in the Mathematics for Tomorrow (MFT) project. The project was planned to help a small set of teachers become teaching facilitators and to continue the inquiry groups after

project funding ended. The participant teachers came to understand a facilitator's role requiring knowledge about mathematics and teaching and having relationships with colleagues. However, in Hammerman's study, the participant teachers showed concerns in working as facilitators in a group. Some teachers felt that the facilitator needed more knowledge to lead a group. Other teachers showed a slight hesitation in perceiving their colleagues as experts and described the importance of shared leadership of inquiry groups as a way of resolving the difficulty. Their concerns involved issues of power, relationships, and the leadership role in the context of collegial collaboration. Rather than studying teachers' community directly, Hammerman gave hints of what kinds of difficulties teachers would have in a learning community.

Many of the studies that I reviewed about teachers' learning and development in learning communities so far have been conducted using a sociocultural perspective. They emphasized communities of teachers and change in teachers' participation. The *communities* mean the contexts of teachers' learning and development, and the *participation* means not just attendance but all the interactions within the context of communities. Although most studies were based on the sociocultural perspective, they were insufficient to discuss how the members' learning can be explained by their theoretical framework. However, Kazemi and Franke (2004) showed a good example of how to use the sociocultural perspective in members' learning. Kazemi and Franke studied teachers' group work in terms of a transformation of participation. They examined the evidence of teacher learning in the participation of a workgroup of elementary teachers. During the school year, ten teachers in an elementary school and a research team met regularly and discussed problems brought up by the research team. Visiting classrooms once or twice between workgroup meetings, the researchers provided ongoing support and built relationships with the teachers. They found two shifts in teachers' participation: a greater focus on children's thinking

and development of instructional trajectories in mathematics. Their study shows that a teachers' community can help teachers change in their thinking about children's mathematics and teaching.

As Rogoff (1994) discussed, researchers cannot understand the learning and interaction of members without an understanding of the sociocultural perspective. Therefore, it is necessary to understand that the relationship among members and the value from their practice in the communities are crucial issues in studying communities of teachers using a sociocultural perspective.

Learning Communities and Partnerships Between Schools and Universities

There exist a lot of ways to form learning communities for teachers. Teachers can form study groups with assistance from professional developers, or school districts can assist teachers to create group activities. As a way of developing teaching and learning, school-university partnerships have attracted considerable attention from educators since the 1980s. Partnerships have several purposes such as pre-service teacher preparation, in-service teacher development, and research. The co-operation between universities and schools is often challenging because of their different cultures and traditions. However, since these partnerships are based on collaboration in communities of teachers in schools and in universities, research on partnerships provides useful information on developing learning communities for teachers.

Professional Development School Partnerships

The fundamental changes to American public schools in the 1980s stressed academic rigor and teacher accountability and emphasized professionalization. This emphasis created the Professional Development School (PDS) (Frampton, Vaughn, & Didelot, 2003). In the wave of reform focusing on the professionalization of teaching, the development of new schools was emphasized to assist preservice teachers' preparation and inservice teachers' professional

development. The schools created by the reform were “clinical schools,” “professional development schools,” and “schools of pedagogy” using the relationship between public schools and universities.

The Holmes Group (1990) proposed the Professional Development School (PDS) partnerships in which schools and universities would collaborate as teacher education units. According to the Holmes Group, the PDS aimed for practicing teachers and administrators to work together with university faculty in partnerships through “(1) mutual deliberation on problems with student learning, and their possible solutions; (2) shared teaching in the university and schools; (3) collaborative research on the problems of educational practice; and (4) cooperative supervision of prospective teachers and administrators” (p. 56). At various sites around the country, the goals varied from the Holmes Group model, and the result was different interpretations and applications of the goals. Although the format and impact varied by school, the PDS partnerships naturally helped to create learning communities through collaborative efforts of teachers and university faculty.

The National Council for Accreditation for Teacher Education (NCATE, 2001) described that professional developments schools as “innovative institutions formed through partnerships between professional educational programs and P-12 schools” (p. 3). PDSs are important because they support students’ learning and teachers’ professional development by aligning them. NCATE made standards for PDSs based on reviewing the literature about PDS and conducting field-tests. They discussed key concepts embedded in the Standards such as integrating professional and student learning, focusing on students’ learning, learning in the context of practice, and developing learning communities. NCATE identified three stages of the process of PDS maturation: the pre-threshold stage, threshold stage, and quality standards stage (Frampton,

Vaughn, & Didelot, 2003). According to NCATE, the quality standards stage has the following critical attributes: learning community, collaboration, accountability and quality assurance, organization, roles, and structure, and equity. Hence, PDS partnerships can not be discussed without examining learning communities.

Although not all schools participate in the PDS partnerships developed by the Holmes Group, they can have various connections with universities. These partnerships can be a good source of developing learning communities of teachers because they are based on collaboration and constant activities such as small group meetings with an agenda. In this study, I focused on a learning community of teachers based on a partnership between a school and university to find better ways to facilitate teachers' professional development.

Research on Teacher Learning in Partnerships

There is some research discussing teachers' learning using the PDS partnership. Snow-Gerono (2005) identified shifts in teachers' thinking about communities. Throughout a yearlong internship in the PDS program, she observed the interns and mentor teachers to find evidence of the benefits of a PLC. The PDS teachers recognized the growth of collaboration and community in the shift from traditional isolation in schools to a community-based culture. They also expressed their desire to engage in collaboration and inquiry in communities. In addition, the teachers recognized the need for an open environment to ask questions and the need for assistance to cultivate a culture of inquiry in the PDS. In her study, Snow-Gerono used the term, *professional learning community*, without defining the notion when discussing PDS teachers, but her study showed that partnerships are related to learning communities of teachers. Moreover, she pointed out that most teachers "seek out school colleagues and people as resources for their inquiries, but they do not have formal, structural agendas for teacher inquiry learning

communities" (p. 253). In this sense, it is necessary to create formal and structured learning communities of teachers for assisting their development.

Fisler and Firestone (2006) examined teacher learning in a school-university partnership. They addressed two research questions about the evidence of teacher learning in the context of a school-university partnership and about the variation of teacher learning. They conducted their research in an urban school district. They created five study groups having specific objectives, observed the study groups and other partnership-related meetings, and conducted surveys and interviews including teachers, university faculty, and school and district administrators for three years. To understand the variation between teachers in terms of their learning, they categorized participant teachers into three groups: restructurers, reviewers, and resisters. They found changed attitudes on involvement, changes in relationships with both the school administration and university faculty, and some increased interest in teacher collaboration. Their study focused on teacher learning, and further, it showed the effects of a school-university partnership. Although Fisler and Firestone addressed concerns such as social trust, they stated that partnerships can support teachers' participation in school decision-making processes and new instructional ideas and can increase willingness to work with colleagues and university faculty to develop teaching.

Like the research of the Holmes Group, the research of Fisler and Firestone is based on learning communities of teachers including university faculty even though Fisler and Firestone called these communities *partnerships*. Since a school-university partnership is based on the collaboration of teachers and staff in schools and faculty in the university and since the aim of this collaboration is teacher development, it is essential to relate such partnerships to the learning communities of teachers. In other words, a school-university partnership is a good resource for research on communities of teachers. In addition, research on partnerships can also provide

information about teachers and teacher educators because the partnerships consist of teachers and teacher educators as a team. Hence, research on partnerships helps us understand not only teachers' learning but also teachers' learning communities.

Issues in School-University Partnerships

Although building partnerships provides a good opportunity for teacher development, there are some issues and concerns that remain unresolved. Collaboration between schools and higher education is difficult due to differences in status, roles, rewards, and perceptions (Nystrand, 1991). Although school-university partnerships can provide support for each partner, it can be difficult for teachers and university faculty to build partnerships in an equitable and democratic manner (Stoddart, 1993). Since partnerships are based on two or more institutions' collaboration, these institutions need to make an effort to resolve issues relevant to collaboration.

Stoddart (1993) discussed the top-down or bottom-up relationship as a challenge in partnerships between schools and universities. From a PDS project at the University of Utah, he discussed the PDS in terms of the vision, the change process, and the organizational structures. The project conducted a series of staff development seminars with elementary teachers in two PDSs. In the seminar, a university faculty member introduced constructivist theory, chose short readings related to the theory, and showed videotapes of classrooms using this approach. Stoddart called this a top-down approach in that the university faculty member delivered information to the school. The seminar was unsuccessful because the PDS teachers did not find the theory personally relevant so the university members' examples did not convince them. Another faculty member tried a bottom-up approach to the PDS teachers, in which the faculty member developed the research process and issues with the PDS teachers. However, this approach was not successful either, because the teachers could not clearly define the research

topics nor could they understand how to process the research. This result illustrates challenges in the process of collaboration. For successful partnerships, partners need to think about the different approaches and choose the way that best suits the purpose of the partnership.

Lefever-Davis, Johnson, and Pearman (2007) discussed two aspects of school-university partnerships: egalitarianism and empowerment. Public schools traditionally structure relationships with a university according to the needs of the university and play a passive role in the relationships. Like Stoddart (1993), Lefever et al. discussed a collaborative process in partnerships. Describing and contrasting the partnerships between a university and two schools, they addressed the issue of egalitarianism. They described two elementary schools, one of which failed to renew the partnership and the other school of which remained as a PDS. They claimed that a key difference between the two schools was in developing egalitarian communication stances. Since the school that failed to renew the partnership had constant changes in participants and leaders, they could not continue the same partnership, so they were unable to shift from a hierarchical to a more egalitarian relationship. The other school had similar changes, but both the university member and the principal who had guided the partnership left the school at the same time. Hence, the timing of major players' departures affected the egalitarian communication in the partnership. Lefever et al. showed that a partnership needed to develop egalitarian communication in order to function effectively. Recognizing how and whether egalitarianism is achieved among partners can influence the creation of more effective partnerships.

As Fisler and Firestone (2006) discussed, social trust and teaching efficacy are critical characteristics related to teacher learning that originated from professional development efforts. Social trust is confidence in the reliability of individuals and social relations and involves a person's decision of whether to engage in activities. Teaching efficacy influences the amount of

effort that a teacher will show in the face of obstacles. The results of Fisler and Firestone's study (2006) showed that partnership requires collaboration with social trust and positive efficacy about teaching. Since school-university partnerships are based on social interactions with teachers in schools and faculty in universities, the relationship among partners may affect what the teachers learn within a learning community using partnerships. Efficacy about teaching may be also a factor of individual teacher's participation in community activities using partnerships, and the individual's participation may change partnerships.

As the earlier studies showed, there are several issues in developing school-university partnerships such as egalitarianism and social trust. To build a learning community using a school-university partnership, partners in schools and universities should anticipate and attempt to resolve the issues that can possibly occur.

CHAPTER 3

METHODOLOGY

Huffman and Jacobson (2003) studied educators' perceptions of a PLC using quantitative research methods. They showed the core processes of the PLC and determined perceived relationships between the core processes and the leadership style of the principal; however, they did not describe how important the meaning of the PLC was for the participants and how the PLC contributed to the professional development of the participants. I wanted to understand how the members in a PLC perceive their PLC and how they learn and develop in it, so I used narrative inquiry (Polkinghorne, 1995) and case study (Dyson & Genishi, 2005) in a qualitative research design.

Polkinghorne (1995) discussed two types of narrative inquiry: paradigmatic-type narrative inquiry and narrative-type narrative inquiry. The paradigmatic type collects stories as data, categorizes the data to identify the plot of the stories, and produces knowledge of concepts, whereas the narrative type collects descriptions of events and actions, uses analysis to make storied accounts, and produces knowledge of particular situations. I followed the first type of narrative inquiry for generating data relevant to my participants' thoughts about their learning community. The members identified the meaning of their learning community as a consequence of their activities, and their reflections and my reflective narrative about the members can offer windows into understanding the cultural and social meanings of a professional learning community.

Partnerships in Reform in Mathematics Education (PRIME)

This study was conducted as part of Partnerships in Reform in Mathematics Education (PRIME)[3] 2005-2006, an NSF-funded professional development effort for high school mathematics teachers in northeast Georgia. From 2005 to 2006, PRIME aimed to build a learning community and to promote partnerships through interactions among inservice teachers, preservice teachers, and university supervisors. With a cooperative effort between a university and local schools, PRIME researchers attempted to understand the role of professional learning communities in the professional growth of teachers who work with student teachers and to look at the construct of mathematical knowledge for teaching within the learning communities. For the purpose of the project, PRIME called the inservice teachers *mentor teachers*, the preservice teachers *student teachers*, and the supervisors *university teachers*. The mentor teachers in the high schools voluntarily participated in PRIME so that they became members of the learning communities consisting of mentor teachers, student teachers, and university teachers. As a part of this project, mentor teachers from 12 high schools and student teachers and university teachers from a university met in each cluster[4] every week and discussed classroom events connected to mathematics teaching and learning or issues raised by the members of each cluster during the 2006 field experience period.

Traditionally the relationship between mentor teachers and university teachers is not as strong as the relationship between mentor teachers and student teachers in partnerships because student teachers work with mentor teachers every day during their field experience, but university teachers visit and talk with mentor teachers a limited number of times during the field

---

[3] Work on this research was supported by the National Science Foundation Grant ESI-0227586. Any opinions expressed here do not necessarily reflect the views of the National Science Foundation.

[4] The PRIME researchers refer to each school meeting as a cluster meeting.

experience period. However, PRIME intentionally tried to strengthen the interactions between mentor teachers and university teachers compared to traditional interactions as shown in Figure 3.

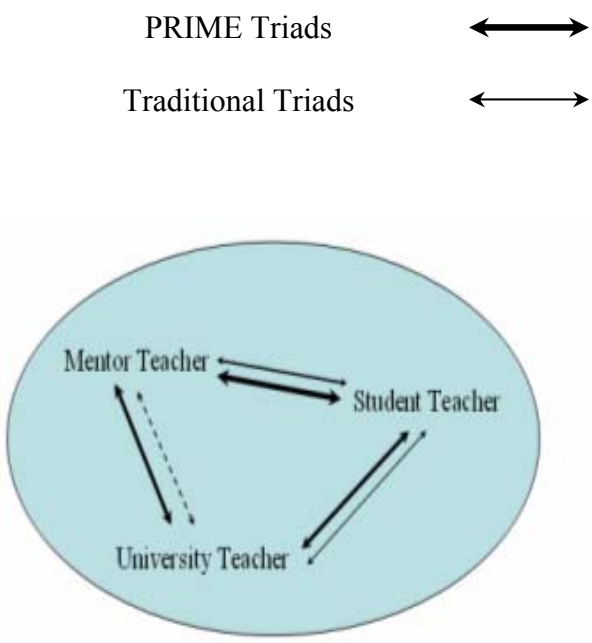

Figure 3.1 Interactions among teachers within a cluster.[5]

University teachers were both members of the cluster and researchers of that cluster. One or two university teachers went to one of the high schools to supervise student teachers and participated in the cluster meetings to facilitate discussions. Besides the activities in the clusters, all university teachers gathered every week at the university to discuss their work, such as what they would or should do in their cluster and the difficulties that occurred in their cluster meetings. Student teachers attended a methods class for their field experience and had assignments to take notes about their experiences, to make lesson plans, and to videotape their own class teaching

[5] From "Building professional communities of mathematics teacher developers," by T. Boerst, D. Hembree, R. Rubenstein, L. Sleep, and P. Wilson, 2005, Paper presented at *the Research Presession of Annual Meeting of National Council of Teaching Mathematics,* Anaheim, CA. Reproduced with permission of the author.

during the 2006 field experiences. While observing their mentor teachers' classes and teaching, student teachers were asked to participate in cluster meetings by the methods course's instructor. Mentor teachers in each school helped student teachers learn teaching mathematics as a profession and advised them about school activities. As members of a cluster, they recognized their role of mentoring student teachers. In January 2006, all the mentor teachers were invited to gather to discuss the PRIME project and student teaching, and most of them got together and shared their ideas.

Participant Selection

I selected one cluster using *criterion-based sampling* (Goetz & LeCompte, cited in Merriam, 1998) in which participants are selected based on how well they match particular bases, criteria, or standards identified by the researcher. For the purposes of this study, my criteria for selecting a cluster were based on the earlier year's activities. I wanted to investigate a cluster meeting as a PLC that included mentor teachers, student teachers, and university teachers. Any school meeting could have been selected as a research site; however, each cluster had a different situation with regard to regular meetings, depending on the school and the members. My approach to the PLC was that the members would have shared activities or discussion through regular meetings. Another criterion for selection was that some of the participants had prior experiences in a PLC that was similar to the 2006 PRIME structure. If they did not have any experience, I needed more time to motivate them to participate in a community and to be familiar with each other. Hence, I looked at the previous year's data and was advised by university teachers who participated in the previous year. I believed I would get better data from the selected cluster and its members because the mentor teachers and university teacher had functioned as a PLC the previous year.

As a researcher, I worked with a university teacher at the cluster I selected. I identified seven possible participants: three mentor teachers, three student teachers, and the university teacher in the cluster. I first expressed my interest to the university teacher and asked her to help me with my study of the cluster. The university teacher agreed to participate; in fact, she drove me to the school site every time she visited the student teachers' classrooms and cluster meetings, and we talked about many things that occurred in the classrooms and cluster meetings and with its members. Before the first meeting with the members, I sent e-mails to the others introducing myself as a researcher and explaining my research purposes. At the first visit, I met three mentor teachers and two student teachers and explained my research procedures as written in my research proposal. The third student teacher was contacted at the second visit because she was absent a few days of the first week of field experience. All of the cluster members agreed to participate in the study.

Context and Participants

Because Norris High School (a pseudonym) had been open only for 3 years when I conducted this research, there were only six mathematics teachers in the 9^{th}, 10^{th}, and 11^{th} grades, and the school was searching for more mathematics teachers for the next year, the 12^{th} grades. The school principal agreed that the mathematics teachers could participate in PRIME, and some of the mathematics teachers had participated in the cluster meetings the previous year. During spring 2006, three mentor teachers from Norris High School participated in PRIME. One of them, Ms. Turner and two of them, Ms. Perry and Ms. Robin, who did not participate in PRIME the previous year, were participants in this study (all names are pseudonyms). The university teacher, Gabby, went to the school to supervise student teachers and joined cluster meetings. She had been the university teacher for Norris High School in the previous year as well, so she had a

history with the mentor teachers. There were three student teachers, Tyler, Abbey, and Ella. Each student teacher observed his or her mentor teacher's classes and received advice from them in a general way. However, one of the requirements of PRIME was that the mentor teachers gather and discuss what their student teachers would do and how the mentor teachers would help their student teachers' activities before starting their field experience. Each student teacher had one mentor teacher during the period, but the mentor teachers encouraged their student teachers to observe and teach classes of the other mentor teachers or other mathematics teachers who had not participated in the project. Therefore, the members could discuss the student teachers' teaching experience not just for one class but for several different mathematics classes in cluster meetings.

All of the seven members of the Norris High School cluster met every Friday after school by their preference, and I always joined the cluster meetings as a researcher. We planned ten cluster meetings, but the ninth meeting was cancelled because of several members' absence. In the cluster meetings, the members generally discussed student teachers' work or questions for approximately one hour. All the student teachers brought copies of their work to each meeting and discussed what and how they did in class and how their students responded. The mentor teachers, university teacher, and I commented on the work or expressed our ideas about teaching and learning mathematics in the meetings. Student teachers also commented on each other's work. Mentor teachers were sometimes late to the cluster meetings because of their school duties. The university teacher was absent twice because she was attending professional conferences. On these occasions, I played the role of a university teacher in the cluster meeting.

Mentor Teacher Ms. Turner

Ms. Turner had about 9 years' experience in teaching mathematics at the time of data collection. She had been participating in PRIME for 2 years and was also participating in another professional development project, named Partnership for Reform in Science & Mathematics (PRISM). She had a master's degree in mathematics education and had been nominated for a teacher award given by the state. Norris High School switched mathematics teachers' classes every semester, and she taught geometry and math money management at the time of data collection. She was also the mathematics department chair that year and had been involved in several projects with the university. She identified herself as a constructivist and believed that her students could build their knowledge with her assistance.

Mentor Teacher Ms. Perry

Ms. Perry had about 25 years' experience in teaching mathematics and the time of data collecting was her first spring semester at Norris High School. She had a master's degree and a specialist degree in mathematics education. She said that she would like to study in a doctoral program in mathematics education in the near future for her career development. She participated in PRIME at that year and was participating in another professional development project, PRISM. At the time of the data collection, she taught Algebra-II and Advanced Placement Calculus. She was passionate about teaching mathematics and enjoyed her teaching and her students' learning. When I observed her class, she always smiled and encouraged her students to solve problems and to work as a group.

Mentor Teacher Ms. Robin

Ms. Robin had participated in PRIME at that year of data collection. This was her second year at Norris High School. She had been teaching mathematics for 11 years and was teaching

Algebra-I and SAT prep at the time of the data collection. Like other teachers, Ms. Robin was involved in several projects and committees. Since she had participated in a summer workshop about mentoring, Ms. Robin tried to emphasize the work as mentors at the cluster meetings. However, she did not talk much in the cluster meetings.

Student Teacher Ella

Ella had participated in PRIME since fall 2005. She had a bachelor's degree in mathematics and was working toward a master's degree in mathematics education. She was preparing for the certification test during her field experience to get a 6-12 mathematics teacher certificate. Ms. Perry mentored her. When I observed her teaching, I felt that she tried to listen to and understand her students' thinking. In cluster meetings, she tried to listen to other teachers' concerns and comments; however, she did not hesitate to express her opinions.

Student Teacher Tyler

Tyler was the only male student teacher in the mathematics department at Norris High School and had participated in PRIME for one year as a student teacher. He was working toward both a master's degree and in bachelor's degree in mathematics education simultaneously through a special option in the university's honors program. Ms. Turner mentored him. He was coaching football for high school students through his club activities for 4 years and liked to interact with students. He expressed great interest in students' work because he had limited knowledge of students' learning.

Student Teacher Ashley

Ashley was also one of student teachers who had participated in PRIME since fall 2005. This semester was her last one for her bachelor's degree in mathematics education. Ms. Robin mentored her. During the field experience period, she was searching a teaching job near her

hometown and was preparing for the certification test in order to get a 6-12 mathematics teacher certificate. Hence, she asked the mentor teachers and university teacher a lot of questions about searching for a job and about teaching as a career. She believed that acting friendly to her students was crucial in teaching so that her students saw her as a friend rather than a teacher.

University Teacher Gabby

Gabby was a third-year doctoral student who worked as a university teacher at Norris High School. She had 4 years' experience of teaching at the high school level and also had experience of teaching algebra and mathematics for elementary teachers at a local community college. Since she had participated in this school the previous year as a university teacher, Gabby knew all the mathematics teachers in the Norris High School well and was familiar with her role as a university teacher. She had great interest in the professional development of teachers and tried to encourage mentor teachers and student teachers to reflect on their students' work. She believed that reflection on students' work and analyzing the understanding behind it would help teachers' professional development.

Data Collection

To build the stories of members, I collected data from multiple sources including the audio tapes of nine cluster meetings, observation notes during and after cluster meetings, two interviews and open-ended questions in written format for each participant, and other documents (such as surveys from the PRIME project and student teachers' assignments of the university methods course). Informal conversations and e-mail conversations also contributed to the data. I audiotaped the nine cluster meetings and 14 interviews in total. The interview tapes were all transcribed.

Observation Notes

I observed the teaching of the student teachers during their fieldwork with a university teacher every week and, after that, discussed the teaching with the student teachers and the university teacher. I sometimes had a chance to observe the mentor teachers' teaching and the student teachers' teaching. I made brief notes about the class observations. As we drove out to the research site, I always asked some questions to the university teacher about the supervising or teaching that we observed. After coming back, I added notes about the discussion.

I participated in nine weekly cluster meetings and audiotaped the meetings. I observed all the participants' activities in the nine meetings and the relationship among the participant teachers within the meetings. The weekly meetings took place in an empty classroom of one of the mentor teachers after school for approximately one hour. During the meetings, I made observation notes about what videos or pictures the participant teachers saw, which I could not capture by audiotaping. I reflected on the discussion after coming back and took more detailed reflection notes about the weekly meeting.

Except the observation of cluster meetings, I have an observation note of the Spring PRIME gathering. All participant mentor teachers and university teachers met in the university before the beginning of spring semester and discussed how each member would contribute to the cluster meetings. I believe that this negotiate process allowed the mentor teachers to join in the planning of the cluster meetings. This observation provided me the information of initial participation of the mentor teachers and the university teachers.

Open-ended Questions in a Written Format

One week before conducting interviews, each participant responded to open-ended questions in writing. The open ended questions (Appendix) were designed to reveal the

participants' experiences and difficulties in the cluster meetings. This process encouraged the participants to reflect on what kinds of events were valuable for them. The open ended questions were sent by e-mail, and the participants reflected on what they had contributed to the cluster, what was valuable for them, and what difficulties they had.

Interviews

After getting all the written responses, during the last 3 weeks of the field experience (March 13 - March 31), I conducted a 30-minute and then a one-hour interview with each participant using a semi-structured format in order to identify (a) how the members in the cluster perceived their cluster, (b) what was valuable for them; and (c) what difficulties the members had in building a PLC.

The first interview focused on the meaning of community and the participants' role in the cluster meeting, and the second interview focused on the activities in the cluster meetings and difficulties in the activities. The second interview was conducted one week after the last cluster meeting. I distributed a summary of the discussion in the cluster meetings that I had made (Table 1), and I used short clips of the audiotapes of the cluster meetings in the second interview as needed to remind the participants of what was discussed in the meeting. The discussion was also important data for understanding the members' participation in their cluster meeting. All the interviews were audiotaped and transcribed. In addition, the participants provided follow-up data through informal conversations and e-mails.

Table 3.1 Cluster meeting activities

Cluster meeting no.	Topics/activities
1	Tasks and discussion about the alternative assessment Brainstorm cluster meetings and student teaching Negotiating next meeting agenda
2	Discussion about mathematical situation brought by student teachers (a students' class note and copies of test problems) Negotiating next meeting agenda
3	Discussion about a student's question whether all procedures in mathematics can be reversed. Sharing about students' struggles in understanding mathematical concept Negotiating next meeting agenda
4	Watching two student teachers' lesson video clips Discussion about teaching and learning in the video clips Negotiating next meeting agenda
5	Watching a student teacher's lesson video clips Discussion about teaching and learning in the video clips Sharing about teaching procedures and concepts Negotiating next meeting agenda
6	Discussion about mathematical situation brought by student teachers (students' understanding showed in written answers and about trigonometry concepts) Sharing about materials made by teachers Negotiating next meeting agenda
7	Sharing ideas came from a professional development workshop Negotiating next meeting agenda
8	Discussion about mathematical situation brought by student teachers (connection between concept and representation) Sharing activities done using observation material came from the professional development workshop Negotiating next meeting agenda
9	Final reflection (important moments among lessons or cluster meetings)

Other Documents

All the participants of PRIME responded to a survey. This questionnaire focused on evaluation of participation in PRIME. I asked my participant teachers to give me the copy of the survey and it allowed me to understand their reflection on activities in PRIME including the cluster meetings. Since the student teachers attended a methods course connected to PRIME during the field experience, the university teacher tried to help the student teachers do their assignments using the cluster meeting discussion. The student teachers gave me copies of their assignments when they submitted them in the methods course. Hence, although the survey and assignments are not the primary data in this present study, they did help me understand the participants.

Data Analysis

I used the *analysis of narratives* (Polkinghorne, 1995) when generating the analysis of my participants' perceptions, values, and struggles in their community. I used a paradigmatic-type narrative inquiry, which comes from Bruner's (1985) distinction,[6] "The paradigmatic type uses an analytic process that identifies aspects of the data as instances of categories" (Polkinghorne, p. 21). The data I collected were the sources of storied narratives including all written documents and oral statements from interviews. I organized the storied narratives by the general notions appearing across the data and wrote several episodes as part of the analysis. The purpose of this analysis of narratives was to describe members' thoughts in a learning community, not to assess their learning community.

At the same time, I developed a case study of the cluster meetings of student teachers, mentor teachers, and the university teacher. Dyson and Genishi (2005) claimed that identifying

[6] Bruner (1985) developed distinction between paradigmatic and narrative modes of thought.

boundaries around the times, spaces, and people of interest helps us make a case. In this present study, I selected a case, weekly cluster meetings as a learning community of teachers. This case had embedded within it the cases of the seven participant teachers, but I studied the learning community as a case, not the individual teachers as cases. The learning community included the relationships among the seven members and the activities from the field experience period. I investigated the learning community in which the participant teachers' learning was embedded using qualitative research methods. Hence, the present study is a qualitative case study.

The data collected were initially assembled into electronic word processing files. I classified the data into three sections according to my research questions: understanding of their community, value of their community, and difficulties in the community. Then, to construct narratives of those three topics, I selected important words or sentences and used bold type to differentiate them from other raw data. As a result, the narratives from the selected data represent my analysis of the three topics. Here is an example of data analysis.

> E: Okay, normally in the cluster meetings, we **get together** and we always focus **each week**. We've done alternative assessment, we've done student discourse things like that. We have **focused to talk about** coming with **student work or some interesting things that happened within the week**… So generally the cluster meetings **get together, brainstorm ideas, and talk about our teaching,** talk about **ways to make ourselves** each other **better.**

This is Ella's first interview piece about what happens in cluster meetings. After bolding the words and sentences that I considered important keywords to analyze Ella's thoughts about the cluster meetings, I read other data, and found similar keywords in this data. Hence, I reorganized these words and made sentences.

> Analysis of narratives: We got together each week and focused to talk about interesting things that happened within this week or students' work in classroom. Generally, we all got together, brainstormed ideas, and talked about our teaching and ways to make us better.

The sentence showed not only a description of what Ella did in the cluster meeting, but it also implies how she thought about the cluster meeting. Her words "get together" showed one element of recognizing the cluster meeting. In the follow-up e-mail response, I asked her about how she got to know other student teachers in her middle school field experience[7], she responded, "I know the three other people who were in the classroom with me, and a few of the other teachers who were in the middle school, from seeing them in the hallways." Whereas Ella knew other student teachers just from seeing them in the hallways in the middle school field experience, regular meetings were an important element in the cluster meetings. In fact, she had a meeting every week to discuss teaching with the other student teachers and mentor teachers. In the later data, she said the cluster meeting is a kind of learning community. If the meeting had not occurred regularly, Ella might not have thought of the cluster meeting as a learning community. Getting together regularly is a crucial activity for organizing the cluster meeting and a factor of being a learning community.

Her next words about discussion topics also explained the activities in the cluster meeting. What the members do is important to build a learning community. In addition, in the 9th cluster meeting and in her second interview, Ella stated that the purpose of the cluster meetings was to make herself and others better teachers. She had a vision of the activities, and that was also an element of a learning community. From my observation, Ella tried to reflect on what we

[7] After 10-week field experience in the high school, student teachers had 2-week extended field experience in different middle schools.

discussed in the cluster meetings. In the 7th cluster meeting, the university teacher brought up observation materials from a professional workshop and recommended using these materials in the classroom. Only Ella and her mentor teacher tried to use this material and discussed that experience in the 8th cluster meeting. Ella recognized the cluster activities were valuable to make herself a better teacher. Hence, I constructed the analysis of narratives from the triangulation of data. It showed Ella's thoughts about the cluster meetings as a learning community: regular meetings and shared activities with a vision.

I constructed the three narratives, one corresponding to each research question, using this process of analysis of narratives. The words in the episodes were not direct quotations of my participants' words. However, the constructed quotations help me understand the members' perceptions about their community, the value of community, and difficulties building a professional learning community.

Limitations of the Study

This study has some limitations in the findings, some of which came from the research design. One limitation arose from the focus of the study, which was to investigate teachers' interaction *within* the cluster meetings. Because of this focus, this study could not capture the teachers' interaction outside of the cluster meetings. The PRIME project aimed to build a partnership through various activities such as a secondary mathematics methods course, a field experience course, student teaching, and a professional teaching seminar. Hence, the teachers in the cluster meetings had a variety of interactions: the student teachers interacted in the field experience course and the methods course, the mentor teachers interacted with each other in their school, and the university teacher interacted with other university teachers in the professional

teaching seminar. However, because this study focused on the interactions *within* the cluster meetings, I did not analyze or discuss activities *outside* the cluster meetings.

The other limitation came from the time spent in collecting data. I spent one semester to investigate the cluster meetings. Building a community takes time because the members need time to build trust and collaborate with each other. How to build social trust among members and how to develop collaboration are significant concerns in building a community using a partnership (Fisler & Firestone, 2006; Stoddart, 1993). Data collection should have taken place over one year in order to investigate the process of changing community because the school curriculum or systems change by an academic year. If the cluster meetings had continued for a full academic year, I might have observed different perceptions, values, and difficulties. My data collection did allow me to show part of the process of building a learning community.

Another limitation derived from the research questions. The research questions focused on understanding the participant mathematics teachers' activities in the cluster meetings as a learning community. Hopefully, the activities in building the community influenced their teaching practice, but that influence was beyond the scope of my research questions. Thus, I investigated what activities in the community the mathematics teachers found valuable, but I could not investigate the impact of the valuable activities on their teaching practice or on their knowledge about teaching and learning.

CHAPTER 4

FINDINGS

The purpose of this research was to understand teachers' perception of a professional learning community and how they valued community activities by providing a learning community through a partnership with a school and a university. Universities need to educate preservice teachers for a certain period and connect their teacher education program to K-12 schools. Preservice teachers go to the specific schools and learn teaching as a career through working with inservice teachers. They observe inservice teachers' classes and get advice about teachers' work in schools. Universities help the learning of preservice teachers through the advice of supervisors. As time goes by, preservice teachers have the chance to teach students for several hours. Although researchers study this process of field experience in terms of preservice teachers' learning, there is little research on the communities that preservice and inservice teachers and supervisors construct during the field experience in schools. The focus of my study was to explore the value of a learning community for student teachers, mentor teachers, and university teachers.

Generally, there are no meetings among student teachers, mentor teachers, and university teachers related to a same subject in schools during the field experience period. In a sense, the cluster meetings in this study were a new venture. The cluster meetings existed temporarily; however, the schools and inservice teachers continue to take preservice teachers every year, and universities also need supervisors to support preservice teachers. PRIME focused on this partnership between universities and schools. From the perspective of the partnership, the

communities exist constantly and are important sources for the development of teachers and teacher educators in mathematics.

In this chapter, three narratives were developed to show the cluster members' understanding of their community. Narrative analysis was used to reconstruct conversations with a group of community members. Describing the members' reflections on their cluster meetings helps to understand their learning community and to find ways to use partnerships effectively in building a professional learning community. I considered the perception and value of the community and difficulties in building the community from the perspectives of student teachers in Narrative 1, of mentor teachers in Narrative 2 and of a university teacher in Narrative 3.

Narrative 1: Student Teachers' View of the Community

Question: During your student teaching period, you have cluster meetings. Can you explain about the cluster meetings?

Ella: They were required for student teaching. We got together and focused on some interesting things that happened during the week. Gabby and you were the people who got to start and came up with the topic for each week. Mentor teachers were inservice teachers, and student teachers were people who were trying to benefit from the other people's opinions. But I don't feel like I have to refer to mentor teachers' opinions, and I feel totally comfortable putting in my own opinion. Generally, in the cluster meetings, we all get together, brainstorm ideas, and talk about our teaching, talk about ways to make ourselves better.

Tyler: Instead of saying it was Gabby's cluster meeting, as the semester went on, we all took a part of the planning and how we would go and just the direction for each week and how a specific cluster meeting went. We have had a focus on one specific question or theme for each

cluster meeting each week. We were trying to bring in student work, to look each other's videos, to think about something specific to a class. One week, I brought in something that I did in class, and another week, my role was just to listen to everyone. Basically the biggest role that we all had is sharing our thoughts and trying to learn from each other to become a good teacher.

Ashley: Cluster meetings were required and gave us an opportunity to get together with all student teachers and all mentor teachers, discuss ways to look at certain aspects, and compare different experiences. It kind of compares each other's opinion. For example, when I brought up one thing in my class, they had so many different suggestions for it and looked at it in different ways as well. As student teachers, our role is to supply and bring certain things that allow for discussion. Gabby would be one sort of a leader, but you and Gabby posed questions, forced us to look at it at a deeper level and then keep discussing it. In the cluster meetings, we are all math teachers. We have the same role in what we are doing.

Question: I defined a learning community as having a purpose, having some shared experience with regular meetings. Have you participated in a learning community other than this cluster meeting? How is the learning community different from this cluster meeting?

Ella: I am a member of a scholarship program. We have three yearly meetings with seven current students or younger teachers and talk online on a discussion board about things we've noticed and need to work on. It was really similar to cluster meetings in getting together, brainstorming ideas, and learning how to make ourselves better. The difference is that we tended to get really in depth in our conversations in the program meetings because we had a lot more time, normally three days at a time.

Tyler: I'm thinking about coaching football. That wasn't talking about the classroom; we're talking about football. We met every Sunday. The staff was very involved, very respectful, wanted to know what each other thought about how things were going. They made me know from the beginning that I'm part of the staff, and there was a little more fixed role and more hierarchy in the coaching team. Similarly, in cluster meetings, mentor teachers never made it feel like we were just the college kids here to learn. The biggest difference is we are all coaches in the coaching staff. Whereas, in our cluster meetings, there was separation of members, mentor teachers and student teachers, in that we're in different positions; they are experienced teachers. Obviously we are not equals; we have a lot to learn from the mentor teachers, but it was never like we were their subordinates.

Ashley: I took a cryptography class, and the class was a kind of learning community. There was a group of five or six of us. We got together a couple of times every week, and all learned from each other. I would say we are all the same level. Even though we had different levels of understanding, in that it was beneficial to everyone. The similarity is that in the cluster meetings, we're trying to find ways to make better teachers, and in the study group, we're trying to find ways to make better students. My study group had one common goal of understanding the material and getting the same right answer, whereas the cluster meeting shared our different experiences, not looking for a certain right answer.

Question: What is a professional learning community?

Ella: I would say we have an informal and a formal sense of a professional learning community. For example, the math department at school could be a professional learning community in an informal sense because math teachers are able to talk about something that happens in class to each other in the hallway. It can be a sort of formal community that you meet

on a regular basis and have specific topics to talk about. There may be an issue of the freedom to talk about the issues that happen in class. I think the main thing about professional learning communities is to make yourself better, and in the sense, the cluster meeting is a professional learning community.

Tyler: I almost think that cluster meeting is a professional learning community, not just a learning community, because it was in a professional environment. In cluster meetings, the student teachers' goal was to become good teachers, and the mentor teachers helped us in a professional sense. I think a professional learning community has a goal of developing professionals. More important than who is involved is what you involved for in a professional learning community.

Ashley: I think that it is based on our interaction and our experiences. I would define a professional learning community as something that made people share experiences and look at a different perspective on things to try in a professional environment; for example, a high school or cluster meetings. In cluster meetings, we're all at the same profession at the same place. We discussed things that happened in the profession and talked about how we can be a better teacher. I think that we made up a professional learning community. Who makes it up could be a matter of thinking as a professional learning community. For example, children prefer to get together, but that's not a professional learning community.

Question: Among the cluster meetings, if you could choose one day or discussion, what was it and why?

Ella: The discussion of Gabby's material was informative for me. We talked about what constitutes student discourse and how to make it better and how to avoid hijacking the conversation. I felt I was changing from more teacher-centered to more student-centered during

my student teaching. The specific observation protocol that Gabby gave us focused on one specific thing to look for and how to notice classroom discourse. Ms. Perry and I used the materials during my lesson. When students were working in groups, she said to me aside, "I think you're in the focus of this conversation. You're the one rehashing everything that the students have said. Just let the students talk." If she hadn't had that material there, that might not have been something that she said to me. Moreover, to spend time discussing student discourse in the cluster meeting, I was able to focus more on my students' discourse during the following weeks.

Tyler: It was an assessment that Gabby brought in. We discussed why or how much credit we would give in the solutions. I think that we got into good mathematics. It was also important to hear different perspectives about what the other experienced teachers thought. This was more valuable in a problem assessment. One thing is that you have to be flexible in how to grade. There is no right way to do a score. The other thing is to make sure there is the connection between what we want to assess and the score that we give them. I learned that teachers are consistent in grading what they want to assess and in giving students credit for what they know instead of finding out everything the students did wrong.

Ashley: We talked about our mathematical situations that we had or situations that were brought up by our students in classes, or how we responded to it. Our mathematical situations promoted discussion about how other people would have approached it. It was interesting to see what they said because it made me think of the best way that I approached it or a different way and what would have been the best for the students. I think that it is important that if teachers were asked a question and they didn't know the answer right then, they need to research the question, come back to it and have a good explanation for the students. The discussion in the

cluster meetings made me think, for example, if it was the best way that I approached it or if I could have done it differently or what would have been the best for the students.

Question: What was valuable in being in the cluster meeting?

Ella: We all had sort of common experiences, but we all had our own perspectives to bring to it. The cluster meetings put us all in an environment where we had to discuss pedagogy and ways to improve our teaching. While teaching in class, I learned math through preparing the subject and interacting with students, and learned how to reach students, whereas in the cluster meetings, I got advice from other teachers who have a different way of thinking about teaching so that I was allowed to reflect deeply on my teaching. They forced me to look at my teaching in a reflective way. The different opinions made me think more deeply about why I agreed or disagreed with them and think about what I truly believe. For example, I brought up the situation in the third meeting and had a chance to see how differently the people understood the question and answer from a different direction than I was looking at. I liked having the veteran teachers in our cluster meetings. That was an invaluable resource as a teacher, and they knew how to get over student teachers' struggles. For instance, the discussion after watching student teachers' lesson videos gave suggestions for ways that I could make it better. The material in the seventh meeting was also informative for me. I felt I was changing from more teacher centered to more student centered when teaching using the material. We got the opportunity to talk to other student teachers so that we discussed the same problems in teaching. Without cluster meetings, I don't think I would have gotten as much out of student teaching as I did.

Tyler: It was similar to being in the last semester's class. The class for preservice teachers' field experience gave us an opportunity to hear different perspectives on a lot of different topics and to be involved in a situation where everyone's opinion was respected. The

cluster meeting also shared different opinions of members in interesting situations and experiences. The cluster meeting gave us the opportunity to learn how different our ideas can be. For example, we talked about what mathematics is in the seventh meeting. I learned that your students might not have the same understanding of the word that you're talking about. When we do not communicate about what we think, it may cause problems in understanding each other's thinking. Next, the cluster meetings gave me experience that I can use in the future. Even though I didn't always agree with what the teachers said, the disagreement in the discussion helped me fortify certain beliefs and ideas about teaching mathematics. For example, the discussion after watching each lesson video fortified my idea that teachers should allow students to justify what they are saying. The biggest thing is that the cluster meeting helped me keep in mind the fact that I need to ask more high-level, cognitively demanding questions.

Ashley: I got to feel that I looked more in depth into certain aspects of students, of the teaching that I have and realized there's more meaning in what I brought up while discussing it in the cluster meetings. I think it was good to get opinions, get outlooks, and hear experience from the diverse members in our cluster meetings. Through participating in the cluster meetings, I've been able to see what I need to do to make my lessons better and how to develop lessons and activities to help students understand the material.

Question: What difficulties did you have or what suggestions would you have in building a learning community?

Ella: The biggest concern with cluster meetings was the meeting time because they took me out of the classroom after school, so that students were not able to come in for extra help. Sometimes, it ran too long. Maybe we need a timer to go off. The number of members was good because fewer people don't have as many ideas coming in, and more people are harder to be

heard. Five to eight would be ideal. Another concern is to have my mentor teacher in there. It made me nervous to critique my mentor teacher's teaching or her discussion because I felt she obviously knows more than I do. I think there may be difficulties if we have somebody who was less open to new ideas or more afraid of other people's thoughts.

Tyler: To me, criticizing each other is the hardest thing because we're all friends and care about each other. I don't have things that I didn't like in the cluster meetings; however, I could complain about the length of the meetings, but everyone was willing to share their opinions so that it took so long. If we were shy to talk to other teachers, then we can't build a community for professional development. If only student teachers met and discussed in the cluster meetings, then there would be a lack of knowledge, and I would not learn things from mentor teachers. In the discussion, after we watched each other's videos, there was a lack of talking. If you were not talking in the meeting, there is no learning at all. If I commented about better meetings, I may encourage the mentor teachers to talk more about what they thought because I felt I didn't get enough personal feedback about what I'm doing and opinions about my teaching approach. I would suggest the more personal stuff for the cluster meeting discussion. I think the most value you can get is talking about specific things that you did in your class.

Ashley: I don't think I would have changed anything. If I had cluster meeting again, maybe not Friday afternoons. Sometimes I felt I didn't have much to contribute to the discussion. Student teachers wouldn't feel comfortable talking in front of everyone because we had just experienced student teaching. We might not want to talk about each other in the cluster meetings if it was not required. For example, it is uncomfortable to look videos and critique each other in the cluster meetings because people worried that they were shown as bad teachers to others. I think physical things coming from student work helped us discuss with other people. The more

physical things we bring would be better for student teachers. Difficult concepts would also be good topics for discussion. For better cluster meetings, I suggest that all of us watch a specific lesson, not on video, and talk about the entire lesson together. If so, then we would be on the same page and could discuss a lot more things that we all saw.

Narrative 2: Mentor Teachers' View of the Community

Question: During the field experience period, you have cluster meetings. Can you explain about the cluster meetings?

Ms. Turner: We met once a week with student teachers, mentor teachers, and supervisors. I think that the goal was not just to address issues happening in the classroom but to broaden our view about mathematics behind the happening, teaching, and student learning. There was a dual purpose of what the mentor teachers had and what the student teachers had.

Ms. Perry: The cluster meetings were designed for student teachers and mentor teachers to reflect on experiences in the classroom. I saw the cluster meetings as a time of reflection on what teachers and student teachers are doing and students are doing. The overall goal of cluster meetings was to reflect on practices, to learn how to teach, and to make teacher practice better. The focus of the cluster meetings was to build the mathematics of student teachers and mentor teachers. As one of the mentor teachers, I was sitting there, listening to, thinking, and giving feedback about activities involving students' learning and teaching.

Ms. Robin: It was a meeting where we got together with the preservice as well as their mentors at their university, and discussed situations and classroom concerns. The cluster meetings were student teacher centered instead of university professional oriented.

Question: You all had cluster meetings last year even though not in the same cluster meetings. Compare this year's and last year's cluster meetings and think about having no cluster meetings.

Ms. Turner: When I had only my student teachers, I didn't get that meeting. We had informal interactions constantly, and our focus was only on our classroom, our kids, and our teaching. On the other hand, having the cluster meeting gave us different viewpoint for other classrooms, students, and teaching by stepping out and thinking about what is going on in other classrooms. Last year's cluster meetings were during lunch time, but we were a very small group of five and very quiet people. So it was hard to get a good conversation going. On the other hand, this year we set up time ahead and knew what we would do next week.

Ms. Perry: If there were only you and your student teacher, then they see one side of one perspective. But we had cluster meetings so that student teachers got feedback from their peers as well as other mentor teachers. I think more feedback makes a step forward in problem situations. Last year we had it during lunch, and there were other teachers from the department at the lunch table. But our discussion was not productive, because it was not focused and directed. The cluster meetings this year were more planned and focused in discussion. Since we met often enough this year, I also got to know the other student teachers well.

Ms. Robin: The basic difference in having cluster meetings is that the members can share ideas and hear feedback not just from my mentor and my student teachers. We have ongoing conversation constantly when we have student teachers, but the cluster meeting gave us other teachers' ideas. Last year we discussed issues of student teachers' concerns in cluster meetings, but this year we've looked at mathematical situations and classroom concerns.

Question: I defined a learning community as having a purpose, having some shared experience with regular meetings. Have you participated in a learning community other than this cluster meeting? How is the learning community different from this cluster meeting?

Ms. Perry: I have recently had an AP calculus teacher learning community about once a month. We're all AP Calculus teachers and discuss the AP test or teaching. A volunteer showed her teaching in the meeting. The similarity between the community and cluster meeting was that there were novice members, for example, novice AP teachers in the AP learning community and student teachers in the cluster meeting. We developed a community that members feel comfortable about sharing what they don't know in both meetings. While the members established the agenda of what we want to accomplish in the AP learning community, the cluster meeting was more directed by someone else.

Ms. Turner: I'm participating in a project to build a vertical team to study curriculum kindergarten through twelfth grade. The similarities between the project teams and cluster meetings would be the open discussion and the discussions that the members focused on mathematics and learning. We had very focused goals, while the cluster meetings had different goals for each meeting. We had no regular set meeting time in the project meetings although we followed up as we needed, but the cluster meetings had meetings regularly. I liked the unstructured format of the cluster meetings. For example, the questions "What are you looking for? What's going to be the focus of the meeting?" gave us a focus for each week.

Ms. Robin: I'm on a professional learning committee that is for staff development and on the school improvement committee. I also have department meetings in this high school as formal teacher meetings. The cluster meetings were more formal to discuss teaching and learning,

whereas the department meeting was all about dispersing information, not about mathematics. We had meetings and talked about something about a school situation, but the topic was different from cluster meetings.

Question: What is a professional learning community?

Ms. Perry: I heard about a professional learning community from two different perspectives. One is a community within a school for students' development, and the other is a community designed to help teachers such as the AP learning community. In other words, one is student focused, and the other is teacher focused. I think the cluster meetings are on the way to developing into a professional learning community. Since we got together for our learning and development and all with same profession, our cluster meetings were close to the generic definition of a professional learning community.

Ms. Turner: I'm a lead teacher of the project team. We want to build a professional learning community. We have regular meetings and set goals, but we have time constraints in the meeting, and this county had just a few teachers on the project team. Our feet are on the ground. The composition of members in a PLC depends on the purpose of the professional learning community. The crucial thing in a professional learning community would be to focus on classroom or teaching or learning aspects that impact the classroom.

Ms. Robin: Professional learning communities are where we get together and talk about mathematics from the teacher's point of view. For example, Ms. Turner's vertical team is a PLC. I think that a professional learning community is all around teachers all the time even though informal or formal. For example, if teachers get together and talk about mathematics at a moment, that is also an informal type of professional learning community.

Question: Among the cluster meetings, if you could choose one day or discussion, what was it and why?

Ms. Turner: My favorite was the third meeting where we talked about the mathematical situation because it was neat to talk about the mathematics and to think about what kids are thinking.

Ms. Perry: I would pick that one too and the last one because those were positive ones instead of the ones like why you are having problems understanding perimeter. I like to hear the student teachers' exciting moments, which make us stay here.

Ms. Robin: I like the third meeting as well because I like to hear the mathematical situations. But I did not like the watching the video of discourse in the seventh meeting because I couldn't categorize the student discourse in the video. We need to talk more about the material and more time to do that kind of activity.

Question: What was valuable in being in the cluster meeting?

Ms. Turner: For example, the student teachers' lesson videos in the cluster meetings revealed things that we didn't see in the classroom even though the camera catches everything of the lesson. Or I tried to tell my student teacher about walking up and down the rows as he's talking in class; however, he could see that he was at the board the whole time in the video. Looking at the missed or unaware things and discussing them were interesting. In addition, different backgrounds and different experiences of members gave us a different perspective through the cluster meetings. The student teachers were able to get a lot more than what we could give them by having out there person coming in cluster meetings. We need the university people to think about beyond what we're doing here. The other thing is that the cluster meetings were a good chance to get to know other student teachers, and the three student teachers could

relate to each other. It was also interesting to come in and talk about the mathematics. We had a department meeting, but it was not about content. However, the discussion about the mathematics in the cluster meeting was not something we were going to teach the kids, but it was something for us to think beyond what was going on in the classroom.

Ms. Perry: University people look at what we're trying to get across in classrooms from a college instructor's perspective. But it's an actual experience, and we knew that they didn't have the experience of where we are. We would like to let college people know where we are and to see how they teach. Through getting different groups together and discussing in cluster meetings, we're helping college professors on the practical side. The other thing is, for example, when watching student teachers' lesson videos in the cluster meetings, the video never catches all the dynamics of the classroom. Nevertheless, the cluster meetings made us more aware how my colleague thought about things having discourse. The cluster meetings with university teachers helped us think about the big picture of teaching, or methodology, so that they made us see weaknesses in us. I think cluster meetings built a stronger relationship among the members.

Ms. Robin: It was good to talk to other teachers about mathematics and to hear what they are doing in their classroom because we don't have time to go out and watch other teaching. The cluster meetings get input from not only veteran teachers but preservice teachers as well. The ideas or ways to teach a topic different from my own helped me in planning and teaching. I also learned that I wish we had an opportunity as teachers to have those meetings even though our schedule makes it hard arrange them.

Question: What difficulties did you have or would you have in building a learning community?

Ms. Turner: Sometimes it is harder to get everybody into the discussion because it's Friday afternoon. But it's better than lunch time because lunch time is a short period and it's hard to focus on discussion. I think we discussed practical things in the cluster meetings, but probably we would have time for discussion of more theoretical things. In the seventh meeting, when I looked at the video clip, I guess there were lots of things in a full classroom discussion where more issues are participating in it than just two persons at the board to see. The whole group discussion is one of the hardest things to do as a teacher to get a class up and to get everybody involved and talk. We need to see and talk about those things.

Ms. Perry: We had watched videos at three cluster meetings, but it was a very short time to discuss a lot of information in it. The cluster meetings were absent of decision process of what the agenda would be. The agenda was decided by one or two of our participants, instead of the cluster deciding. If we had had a chance to think and talk about our agenda for cluster meetings, then all members would have equal sides of the picture. But I don't know whether we put the priorities of the agenda to the student teachers. Another problem is the time issue. For example, I waited ten minutes for other mentor teachers to get to the meetings. If we could avoid the wasted time, it would be a better meeting. And last, I would like to suggest the student teaching period should be longer with cluster meetings because ten weeks are so short to learn.

Ms. Robin: It was interesting to see students' discourse in the seventh meeting, but I didn't understand what we were going to see that day. I agree with Ms. Perry's idea that the whole group could find the direction together. Student teachers brought a mathematical situation into the cluster meetings; however, what was the mathematical situation? What if nothing

happens that you feel is suitable? We should have talked about that, not forced us to find mathematical situations. Personally, a meeting once a week was too much although it was a wonderful opportunity to talk with other teachers.

Narrative 3: University Teacher's View of the Community

Question: During the field experience period, you have cluster meetings. Can you explain about the cluster meetings?

Gabby: In the first cluster meeting, I brought in assessment examples. There were a few cluster meetings that the student teachers would bring in things from their classroom and examples of student work. We had one cluster meeting where we looked at a video to think about how to observe and how to talk about those observations. Discussions in cluster meetings were grounded in actual teaching experience, whereas the discussions in university courses were things outside of the classroom, not in classrooms they're directly involved with.

The cluster meetings had three mentor teachers who have been teaching at least ten years, three student teachers who have no teaching experience, and myself who had teaching experience in the past. I think we all had a different role in the sense that student teachers had less experience to build on and to share issues of teaching, but the mentor teachers had more experiences to help the student teachers.

In the beginning my role was to set the stage for how the meeting was going to go, but for the most part, my role was to sit back and let the teachers talk among themselves. Overall, my role was to encourage the group of teachers to share aspects of their practice, to consider each other's practices, to think about mathematics, and to learn from each other. I brought stuff and posed some questions in the cluster meetings to organize and encourage participants to be involved.

I felt I was part of the community but not a member, because I was an outsider in the sense that I only went to Norris High School once a week, but the mentor teachers and the student teachers were there every single day. But I tried to be a member, another teacher who had taught in the past in the cluster meetings.

Question: You had cluster meetings last year in this school. Compare this year's and last year's cluster meetings.

Gabby: There were different numbers of mentor teachers and student teachers last year. This year having three mentor teachers and three student teachers was much better than two mentor teachers and two student teachers last year. I definitely took more of a hands-on approach last year than I did this year. I think last year was more formal in that we outlined the agenda as a group.

Another difference is that last year we focused on mentor teachers, but this year I focused on student teachers. The personality of the mentor teachers and student teachers was also different. For example, last year both student teachers were quiet in cluster meetings, whereas this year all three of them spoke up when they wanted to speak up. Last year, one mentor teacher who had the experience of having a student teacher was very talkative, but the other mentor teacher, for whom it was the first time having a student teacher, was very quiet.

Last year, the members talked about only something that happened in their own class. If there was something that they both had access to and observed, then they didn't talk about it. But this year all of us shared experiences that we have had in our lives outside of Norris and things that we observed at Norris. The discussion time was different, for example, just ten minutes at lunch time last year, but we had Friday afternoon for one or two hours this year.

Question: I defined a learning community as having a purpose, having some shared experience with regular meetings. Have you participated in a learning community other than this cluster meeting? How is the learning community different from this cluster meeting?

Gabby: I'm working on a project that is examining doctoral students learning within the various research projects at my university. I work with a few doctoral students, and we collectively work together to try and figure out what's going on in the projects. There is similar learning in the sense that everybody is contributing, and my role is kind of the same in both project meetings and cluster meetings, bringing in something to elicit conversations and posing questions. The other similarity is that members in project meetings work together, see each other frequently, and talk anywhere that they meet such as in the halls. The members in cluster meetings also have chats in between classes and after or before school.

The difference is that we're all doctoral students except one professor in the project, although I have been longer in the project than the other people have, whereas everybody is a teacher except me in the cluster meetings. In addition, the members in cluster meetings came from different backgrounds; for example, experienced teachers as mentor teachers, student teachers who are beginning teachers, and a university teacher who has research experience. Another difference is that the project was more goal-oriented, whereas the cluster meetings' goals were very broad. There is a clear focus in the project meetings to answer the four research questions, but what ends up happening in the cluster meeting is?

Question: What is a professional learning community?

Gabby: The idea of community is more than just sitting down and meeting. I've been in a lot of different professional learning communities. The word *professional* was to distinguish

between personal things and things that I do career-wise. I think a professional learning community is a group of people who come together having this goal that they have similar experiences or have things that can talk about in a way that they are learning themselves and encouraging other members to learn. My definition of a professional learning community is a group of professionals who work together for a common purpose of learning more about their practice. The members in a professional learning community can be from different backgrounds, but it is still within the same profession. In order to have an effective learning community among teachers, it's not enough to come together and talk. You've got to have activities and some purpose.

Question: Among the cluster meetings, if you could choose one day or discussion, what was it and why?

Gabby: I would choose the first meeting. I brought in examples of student work in the alternative assessment book. They were differently graded work and rubrics about the grading, and we discussed whether we agreed with the score that was given. But I'm not sure that I learned something from the specific meeting.

Question: What was valuable in being in the cluster meeting?

Gabby: I interacted with the members in cluster meetings, in the classroom, before school sometimes, and after an observation. So it is hard to distinguish what experiences have influenced me in those different situations. But cluster meetings provided chances to ask all three of the mentor teachers about things that happened, and that made us closer professionally. The cluster meetings helped me to understand more about how the teachers at that particular school interact in a community, to understand how these teachers viewed mathematics and teaching and learning mathematics, and to understand a vision of what those teachers thought the purpose of

student teaching was and how that vision was predominant among teachers. The cluster meetings also gave me insights into how to be a leader of a group of teachers. This will influence my future work as a professional developer.

The meetings provided opportunities for mentor teachers to share their thoughts about mathematics and teaching and learning mathematics. The cluster meetings allowed the student teachers the opportunity to share something that happened in their classroom and to engage in professional conversations with colleagues. I also learned more mathematics through the cluster meetings.

As a whole, I got to know the student teachers well, although it's hard to distinguish cluster meetings versus my individual interactions with them as I said earlier. For example, watching videos in the fourth and fifth meetings was good to know where the student teachers were. I learned Tyler was very focused on student thinking. I think Ashley learned how she thinks about motivating students and her desire of teaching to make mathematics interesting. Ella was very strong mathematically.

I think having three groups in cluster meetings was an advantage because they have different experience. Mentor teachers have years of experience that was valuable, and as a university teacher, I have the university background and teaching in another state. You also had different experiences in your country. That diversity was definitely an advantage for them.

Question: What difficulties did you have or would you have in building a learning community?

Gabby: There were power issues as part of the problem with putting three groups of people together. A university person seems to be the one with all the power because he or she gave grades to the student teachers. Mentor teachers had years of experience of teaching to fall

back on, but student teachers had no teaching experience and had to get credit for their teaching. So I would be very careful of what and when I said something. It was challenge to me to decide when I should speak or when I should stay quiet. However, I think we're okay this year because we're comfortable at talking.

I didn't like distractions in cluster meetings. For example, when student teachers brought examples of student work, they brought only one copy and only one person could look at it. So other members didn't actually hear what the person was saying and have a chance to comment on it. In addition, to create a meaningful experience for teachers, I think it takes more than a 30-minute meeting.

I want mentor teachers to have more thoughts about their teaching practices and mathematics beyond the cluster meetings, but they viewed their predominant role just to be a mentor to the student teachers.

To develop our cluster meetings into professional learning communities, we have to have specific goals, not broad goals. I think there were not clear goals for the PRIME, which created problems in cluster meetings. We need a coherent goal that everybody understands, and the members' roles within the community should be clearly defined. We also need to consider the community that exists at Norris High School. If we want to impact the mentor teachers, then we have to take the way that they already operate in their community. I think teachers should be included in professional development, whereas the teachers were not really partners in this project.

Results

How Do the Members Perceive Their Cluster Meetings Differently?

To answer this question, I discuss how each group perceived the cluster meetings. Since there was only one university teacher, it was hard to say that there was a group of university teachers. However, the cluster meetings were composed of three groups of teachers in the sense that their status was different. Hence, I consider the cluster as having three subgroups. Although each member showed different opinions, the members of each group showed similar perceptions about the concept of cluster meeting.

Professional Learning Community for Student Teachers

All the student teachers considered the cluster meeting itself a professional learning community. Although two student teachers, Ella and Ashley, said that the meetings were required for student teaching, they perceived the cluster meetings as a learning community consisting of mentor teachers, student teachers, and university teachers, having the activities of discussing teaching and learning mathematics for a shared vision, and having regular meetings. Furthermore, the student teachers believed that the cluster meetings were a professional learning community with the goal of developing professionals. They also said that all student teachers took a leadership role in each cluster meeting. From the student teachers' perspectives, the cluster meetings were a professional learning community with people from the same professions having shared leadership and a shared vision.

According to Grossman, Wineburg, and Woolworth (2001), as teachers' professional communities start to form, individuals act as if they have a *pseudo community*—having shared values and common beliefs in the community. In Grossman et al.'s study, the pseudo community eventually showed conflicts of different tensions, knowledge, and beliefs. Incidents of ridicule

and muttering in a community can break up members' relationships; unfortunately, when members lack knowledge and skill in dealing with these challenges, the problems become worse. In this study, however, the student teachers did not show those conflicts. Instead, as shown in Narrative 1, they had a shared vision of making themselves better teachers in the cluster meetings. This vision was consistent with the goal of their field experiences. The student teachers had created a shared vision for their entire field experience by negotiating what they would do and how, and discussing teaching and learning mathematics in the cluster meetings. They may have passed over this stage of *pseudo community*.

In a schematic model of the formation of teachers' professional communities that Grossman et al. (2001) discussed, a mature level of the formation of group identity shows identification with the whole group and recognition that the group is developed through the contributions of multiple perspectives. In this study, the student teachers perceived the cluster meetings as a mature community. For example, one student teacher, Ella, discussed the roles of mentor teachers, student teachers, and university teachers when she was asked about the cluster meetings in the interviews. She and the other student teachers identified the three subgroups of professionals in the cluster meetings. Also, Tyler saw the cluster meetings as a professional learning community and a whole group. This view is similar to the other student teachers' views. In this sense, student teachers' thoughts of group identity seem to be close to a mature level. In addition, they understood the benefits of differences among members and believed that the cluster meetings were enhanced by multiple perspectives. According to Grossman et al.'s model of the formation of teachers' professional communities, the cluster meetings described by the student teachers in this study are close to a mature level in the formation of group identity. However, I cannot say that the cluster meetings were a mature professional learning community

because Grossman and his colleagues' study was conducted only with inservice teachers, whereas this study included diverse members such as student teachers, mentor teachers, and university teachers. This difference in organization may have prompted the student teachers to have a clear identification of all the subgroups within the whole group: student teachers, mentor teachers, and university teachers. This result suggests that various groups of members help the formation of identity in a community.

Pseudo Learning Community for Mentor Teachers

The mentor teachers' perceptions of their cluster meetings stayed in the stage of *pseudo community* that Grossman et al. (2001) discussed. The mentor teachers perceived the cluster meetings as having the goals of developing mentor teachers and student teachers and of discussing teaching and learning mathematics in regular meetings. When I asked the mentor teachers about the organization of the cluster meetings in the first interview, unlike the student teachers, they identified only the student teachers and the mentor teachers themselves as members of the cluster meetings not the university teacher. From the mentor teachers' point of view, there were activities focusing on student teachers and mentor teachers and therefore, they recognized only two subgroups of the cluster meetings. In contrast, when I asked if having university teachers in the cluster meetings was necessary in interviews, the mentor teachers responded that they needed university teachers in the cluster meetings. To sum up, the mentor teachers failed to perceive the whole group of the cluster meetings, but they recognized the need of unique contributions of university teachers. According to the Grossman et al.'s model (2001), the mentor teachers perceived their community as in the pseudo community. Since I considered the cluster meetings as a learning community of teachers, I claim that the mentor teachers recognized the cluster meeting at the stage of pseudo learning community.

In addition, from the observation of the Spring PRIME gathering, I found that the mentor teachers thought that university teachers made the agenda and the mentor teachers were required to follow them rather than participate in the process of planning. However, in the last meeting and the second interviews, the mentor teachers talked about the importance of all members making the agenda together. This shift showed that the mentor teachers participated in open discussion of the agenda, but they needed to develop the agenda with all other members. According to Grossman et al. (2001), this shift can be shown in the process of pseudo community to mature community. As a mentor teacher stated in her second interview, the cluster was in the process of becoming a professional learning community. To summarize, the mentor teachers' perceptions of the cluster meetings were evolving through their participation, but they had not arrived at a mature level yet.

The mentor teachers' response about who led the cluster meetings was different from the student teachers' response. The mentor teachers believed that the meetings were directed by someone. They believed that the cluster meetings were led by the university teacher who designed the meetings, rather than by the members themselves. On the other hand, the student teachers said that they had shared leadership in the cluster meetings in their interviews. For example, in the first interview, one student teacher, Tyler, said that the cluster meetings were not Gabby's cluster meetings as the semester went on because the members started to take part in the planning. He believed that everyone took responsibility for leadership in the cluster meetings rather than thinking one person dominated the meetings. As time went by, the mentor teachers felt that they needed to play more of a leadership role in the cluster meetings, whereas the student teachers believed that they did play a leadership role. One of the mentor teachers, Ms. Perry, insisted that all members should participate in making decisions to set the agenda, and the

other mentor teachers agreed. The mentor teachers suggested that they needed more open discussion about the agenda and norms. This example shows another stage of *pseudo learning community* in formation of norms of interaction.

Early Pseudo Learning Community for the University Teacher

The university teacher perceived the cluster meetings as being in the early stage of a pseudo learning community. Gabby identified the cluster meetings as a community; nonetheless, she recognized herself as an outsider in this community because she believed that she was not a member of Norris High School. She perceived cluster meetings as part of the school community. This expanded perception occurred only to her.

Grossman et al. (2001) discussed the lack of agreement over purposes in the beginning stage of the teachers' professional community model. Like other members, Gabby also believed that the cluster meetings could be a professional learning community. She responded in the first interview, "My definition of a professional learning community is a group of professionals who work together for a common purpose of learning more about their practice." However, since the cluster meetings had broad goals, Gabby thought that the cluster meetings had not yet formed a professional learning community. She also disagreed with the "shared" vision that the student teachers said they had. Although the student teachers believed that they had a shared goal to make themselves better teachers, Gabby believed that it was not so because it was too broad. For her, there was a lack of discussion about vision and goals in this community.

On the other hand, the university teacher perceived the community was in an evolving stage concerning the members' contributions. She emphasized members' activities and contributions in the cluster meetings. Among the members, it was she who most clearly talked about what the members did in the cluster meetings, who was there, and why she was there.

When she talked about comparing the last year's cluster meetings with this year's, she addressed the issues of differences in the number of members, personality, and contributions of individual members. She was aware of individual members' contributions to the community and of her own learning from the members. According to Grossman et al, Gabby's perception about members' contribution was in an evolving stage.

Since the university teacher, Gabby, showed characteristics of being in both the beginning and the evolving stages that Grossman et al. (2001) discussed in perceiving cluster meetings, I regard her perception of the cluster meetings as the early stage of pseudo learning community. Grossman et al. did not discuss this stage specifically.

Ball and Cohen (1999) claimed that teachers need to become learners in and around their practice to teach and produce student learning that reformers envision. The analysis in my study showed that the participant teachers were all learners of practice in cluster meetings as a learning community although their perceptions were different. When the teachers talked about their perceptions about the learning community, they reflected on the community discussions about their students' mathematical thinking and about their own and other teachers' teaching. This perception not only showed just how the teachers feel about their learning community, but also provided information about how they learned about mathematics teaching and students' learning through being in the learning community. Ball and Cohen (1999) recommended that teachers need to be "learners of practice" rather than learners of strategies. From this study, I suggest that mathematics teachers can become learners of practice through a well-structured learning community in which they can develop and expand their ideas about teaching and learning mathematics.

Patterns of Participation

The three groups of members showed different attitudes toward participating in discussions about mathematics teaching and learning in the cluster meetings. The student teachers played an active role in almost all discussions, perhaps because they were required to participate in the cluster meetings for their field experiences and because they perceived themselves as having the most to learn. They tried to ask various questions such as how other teachers would interpret mathematical situations that the student teachers experienced, how they would respond to students' ideas, how they would prepare materials for teaching in cluster meetings etc. On the other hand, the mentor teachers played a less active role: they thought about the questions student teachers raised and gave feedback about the thoughts and activities of the student teachers. However, they rarely shared dilemmas or questions of their own. In the sense that the mentor teachers showed their experiences in response to student teachers' questions, they were very passive when participating in discussions. This passive and active involvement may influence the teachers' perception of the cluster meetings. The student teachers, who actively participated in cluster meetings, were able to understand more about the participants, visions and activities, and structure of cluster meetings as a learning community. However, the mentor teachers, who participated less active than student teachers in the cluster meetings, had limited understanding of the members' activities. Therefore, the student teachers perceived cluster meetings as a professional learning community, whereas the mentor teachers perceived them as a pseudo learning community.

The university teacher considered herself as a facilitator in the cluster meetings. She tried to organize the cluster meetings to encourage the members to share their practices and ideas about mathematics, and to promote learning from each other. Although the university teacher

said that she learned many things about the members and about mathematics, she emphasized her learning as a facilitator rather than as a member of the cluster meetings. Because the university teacher did not believe that she was a member of the cluster meetings as a learning community, she was not actively involved in the discussions in cluster meetings. Rather than being involved in the cluster meetings, she tried to investigate the members and the community. The university teacher had a clearer definition of a professional learning community than the mentor teachers and student teachers and felt more responsibility for organizing the meetings as a learning community than the other teachers. I believe that the university teacher could not be actively involved in the cluster meetings as a member because of her preexisting knowledge about PLCs and because of her responsibilities at the university so that her limited involvement hindered her perception of the learning community. In addition, the university teacher seemed to be aware of the power differential so that she deliberately refrained from participating actively in the cluster meetings.

Development of the Members and the Learning Community

As I stated earlier, I believe that a community and its members are integrated, and as the members grow and change, the community shifts. In this study, the members showed different perceptions depending on their different levels of participation. The different perceptions can be evidence of changes in participation in the community. For example, the university teacher perceived the cluster meetings as an early pseudo learning community, the mentor teacher perceived them as a pseudo learning community, and the student teachers perceived them as a professional learning community. The learning community in this study was in an evolving stage in general although the members' recognitions of group identity or responsibility were different.

The members' perceptions of the community may not directly show the members' changes in their practice. However, the perceptions imply a shift in their future practice in the community.

Grossman et al. (2000) suggested a model of the formation of a teachers' community, but it may not fit a real teachers' community. The development of a teachers' community is not necessarily identical for every member because the level of participation of each member would be different. In other words, communities can develop with their members' growth, but that does not guarantee that every member reaches the same level of development. This study showed that the participant teachers had different perceptions of their community. These different perceptions imply that the teachers shifted in their participation, indicating that the learning community of teachers was evolving with the members' shift in participation.

What Was Valuable in Participating in the Cluster Meetings?

Learning from Different Perspectives: Notice and Formation

Notice. Sherin and her colleagues (Sherin, 2003; Sherin & Han, 2004; Sherin & Van Es, 2005) examined how video can help teachers learn to *notice*. Whereas Sherin and her colleagues found that video was a useful tool for helping teachers notice, in this research, I found that discussions with different groups of teachers in cluster meetings could also help teachers *notice* their classroom interactions. The teachers in the cluster meetings often said that they became aware of things that they did not notice in their own classrooms while observing student teachers' classrooms or while talking about materials that student teachers brought up. In the cluster meetings, the student teachers brought copies of their students' work and questions that had been raised in their classrooms. Discussing these with other teachers, members in the cluster meetings identified what they had missed in their own teaching and what was important in the teaching situation.

I would like to suggest another *noticing* that arose in this study. Sherin and her colleague discussed that noticing is related to using what one knows about the context to reason about classroom interactions. This implies that teachers notice what other teachers know about curriculum and materials to interpret classroom interactions in their community discussion. Beyond this noticing, discussion with different groups of teachers in the cluster meetings helped the teachers got to know each other. In other words, discussion in a learning community of teachers facilitates noticing how teachers think differently from each other and what they believe about teaching and learning mathematics. This new category of noticing is different from the noticing that Sherin and her colleague discussed in that it is related to understand other teachers as colleagues, rather than understanding teaching and learning.

I became aware of this new category of noticing in several cluster meetings. For example, in the fourth meeting, the members discussed what they noticed while watching a 5-minute classroom video of the student teacher, Ella. The video clip was about her Algebra II lesson. Each member questioned Ella about the classroom situations and the context, and discussions followed about the teaching and learning visible in the classroom interactions. In particular, Ella questioned whether the instances of transition in her teaching were appropriate, and the mentor teachers commented on that. While the teachers listened to Ella's questions and responses in the cluster meeting, the mentor teachers understood what she was thinking in the classroom. Her mentor teacher, Ms. Perry, said that she did not know Ella had concerns because she thought that Ella's teaching was fine. Although only Ms. Perry observed Ella's teaching live, the other mentor teachers had an opportunity to notice Ella's teaching by viewing the video clip in the cluster meeting. The discussion that followed also allowed the mentor teachers to notice how the student teachers interpreted the situation differently and allowed the student teachers to notice

how the mentor teachers and the university teacher were different in thinking about teaching and learning mathematics. As well as using their own knowledge about the context, members in the cluster meetings came to know each other's knowledge and beliefs by participating in the discussion. This is another aspect of noticing in learning from cluster meetings.

In addition, one of the mentor teachers, Ms. Turner, talked about her chance to get to know other student teachers. Mentor teachers generally do not know other student teachers mentored by their peers. The cluster meetings helped these mentor teachers get to know other student teachers by having time to meet and discuss their different ideas. Similarly, Gabby said in the second interview that she was able to understand better the student teachers and mentor teachers from listening to their opinions in cluster meetings. She believed that the opportunity of having discussions in cluster meetings helped members know where they were and what they thought about mathematics and teaching and learning mathematics. To summarize, the cluster meetings gave members many opportunities to notice each other and to understand their different perspectives. Noticing facilitates collaboration in community learning because members come to understand each other's thoughts.

Formation. The student teachers found the cluster meetings useful because they provided an opportunity for them to incorporate diverse perspectives and to build up their ways of thinking. They believed that the opportunity to hear different perspectives and experiences helped them reflect on their own ways of thinking and build up their ideas about teaching and learning mathematics. Instead of just learning *how to teach*, the student teachers learned *how to think* from the diverse members in the cluster meetings. In other words, the cluster meetings did not give them a manual of how to teach but gave them a lot of open-ended questions about how to teach, and these inquiries helped them to reconstruct their ideas on how to teach. In this study,

I cannot know whether the student teachers' instructional practice changed or not because that was beyond my data; however, according to Thompson (1992), changing teachers' beliefs influences change in their instructional practice. Other researchers (e.g., Borko & Putnam, 1996) claim that the order of change in beliefs and practices might not be so important. "Meaningful change in one requires change in the other (p. 702)." Hence, we can assume that the student teachers who have reconstructed ideas on how to teach may be able to change their teaching practice in the future.

Learning from a Different Environment

Reflecting on their own practices. The cluster meetings provided a different learning environment to discuss members' own teaching practice. Although it is hard to reflect on one's own teaching during or after teaching practice, researchers have argued that teachers should be reflective practitioners (Dewey, 1933; Schőn, 1983). In discussing their classrooms, mentor teachers and student teachers had the opportunity to look at things missed or hidden in their classrooms. For example, watching short video clips of student teachers encouraged the members to ask a lot of questions about their classroom situations, teaching, and learning mathematics. In the fourth meeting, the student teacher, Tim, was able to reflect on his teaching and his students' learning in that situation. Tim's video recorded the side of the board so the other teachers could not see what exactly happened in the class. Tim gave a brief overview about the Geometry lesson, and the other teachers asked him questions such as why he chose the 5-minute clip and what his goal of the lesson was. He had an opportunity to reflect on his teaching while responding to questions, and the mentor teachers naturally reflected on similar experiences of their own, which they shared with the other teachers. In every meeting, the student teachers brought copies of their

students' work. The student teachers, in particular, believed that the opportunity to reflect on their practices would help to change their future teaching.

Increasing motivation for being a member of communities. The different learning environment encouraged teachers to become members of a learning community. Fisler and Firestone (2006) found that teachers who participated in school-university partnership activities showed increased interest in teacher collaboration. The partnership evoked the teachers' reflection on the benefit from the opportunities of working together. Similarly, in this study, the participant teachers in the cluster meetings expressed their desire for collaboration via learning communities. For example, one mentor teacher, Ms. Robin said that the cluster meetings allowed her to realize her desire to be part of a community. Like the other mentor teachers, she believed that the cluster meetings were a very good opportunity to hear colleagues' opinions about mathematics and teaching and to develop her own teaching. As Ms. Robin stated, although teachers are hard pressed to make time to build a community, successful cluster meetings during this research period increased her desire to gather together with other teachers. The awareness of this desire could help teachers search for communities inside or outside schools in order to participate in community activities, and participation in these activities could eventually give teachers opportunities for professional development. In this sense, it is important to understand one's own desire to be a member of a learning community. By participating in cluster meetings, members might realize their own desire to interact with other teachers, and that might motivate mentor teachers to participate actively in later cluster meetings.

Recognizing partners. At the beginning of the semester, PRIME asked all the mentor teachers from 12 high schools to gather together with university teachers from the university to discuss the purposes and plans for the student teaching field experience in PRIME Spring

gathering. At the time of that meeting, the mentor teachers considered themselves just as participants in a project and as a mentor teacher in a school. However, one of the mentor teachers, Ms. Perry, valued the partnership between the school and the university. Since university people look at interactions in classrooms from the college instructor's perspective, she believed that they do not know the teachers' perspectives. She said in her second interview that mentor teachers assisted teacher education in a practical way by having cluster meetings and mentoring student teachers. Ms. Perry was aware of the importance of activities in cluster meetings as part of the partnership. In the process of developing a community, the mentor teachers came to understand the relationships among the members and considered themselves as partners, not just as participants in the cluster meetings. In other words, through their activities in the cluster meetings, the mentor teachers realized that they were partners who cooperate with university teachers. I believe that this recognition influenced the shift of active participation of the mentor teachers.

Learning from Students' Work

Intervention for activating discussions. Learning from students' work had two meanings for members in the cluster meetings. First, by using students' work in classrooms, the teachers were able to initiate discussion and understanding of other teachers' thinking. For example, they learned how other teachers interpret and respond differently as well as how students think. In the cluster meetings, the students' worksheets or questions that student teachers brought in from their classrooms encouraged members to think and express their own ideas. For instance, in the third meeting, a student teacher brought in a question one of her students had asked, "Can all procedures in mathematics be reversed?" When the question was on the table, the members revealed that they had difficulty giving an answer. Some student teachers addressed issues about

the different interpretation of the meanings of the question. The mentor teachers and the university teacher brought up some examples of mathematics procedures and shared their similar experiences with their students so far. All the members were interested in this question and wanted to share their stories instead of feeling pressure to say something as participants in the cluster meeting. The question asked by a student catalyzed the discussion among the members in the cluster meeting. By using the question, the members were able to discuss what the student was really asking, what mathematics is, and what teaching mathematics is. The discussion helped members share their activities and have a shared vision of being a better teacher. The discussions helped the cluster meetings themselves develop into a PLC. Focusing on students' learning in cluster meetings helped the members share ideas, understand students' learning, and understand other members' different thinking. Little (2004) claimed that student work can be used as a resource for developing teacher knowledge, catalyzing inquiry, and providing a basis for building a professional community. The first principle of PLCs that DuFour (2004) suggested was to shift from a focus on teaching to a focus on students' learning. Focusing on students' learning was also an important principle for transforming cluster meetings into a PLC.

Establishing identities as teachers: The second meaning of *learning from students' work* is that it encouraged members to think of themselves as teachers and increased members' identities as teachers. In cluster meetings, all the members were teachers even though they had different knowledge and teaching experience. When members looked at students' work and discussed it, there was no distinction among the student teachers, the mentor teachers, and the university teacher. They just reflected on their teaching and their students' thoughts and discussed these ideas as teachers. One of the student teachers, Tyler, in his first interview said that the members considered him as a teacher, not a college student, in the cluster meetings.

During discussions in the cluster meetings, all the members regarded the university teacher as a teacher, and Gabby also participated in the cluster meetings as one of the teachers. Focusing on students' learning allowed members to recognize their identities as teachers and to consider the student teachers, mentor teachers, and the university teacher as peer teachers. Sowder (2007) noted that developing a sense of self as a teacher of mathematics can be a consequence of ongoing professional development. Learning from students' work was valuable for the participant teachers to develop their identities as teachers and is also evidence that activities in this learning community helped ongoing professional development for the teachers.

Learning from New Materials

The new materials prepared by the university teacher encouraged members to think about teaching and learning mathematics. For example, the assessment material in the first meeting allowed members to think about how they would evaluate their students and what their goals would be in the evaluation. The observation material that the university teacher introduced in the eighth cluster meeting gave members time to think about students' discourse. In fact, one of the student teachers, Ella, said in her second interview that she was able to focus more on her students' discourse and talked about it with her mentor teacher because of the discussion about the material in the cluster meeting. Generally, the student teachers showed more preference than the mentor teachers did to learning with new materials. The mentor teachers were not pleased with the new materials. They preferred to discuss what and how to grade, but some of them disliked the observation material in the eighth meeting because there was no time to discuss the meaning of *student discourse* and to understand the material fully. Although some members showed anxiety about using new materials, most student teachers appreciated learning from new materials. This result implies that student teachers tend to have more expectations about new

resources for their learning whether they fully understand the resources or not, whereas mentor teachers show a reluctance to work with new materials, especially when they do not have time to become fully comfortable with them.

What Challenges Did the Members Have in Building a Learning Community?

Time Constraints

As research on communities has indicated (e.g., Arbaugh, 2003), deciding on a time to meet and the length of meeting time was a challenge for all members in organizing a community. For student teachers, both time to meet and the length of meeting were concerns. The student teachers were concerned that their high school students were not able to come for extra help after school on the days of the cluster meetings and that they (the student teachers) were too tired on Friday afternoons to have productive meetings. One of the student teachers complained that the length of the meeting was too long even though the discussion was valuable. The mentor teachers too were concerned with the time issue because they were very busy with other schoolwork such as bus duties or personal appointments. One of the mentor teachers, Ms. Perry, complained that she wasted time waiting for other members to arrive at the meetings. Although the reasons were different, for most of the members, finding the time required for building a community was a challenge. The time issue in building a community needs the help of school principals or district administrators who can arrange teachers' schedules so as to avoid conflicts with the teachers' teaching schedules and other duties.

Power Issues

Power issues were revealed in relationships between student teachers and mentor teachers, student teachers and the university teacher, and mentor teachers and the university teacher in the beginning of cluster meetings. One power issue was shown in the student teachers'

hesitation to express their opinions about the mentor teachers' teaching. For example, one of the student teachers, Ella, revealed her nervousness about expressing her opinion on her mentor teacher's teaching in initial cluster meetings. Ashley also said in her interview that she lacked confidence in talking in front of the mentor teachers because she was just a student teacher. The student teachers generally hesitated to give their opinions about anything related to their mentor teacher or other mentor teachers; however, their hesitations were decreased over time. They acknowledged that they were just novice teachers with little teaching experience, whereas their mentor teachers had more than 10 years' experience.

Dissimilar views about the value of cluster meetings also revealed a power issue. The student teachers' views about the value of the cluster meetings were slightly different from the mentor teachers' and the university teacher's views. Whereas the student teachers valued the various perspectives of the other members in order to reconstruct their thoughts, the mentor teachers and the university teacher valued the opportunity itself. It seems like these were similar opinions, but they were different in the sense that one group took a position to receive information, and the other gave the information. In other words, the mentor teachers and the university teacher perceived themselves as the people who provide the opportunity, whereas the student teachers perceived themselves as receiving the benefits. The different perceptions originated from a difference in power.

The university teacher revealed another power issue. She was concerned about the power relations among the three subgroups in cluster meetings. Gabby said in the second interview that she held power over the student teachers because she assessed their field experiences, and the mentor teachers held power over her and the student teachers because they had years of teaching experience. She believed that the student teachers were relatively

powerless because they had to get credit for this experience and had little teaching experience. Although she wanted to talk more in cluster meeting discussions as a teacher who had different teaching experiences from the mentor teachers, Gabby was very careful in cluster meetings because she was aware that mentor teachers considered her as a facilitator from the university and also as a teacher who had less teaching experience than they did. Her awareness about the mentor teachers' expectations and considerations revealed a power issue.

A power issue addressed by the mentor teachers arose in the relationship between the mentor teachers and the university teacher. As Gabby said, the mentor teachers regarded her as a facilitator from the university. For instance, they asked Gabby questions about her opinions as a university teacher in the cluster meetings. In the PRIME Spring gathering, the mentor teachers asked the university teachers what the university wanted them to do. This concern may naturally come to participant teachers. In this research, those power issues did not seriously harm my participants from creating a learning community. However, those issues are inherent in impeding members from fully participating in a community and can harm the relationships among mentor teachers, student teachers, and university teachers in creating a community.

Understanding One's Responsibilities

Ms. Turner, a mentor teacher, discussed the difficulty in understanding participants' responsibilities in cluster meetings. Ms. Turner said in her second interview that student teachers had too much responsibility such as preparing copies of students' work or mathematical situations and videotaping their teaching, whereas, none of the student teachers talked that they had too much responsibility. Rather, the student teachers worried about a lack of talking. The mentor teachers came to the cluster meetings, gave advice in response to the student teachers' questions or classroom situations, and discussed their perspectives about mathematics and

teaching and learning mathematics. Even though they did not bring their students' work, the mentor teachers talked about their experiences with their students or classroom situations. The student teachers wanted to hear the mentor teachers' stories about situations that the student teachers had not yet encountered or to learn how the mentor teachers' experiences were different from their own. The mentor teachers might not have fully understood their responsibility as mentors in the cluster meetings. If the members in a learning community do not understand their duties, then they can not make a successful PLC because they cannot have a shared vision.

Insufficient Participation in a Planning Stage

The mentor teachers wanted to participate in the planning stage as well. For example, one of the mentor teachers, Ms. Perry, discussed partnerships between schools and a university in the last cluster meeting and gave her opinions about participating in setting the agenda for cluster meetings. She thought that she had not been involved in planning the cluster meetings although she had participated in the PRIME Spring meeting where all the mentor teachers and university teachers met and discussed each school's cluster meetings and student teaching. PRIME had designed the Spring meeting to set up student teaching and cluster meetings. Nonetheless, the mentor teachers believed that they did not fully participate in making plans for the cluster meetings. On the other hand, the student teachers did not talk about planning the cluster meetings even though they suggested discussion topics for future cluster meetings in their interviews. I believe that the mentor teachers considered the issue of leadership in cluster meetings one of their responsibilities. As I observed the cluster meetings, the mentor teachers addressed questions, shared their experiences, and gave suggestions. However, in some way, the mentor teachers were leaders in that they proceeded with the discussions originated by student teachers. This fact implies that the negotiating process might have been insufficient to allow the mentor teachers to

understand their participation in planning. To create a PLC, members need to understand their extent of participation so that they can identify their contributions and developments.

Discussion

Different Purposes of Learning Communities

Based on this study of a learning community of mathematics teachers, I discuss several purposes of learning communities. The boundaries and scope of learning communities are defined by their purposes. The tasks or relationships between members have specific purposes and sustain interactions. Therefore, I classify learning communities according to purpose. I describe three purposes for learning communities of teachers based on the findings of this research: socializing, sharing information, and learning knowledge and skills for teaching.

Socializing

Teachers want to continue their personal relationships with their friends or their colleagues regardless of their profession. They meet and share personal stories about their lives and their interests. Teachers like other people want a learning community with the purpose of socializing. This learning community does not require any duty to members and the members do not need to have pressure to participate in this community.

Sharing Information

Teachers generally have regular meetings in their departments and in their school to share ideas about curriculum or to receive information from the school district or the state department of education. Department meetings provide opportunities for teachers to share important ideas about teaching and learning and sometimes to plan curriculum together. Although teachers interact during the meeting, they generally do not think about their learning and development in a departmental meeting because the primary purpose is to share information or ideas with other

members. The department meeting can be a learning community with the purpose of sharing information. That is, the teachers in the meeting perceive their role in the community to be one of sharing, not one of learning knowledge.

Learning Knowledge and Skills

Learning knowledge is always the purpose of classrooms for students; however, it can apply to teachers as well because they learn about preparing for their profession in university classes. Preservice teachers learn knowledge and skills from their university content and methods courses. They also participate in seminars or study groups at their university. Inservice teachers participate in workshops, conferences, or projects developed by the university, district, or professional organizations for their professional development. The workshops or project meetings aim to facilitate teachers' learning through providing opportunities to engage in problem solving and activities relevant to their subject or reading and discussing articles with other teachers in a group. Thus, learning knowledge and skills has been the purpose of professional development programs in general. Hence, the workshops or other professional development programs that teachers participate in can be a PLC. The learning communities having this purpose are very important for teachers because even though teachers know what they have to do and how to develop their teaching in their school, they need continuing professional development over time.

A Professional Learning Community

As I stated earlier, a PLC of teachers seeks their professional development. The different purposes that I described earlier can be included in the activities of a PLC. Through having activities together in a professional learning community, teachers can obtain social relationships with other participant teachers, share information about their students and curriculum, and learn

knowledge and skills about teaching. These additional effects may be expected; however, they cannot be the main purpose of a PLC. Although the development of social relationships and the sharing of knowledge may be important byproducts of a PLC, its foremost purpose is professional development.

Learning Communities for Teachers

I have several ideas for establishing learning communities for teachers. First, teachers need to consider their colleagues' professional development as well as their own by building learning communities. There are various learning communities for teachers' professional development; however, most such communities consider just the individual teacher's development from the community activities. The professional developers who design the programs consider only the participant teachers. That means that teachers participating in professional development programs take into account their own development in the programs, and they may be satisfied if they personally gain some information from workshops or conferences. However, they can assist their colleagues' professional development by building a learning community. For example, if teachers participate in a workshop, they can present the information to their colleagues who do not participate in the workshop and do the activities together during a meeting of the learning community. Creating a PLC of teachers who participate in professional development activities with teachers who do not participate in any activity is an alternative way to support their colleagues' professional development. Teachers do not need to participate in every workshop prepared by universities or county staff for professional development. They can consider alternative ways instead of joining every professional development activity for teachers. It makes it possible for teachers to help their colleagues'

professional development. Hence, when teachers consider their colleagues' professional development, they can create various learning communities.

Second, building learning communities *within* schools helps teachers become more involved in school improvement. Sarason (1990) claimed that summer institutes or short workshops may affect individuals, but teachers are unlikely to change their school in any significant way. Since most programs for professional development are conducted in new settings out of teachers' workplaces, when teachers return to an unchanged workplace, they struggle with implementing what they have learned. Building learning communities within schools may be a way to resolve these struggles. For example, teachers can make study groups with same subject teachers to develop their curriculum or their subject knowledge. Teachers can have small conferences regularly with their colleagues to share materials and discussions from national or international conference. These learning communities are possible for teachers within their school. I believe that teachers can change their colleagues and their schools by building learning communities instead of just having chats with their colleagues in the lunchroom or in the hallway. Learning communities in schools provide opportunities for teachers to share their ideas to develop their schools and make collaborative environments with their colleagues. In addition, schools are good places for inservice teachers to create learning communities because they spend most of their time in schools. Therefore, creating learning communities within schools may increase teachers' involvement in school improvement.

Third, teachers need structured learning communities more than informal meetings to promote their learning. Teachers' development can be more successful, and they can understand their colleagues' thinking through structured learning communities. In this study, the mentor teachers valued their colleagues' thoughts about mathematics and teaching in cluster meetings

although they often had informal discussions about their teaching and mathematics during lunch or in the hallway. They might not discuss their beliefs about teaching and mathematics and students' mathematical thinking in depth in the informal meetings. Structured meetings can help teachers have serious discussions about subject matter knowledge and students' thinking. Such meetings promote teachers' interactions so that they know each other well and work collaboratively in their schools. Hence, I recommend that teachers build more structured learning communities for supporting their learning.

What Made It Possible to Create Cluster Meeting without a Crack?

I assert that the cluster meetings in this study did not have the cracks in pseudo community that Grossman et al. (2001) discussed. In Grossman and her colleagues' research, their participant teachers showed incidents of eye rolling, ridicule, and muttering in discussions from the second month of the project, and one teacher even left 3 months after joining because he was disheartened by some teachers' comments. From the members' perceptions about cluster meetings, I believe that the cluster meetings were an evolving community, but not far from the pseudo community stage. Then what made it possible to create this cluster meeting without a crack in pseudo community?

Like Grossman et al. (2001), PRIME did not consider the emotional aspect of managing group interactions. However, when PRIME set up each participant group with student teachers, mentor teachers, and a university teacher, these roles controlled the emotional interactions. Nobody asked why the inservice teachers were the mentor teachers or why the graduate students as the supervisors were named the university teachers. The titles of the teachers naturally made the members assume their roles in cluster meetings. The designation created authenticity among

the members. I believe that the authenticity managed possible conflicts and prevented cracks that sometimes occur in pseudo communities.

Second, the power issues that I noted earlier played a significant role in the evolution of cluster meetings without conflicts in the present study. The given titles controlled the members' emotional interactions at the beginning stage of building cluster meetings, whereas the power issues managed their interactions while the cluster meetings were going through the pseudo community stage that the Grossman et al. (2001) described. The members in the present study were considerate of other members because of the power issues so that ridicule or muttering did not exist in cluster meetings. The power issues did not prevent the members' interactions within the cluster meetings in this study. In this sense, the power issues might help the evolution of the cluster meetings instead of prohibiting the process of building the cluster meetings. To some extent, a power issue can help members manage their behavior.

Finally, in this study, collaboration in a partnership between a school and a university played an important role in facilitating teachers' community. Although the teachers showed various perceptions because of the different levels of participation, they valued the learning in their community. In this study, the members in the cluster meetings included inservice teachers from a school and student teachers and a supervisor from a university. The university suggested the idea and vision of the cluster meetings and negotiated the implementation with the school. Rather than saying that the university created the cluster meetings, it is more appropriate to say that all the members in the meetings developed the cluster meetings. The cluster meetings provided an opportunity to share ideas regularly for the teachers' professional development. In that sense, the partnership helped the members get together and create a learning community that

can develop a PLC. The collaboration in the partnership made it possible to create the learning community without a serious crack.

Power issues and community

As I stated earlier, Grossman and her colleagues' (2001) study provided important information on building a teachers' community, but they did not discuss power issues because the members in their study were all teachers from an urban high school and therefore had equal power. They selected two departments that rarely met formally and had volunteers from the departments participate by giving an incentive to individual teachers. During the second month of the monthly meetings, the teachers encountered problems with the meetings that made it difficult for them to continue and asked the researchers to intervene. Grossman et al. identified the researchers' lack of knowledge and skill in dealing with dynamic interactions as the reason for incidents of eye rolling, ridicule, and muttering. They tried to resolve the problem through holding a planning meeting with the teachers. As noted earlier, the present study is different from the one reported by Grossman et al. because there were power differences between the individuals involved in the learning community, and those power differences seemed to help the community function smoothly.

Whereas the Grossman and her colleagues discussed the formation of teachers' community in a school, the present study examined the formation of a teachers' community that involved a partnership between a school and a university. The teachers in the present study had power differences because of their different status and different roles, but the power differences helped the formation of a learning community without incivilities for each other. In contrast to Grossman et al.'s study, I observed the cluster meetings for a semester without any incident of incivilities. This implies that a teachers' community that uses a partnership can be built

differently from a teachers' community in a school because of the differences in power that exist. Researchers who study teachers' communities should consider how power issues influence the formation of the community based on the nature of the participants in the community.

CHAPTER 5

SUMMARY AND CONCLUSIONS

The purposes of this study were to understand mathematics teachers and teacher educators in the context of community and to contribute to the research on professional development using a partnership between schools and a university. To avoid confusion about terms that teacher educators or researchers use with different meanings, I offered definitions about professional development and professional learning community. In my study the term *professional development* referred both to teacher preparation and to the development of inservice teachers, and a PLC was defined as a learning community having the purpose of members' professional development through shared activities in regular meetings.

As one of the elements in teachers' professional development, the context of communities has attracted attention in teacher education. In spite of rising interest in professional learning communities, there is little empirical research about such communities and their members' learning in mathematics education. I designed a qualitative case study of a teachers' community using narrative analysis. I was interested in how teachers in a learning community perceive their community, what they find valuable from their activities in the learning community, and what struggles they have in building the learning community.

This study was conducted as part of Partnerships in Reform in Mathematics Education (PRIME) 2005-2006, an NSF-funded professional development effort. From 2005 to 2006, PRIME aimed to build learning communities and to promote partnerships through field experience in which preservice teachers of secondary mathematics, their mentor teachers, and university teachers interact in school settings. The partnership between a university and

participating schools is promoted through various activities such as a secondary mathematics methods course, a field experience course, student teaching, and a professional teaching seminar. This project provides professional development opportunities for mentor teachers as well as supporting preservice teachers' field experience and participating doctoral students' research. For the purpose of the project, PRIME called the inservice teachers *mentor teachers*, the preservice teachers *student teachers*, and the supervisors *university teachers*. In addition, PRIME named the group of mentors, student teachers, and university teacher in a school as a *cluster*. In this study, I selected one cluster based on the previous year's PRIME data and collected data from the cluster meetings.

During the student-teaching period, three mentor teachers, three student teachers, and a university teacher had a regular cluster meeting every Friday after school at Norris High School. I was involved in the meeting as a researcher as well. The three mentor teachers already had the experience of cluster meetings the previous year although the structure was different from this year's meetings. Every week the student teachers brought their students' work, copies of problem-solving tasks, or short video clips of their classroom teaching. Sometimes the university teacher brought copies of assessment or observation material. In the cluster meetings, the mentor teachers, the student teachers, and the university teacher discussed the high school students' learning and their teaching using the student teachers' copies of students' work or the university teachers' copies of books or materials. They gave feedback or advice about each others' teaching, told stories of earlier teaching experiences, and discussed their interpretation of students' learning in their classroom. This study investigated the teachers' perceptions of their community, valuable activities, and difficulties in developing community through the cluster meetings.

Conclusions

I used narrative analysis to construct three narratives of student teachers, mentor teachers, and the university teacher by triangulating data from multiple sources. The constructed narratives showed the cluster members' understanding of their cluster meetings focused on the perception, value, and difficulties in building the cluster meetings as a learning community.

Perceptions about the Cluster Meetings

The groups of teachers showed similar perceptions about the cluster meetings. The student teachers considered the cluster meetings *a professional learning community*. They believed that the cluster meetings shared a vision and a leadership role. The student teachers in this study did not show the conflicts such as ridicule and muttering that Grossman et al. (2001) found in their community study. The mentor teachers' perceptions of the cluster meetings were at the stage of a *pseudo learning community*. They did not identify all subgroups in the cluster meetings and believed that the meetings were led by the university teacher rather than having a shared leadership. The mentor teachers' perceptions were evolving but had not arrived at the mature level of a professional learning community. The university teacher perceived the cluster meetings as if they were in the early stage of a pseudo learning community. She discussed the "shared" vision, but she believed that the goals were too broad. Her perception of the members' contribution was in an evolving stage, but in general, she recognized the cluster meetings as being an *early pseudo learning community*.

The different attitudes toward participating in the cluster meetings reflected the members' perception about the meetings. Whereas the student teachers played an active role in almost all discussions and perceived the cluster meetings as a professional learning community, the mentor teachers played a less active role and perceived the cluster meetings as a pseudo learning

community. The university teacher could not be actively involved in the cluster meetings as a member because of her responsibilities at the university and because of her preexisting knowledge about professional learning communities. This result implies that the passive and active involvement may influence the members' perception of the cluster meetings.

Valuable Learning in the Cluster Meetings

The teachers in the cluster meetings found several things valuable such as learning from different perspectives of other teachers, from the different environment, from students' work, and from new materials. The teachers were able to identify what they missed in their own teaching and what was important in a teaching situation from other teachers' perspectives. The discussion in the cluster meetings facilitated *noticing* how members think differently from each other and what they believe about teaching and learning mathematics. The noticing supported collaboration of the teachers through community activities. The student teachers found the cluster meetings valuable because they provided an opportunity to build up their ways of thinking. They said that they learned *how to think* about teaching rather than *how to teach*.

The cluster meetings also provided the teachers with a different learning environment from the classroom. The mentor teachers and student teachers were able to reflect on their practice and on their students' learning. The different environment of the cluster meetings encouraged the teachers to become members of the learning community. In particular, the mentor teachers showed an increased desire to participate in a teachers' community. In addition, the mentor teachers realized that they were partners who cooperate with university teachers through interacting with the student teachers and the university teacher in the cluster meetings.

Learning from students' work was valuable in two ways. First, students' work facilitated the discussion so that the teachers were able to understand other teachers' thinking by

participating in the discussion. Second, focusing on students' learning allowed the teachers to recognize their identities as teachers. Developing identities as mathematics teachers implies the members' ongoing professional development. The new materials prepared by the university teacher also facilitated the teachers' discussion of teaching and learning mathematics.

Difficulties in Building a Learning Community

Although the teachers found their learning valuable, there were some challenges in the cluster meetings. As shown in earlier studies of teachers' communities, the time issue was an unsolvable challenge in creating a learning community of teachers. In this study, power issues were revealed in relationships between the student teachers and the mentor teachers, the student teachers and the university teacher, and the mentor teachers and the university teacher. The Grossman et al.'s (2001) study discussed the issue of incivility as an obstacle of building a community; however, the present study found power issues as both an initial difficulty and assistance of building a teachers' community. Although the power issues can crack the relationships among members, in this study, the power issues played a significant role in building the cluster meetings. Professional developers should consider the role of power issue in building partnerships between schools and universities. The mentor teachers discussed their difficulty in understanding their responsibility in the cluster meetings and argued that they should have played a greater role in planning the cluster meetings.

Implications

> Being a teacher of mathematics means developing a sense of self [as] a teacher. Such an identity grows over time. It is built from many different experiences with teaching and learning. Further, it is reinforced by feedback from students that indicates they are learning mathematics, from colleagues who demonstrate professional respect and acceptance, and from a variety of external sources that demonstrate recognition of teaching as a valued profession. (National Council of Teacher of Mathematics, 1991, p. 161)

The results of this study showed that discussing students' learning in a learning community of mathematics teachers is helpful for developing the mentor teachers' and the student teachers' identity as a teacher. Little (2004) claimed that written student work could be used as a resource for improving teacher knowledge and also would assist in developing a professional community. In this study, students' work also encouraged teachers to converse about mathematics, teaching, and students' learning in a learning community. It implies that professional development activities for preservice and inservice teachers need to focus on students' learning in that doing so can not only promote development of teacher identity but can also increase teachers' knowledge about teaching and learning mathematics.

Sowder (2007) stated that the creation of teachers' communities is intrinsically more difficult than other professions because participation is voluntary. Teachers often teach individually behind closed doors, so they do not feel the need for external assistance. However, Little and McLaughlin (1993) found that many teachers sought to find professional communities. My study also showed that teachers wanted to participate in professional communities to improve their knowledge and practice in mathematics teaching. I believe that many teachers do not know what a successful PLC looks like and how successfully the communities can help them increase their knowledge and change their practice, so they do not express their desire to participate in communities. In my study, the participant teachers experienced how they could build a PLC and what they would need for a better community. From the experience in the cluster meetings, they were able to understand the possibility of building a PLC and to recognize their need to participate more in community activities increased. This implies that professional development should enable teachers to participate in a successful learning community to promote their learning.

In the cluster meetings of this study, all of the teachers were involved in leading the cluster meetings: as preparing student work to discuss, being a leader sometimes, and participating in the whole group discussion not just observing what others did. The discussion in the cluster meetings was also about what they did and how in their classrooms and what they thought about other teachers' teaching or students' thinking. This made it possible for the teachers to reflect on their activities as members of the cluster meetings and to reflect on students' understanding as teachers. Most teachers found this reflective discussion valuable. This observation implies that professional development programs should give teachers the opportunity to reflect on their practice during and after the programs. In this sense, professional development designers should consider ways to promote participant teachers' reflection.

Improving Partnerships for Mathematics Teachers' Professional Development

The National Research Council (2001) identified critical issues in existing practices and policies for K-12 teacher preparation. They included suggestions for developing learning communities of mathematics teachers using partnerships between schools and universities as well: involve collaborative efforts developed by mathematicians, education faculty, and K-12 teachers, encourage reflective inquiry through collaborative study and discussion, encourage students to participate in the professional community of educators, and so forth. With the recommendations of National Research Council, the results of the present study also addressed several suggestions for improving partnerships.

1. Encourage collaboration among university faculty and practicing K-12 teachers.

Collaboration is essential in building partnerships between schools and universities. Collaboration with mathematicians helps mathematics teachers increase their subject matter knowledge by providing teachers with a mathematical learning experience. With university

faculty, mathematics teachers can develop their understanding of theoretical aspects of teacher education. However, as this study showed, power issues may arise between school teachers and university teachers. Sometimes the power issues may hinder collaboration, but other times they may help the collaboration by keeping a balance among the members in the community. When conducting partnerships, professional developers should keep in mind the importance of collaborative activities and carefully consider the advantages and disadvantages of the power structures among the collaborators.

2. Provide opportunities for mathematics teachers to reflect on their teaching and students' learning through collaborative study, discussion, assessment, and classroom-based research.

The opportunity of reflecting on teachers' teaching and students' learning is essential to improve the instructional capacity of teachers (Cohen & Ball, 1999). Collaborative endeavors with other teachers and university faculty in a community may provide crucial opportunities to reflect on teachers themselves, their teaching, and their students' understanding. As this study showed, a learning community with other teachers can make a natural environment to discuss teachers' reflection on their own teaching and their students' thinking. Hence, professional developers should consider providing meaningful reflection opportunities within a collaborative environment in developing partnerships.

3. Focus on students' mathematical learning

As earlier studies suggested, focusing on students' learning is important in creating a community of mathematics teachers using partnerships. In general, power issues can increase when discussing teaching; however, this study showed that power issues could help the community keep balance among teachers because the discussions and activities in the cluster

meetings emphasized students' mathematical thinking not teaching. The other reason for focusing on students' mathematical learning is that it helps teachers establish their identity as teachers. Therefore, focusing on students' learning is crucial in preservice programs. In addition, it promotes in-service teachers' reflection on their teaching practice and their students' understanding. If partnerships are conducting with teacher preparation programs and professional development for in-service teachers focusing on students' learning, the partnerships can assist both pre-service and in-service teachers. Hence, professional developers should carefully consider the benefits of activities that focus on students' learning in developing a partnership.

Future Research

This study has suggested how a learning community using partnerships can help mathematics teachers' professional development. I hope that there would be continuous further efforts for professional learning communities using partnerships. The participants in this study were high school mathematics teachers, student teachers, and university supervisors. Since a community can have different cultures depending on its members, a replication of this study with different members might help professional developers determine the effectiveness of using partnerships for teachers' professional development; for example, with elementary teachers, with middle school mathematics teachers, or with teachers from different subjects. These kinds of studies can help us build a larger research base from which to generate theory about the nature and structure of partnerships for professional learning.

A study over 1 year could provide more useful information on the status of learning communities and of the members' learning and development. As I stated earlier, this study had a limitation because of the period of data collection. Developing a community requires some amount of time generally because the members need to know and trust each other and build

shared norms based on the trust. Hence, a longitudinal study is warranted to investigate the whole process of maturing learning communities so that researchers could explore how the members improve their relationships over time and how the community changes as the members shift through the longitudinal study. In addition, studies about power issues are needed to understand teachers' communities and the influence of the power issues on the process of building teachers' communities.

Further studies may seek answers to the following questions, "What impact or influence do the community activities have on the participants' teaching practice?" and "How does the impact on teachers influence students' learning?" Since this study aimed to investigate the process of building a learning community of teachers, it was limited to examining the change of participant teachers' teaching. Such research would provide valuable insight into teachers' changes. Further, based on the results of such research, professional developers could develop new programs or activities using learning communities and partnerships.

REFERENCES

Arbaugh, F. (2003). Study groups as a form of professional development for secondary mathematics teachers. *Journal of Mathematics Teacher Education, 6,* 139-163.

Arbaugh, F., & Brown, C.A. (2005). Analyzing mathematical tasks: A catalyst for change? *Journal of Mathematics Teacher Education, 8*, 499-536.

Ball, D. L., & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In L. Darling-Hammond & G. Sykes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 3-32). San Francisco: Jossey-Bass.

Bellan, R. H., Madsen, N., Sullivan, W.M., Swidler, A., & Tipton, S. M. (1985). *Habits of the heart: Individualism and commitment in American life.* Berkeley: University of California Press.

Birchak, B., Connor, C., Crawford, K.M., Kahn, L.H., Kaser, S., Turner, S., & Short, K. G. (1998). *Teacher study groups: Building community through dialogue and reflection.* Urbana, IL: National Council of Teachers of English.

Boerst, T., Hembree, D., Rubenstein, R., Sleep, L., & Wilson, P. (2005). *Building professional communities of mathematics teacher developers*. Paper presented at the Research Presession of Annual Meeting of the National Council of Teachers of Mathematics, Anaheim, CA.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher*, *33*(8), 3-15.

Brahier, D. J., & Schäffner, M. (2004). The effects of a study-group process on the implementation of reform in mathematics education. *School Science and Mathematics*, *104*(4), 170-177.

Bruner, J. (1985). *Actual minds, possible worlds*. Cambridge: Harvard University Press.

Cohen, D. K., & Ball, D. L. (1999). *Instruction, capacity, and improvement* (CPRE Research Report Series No. RR-43): Consortium for Policy Research in Education.

Dewey, J. (1933). *How we think*. Mineola, NY: Dover.

DuFour, R. (2004, May). What is a "professional learning community"? *Educational Leadership, 61*, 6-11.

Dyson, A. H., & Genishi, C. (2005). *On the case*. New York, NY: Teachers College Press.

Eaker, R., DuFour, R. & DuFour, R. (2002). *Getting started: Reculturing schools to become professional learning communities.* Bloomington, IN: Solution Tree.

Fennema, E., Carpenter, T.P., Franke, M. L., Levi, L., Jacobs, V., & Empson, S. (1996). A longitudinal study of learning to use children's thinking in mathematics instruction. *Journal for Research in Mathematics Education, 27*, 403-434.

Fernandez, C., & Yoshida, M (2004). *Lesson study: A Japanese approach to improving mathematics teaching and learning*. Mahwah, NJ: Erlbaum.

Fisler, J. L., & Firestone, W. A. (2006). Teacher learning in a school-university partnership: Exploring the role of social trust and teaching efficacy beliefs. *Teachers College Record, 108*, 1155-1185.

Frampton, P., Vaughn, V. L., & Didelot, M. J. (2003). The professional development school partnership: Is practice improving? Teachers and principals respond. *Journal of Educational Administration, 41*(3), 292-309.

Franke, M. L., & Kazemi, E. (2001) Teaching as learning within a community of practice. In T. Wood, B. S. Nelson & J. Warfield (Eds.), *Beyond classical pedagogy: Teaching elementary school mathematics* (pp. 47-74). Mahwah, NJ: Erlbaum.

Grossman, P., Wineburg, S., & Woolworth, S. (2001). Toward a theory of teacher community. *Teachers College Record, 103*, 942–1012.

Hammerman, J. K. (1997). *Leadership in collaborative teacher inquiry groups*. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago. (ERIC Document No. ED408362)

Holmes Group (1990). *Tomorrow's schools: Principles for the design of professional development schools.* East Lansing, MI: Holmes Group.

Hord, S. M. (1997). Professional learning communities: What are they and why are they important? *Issues … about Change, 6(1).* Austin, TX: Southwest Educational Development Laboratory.

Huffman, J. (2003). The role of shared values and vision in creating professional learning communities. *NASSP, 87*, 21-34.

Huffman, J. B., & Jacobson, A. L. (2003). Perceptions of professional learning communities. *International Journal of Leadership in Education, 6*, 239-250.

Kazemi, E., & Franke, M.L. (2004). Teacher learning in mathematics: Using student work to promote collective inquiry. *Journal of Mathematics Teacher Education, 7*, 203-235.

Krainer, K. (2001). Teachers' growth is more than the growth of individual teachers: The case of Gisela. In F. L. Lin & T. J. Cooney (Eds.), *Making sense of mathematics teacher education* (pp. 271-293). Dordrecht, The Netherlands: Kluwer.

Kruse, S. D., & Louis, K. S. (1993). *An emerging framework for analyzing school-based professional community.* Paper presented at the annual meeting of the American Educational Research Association, Atlanta.

Kwon, N. (2005). Teachers' perception about their community. University of Georgia.

Lerman, S. (2001). A review of research perspectives on mathematics teacher education. In F. L. Lin & T. J. Cooney (Eds.), *Making sense of mathematics teacher education* (pp. 33-52). Dordrecht, The Netherlands: Kluwer.

Little, J. W. (2003). Inside teacher community: Representations of classroom practice. *Teachers College Record, 105*, 913–945.

Little, J. W. (2004). 'Looking at student work' in the United States: A case of competing impulses in professional development. In C. Day & J. Sachs (Eds.), *International handbook on the continuing professional development of teachers* (pp. 94-118). Berkshire, England: Open University Press.

Little, J. W., & McLaughlin, M. W. (1993). Introduction: Perspectives on cultures and contexts of teaching. In J.W. Little & M. W. McLaughlin (Eds.), *Teachers' work: Individuals, colleagues, and contexts* (pp. 1-8). New York: Teachers College Press.

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.

Mitchell, K. (1989). Professional study groups: Collegiality for the improvement of instruction. *CSSEDC-Quarterly, 11*(1), 6-7.

National Council of Teachers of Mathematics. (1991). *Professional standards for teaching mathematics.* Reston, VA: Author.

National Council for Accreditation of Teacher Education (NCATE) (2001). Draft Standards for Professional Development School, National Council for Accreditation of Teacher Education.

National Research Council, Committee on Science and Mathematics Teacher Preparation. (2001). *Educating teachers of science, mathematics, and technology: New practices for the new millennium.* Washington, DC: National Academy Press.

Nelson, B. C., & Hammerman, J. K. (1996). Reconceptualizing teaching: Moving toward the creation of intellectual communities of students, teachers, and teacher educators. In M. W. McLaughlin & I. Oberman (Eds.), *Teacher learning: New policies, new practices* (pp. 3-21). New York: Teachers College Press.

Norman, P. J. (2006). When a PDS isn't working: Confronting the question of pulling out. *Action Teacher Education, 27*(4), 35-44.

Nystrand, R. O. (1991). Professional development schools: Toward a new relationship for schools and universities. Trends and Issues Paper No. 4, ERIC Clearinghouse on Teacher Education, Washington, DC. (ERIC Document Reproduction Service No. 330 690)

Polkinghorne, D. E. (1995). Narrative configuration in qualitative analysis. *International Journal of Qualitative Studies in Education, 8*(1), 5-23.

Rich, S. J. (1992). Teacher support groups: Providing a forum for professional development. *Journal of Staff Development, 13*(3), 32-35.

Rogoff, B. (1994). Developing understanding of the idea of communities of learners. *Mind, Culture, and Activity, 1*, 209-229.

Sarason, S. (1990). *The predictable failure of educational reform: Can we change course before it's too late?* San Francisco: Jossey-Bass.

Secada, W. G., & Adajian, L.B. (1997). Mathematics teachers' change in the context of their professional communities. In E. Fennema, & S. Nelson (Eds.), *Mathematics teachers in transition* (pp. 193-219), Mahwah, NJ: Erlbaum.

Schőn, D. (1983). *The reflective practitioner: How professionals think in action.* London: Temple Smith.

Sherin, M. G. (2003). Using video clubs to support conversations among teachers and researchers. *Action in Teacher Education*, *24*(4), 33-45.

Sherin, M.G., & Han, S.Y. (2004). Teacher learning in the context of a video club. *Teaching and Teacher Education, 20*, 163-183.

Sherin, M. G., & van Es, E. A. (2005). Using video to support teachers' ability to notice classroom interactions. *Journal of Technology and Teacher Education, 13*, 475-491.

Shulman, L. E., & Shulman, J. H. (2004). How and what teachers learn: A shifting perspective. *Journal of Curriculum Studies, 36*, 257-271.

Snow-Gerono, J. L. (2005). Professional development in a culture of inquiry: PDS teachers identify the benefits of professional learning communities. *Teaching and Teacher Education, 21*, 241-256.

Sowder, J. T. (2007). The mathematical education and development of teachers. In F. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 157-223). Reston, VA: National Council of Teachers of Mathematics.

Stein, M. K., & Brown, C. A. (1997). Teacher learning in a social context: Integrating collaborative institutional processes with the study of teacher change. In E. Fennema & B. S. Nelson (Eds.), *Mathematics teaches in transition* (pp. 155-191). Mahwah, NJ: Erlbaum.

Stoddart, T. (1993). The professional development school: Building bridges between cultures. *Educational Policy*, 7(1), 5-23.

Van Es, E., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, *10*, 571-596.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. New York: Cambridge University Press.

APPENDIX

OPEN-ENDED QUESTIONS

Name:
The following questions are designed to find out about your experiences in participating in cluster meetings. Please describe your thoughts as specifically as possible.

1) Why did you participate in PRIME?

2) What did you contribute in the cluster meetings?

3) What was valuable about meeting and discussing teaching and learning mathematics in the cluster meetings?

4) What aspects of your participation in the cluster meetings have supported you in planning or implementing instruction? (for MTs and STs)
   What aspects of your participation in the cluster meetings have supported you in thinking about teacher education or your research? (for the UT)

5) What aspects of your participation in the cluster meetings have had an impact on your beliefs or knowledge about mathematics /teaching and learning/students?

6) What kinds of problems have you had in participating in the cluster meetings?

7) Is there anything else you would like to tell me about your participation in the cluster meetings or in PRIME?