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Teacher Noticing in the Context of a Learning Community[1)]

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This study aimed to investigate teacher learning in the context of a community. For the purpose of this study, two research questions about the kinds of teacher noticing in a community and the role of partnership were addressed. To build a learning community, a professional development project, PRIME, established partnerships with 11 high schools and one of the cluster meetings were investigated in this study. Three mentor teachers, three preservice teachers, and one university supervisor participated in the cluster meeting. For this study, the multiple data such as audio tapes of cluster meetings, observation notes, and interviews were analyzed using the analysis of narratives. The results showed that the participants engaged in different kinds of noticing of their own beliefs about teaching and learning, teacher practices, and teacher identities including noticing of students' understanding in classroom situations. The partnership played the crucial role of reinforcing relationships among teachers, assigning tasks, and creating various communities.

Ⅰ. Introduction

A teacher should have the appropriate knowledge and experience being necessary for performing teaching practices. There are various opinions on what and how much knowledge is appropriate for teaching; however, we agree that teachers should be able to understand and analyze their students' learning at least in their own classrooms. With regard to this ability, Jacobs, Lamb, and Philipp (2010) stress the importance of *professional noticing of children's mathematical thinking*, which involves attending, interpreting, and deciding how to respond to children's understanding. Enabling teachers to notice students' thinking in classroom events may be consistent with supporting their acquisition of knowledge for teaching. This leads to important questions: What do teachers notice in a different context from a class such as a teacher community? How does the noticing assist teachers to develop their professionals or to improve teaching practice? What kinds of contexts are effective in teachers' professional development? How can researchers help teachers learn in the context? Although these questions are relevant to teachers of any subject, a main interest of this study is on mathematics teachers.

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Some researchers (Borko, 2004; Darling-Hammond, 1997; Martin, 2007) insist that high-quality professional development programs enable teachers to improve their instructional practices and guide changes in their students' learning. Traditional professional development programs for teachers are often consisted of workshops in which professional developers convey knowledge or information to participants; however, researchers have identified limitations in the changes teachers make as a result of their participation in such workshops (Gellert, Amato, Bairral, Zanette, Bloch, & Gadanidis, 2009). On the other hand, educators have recently put forward various professional development efforts, such as lesson study and video clubs, which have different settings from traditional workshops. Some studies (Sherin & van Es, 2005; Tepylo & Moss, 2011) provide evidence that these professional development efforts can change teachers' knowledge about teaching and learning or ability to teach. Therefore it deserves to investigate a community in which teachers participate for a professional development effort and to examine the teachers' learning in the community.

The context of communities has lately attracted considerable attention from researchers who design professional development programs. In Western society, people traditionally believe that each teacher works individually in his or her classroom and teachers make personal efforts to improve their teaching practice. However, teacher educators now emphasize collegiality and collaboration for the professional development of teachers in the context of groups or communities. Researchers have investigated various communities with different names such as "teacher inquiry groups" (Hammerman, 1997), "study groups" (Carroll, 2005), "networks of critical friends" (Krainer, 2001), and "teacher learning communities" (Lieberman, 2009). All of these notions are related to community-based environments for professional development.

Yet despite rising interest in the community-based environments, previous studies have used different names, such as study groups, critical friends, and learning communities, to describe teachers' communities. Referring to Allee (2000), Krainer (2003) explain the differences between the notions of "teams", "communities", and "networks" in the following:

> Teams (and project groups) are mostly selected by the management, [they] have pre-determined goals and therefore rather tight and formal connections within the team. *Communities* are regarded as self-selecting, [with] their members negotiating goals and tasks. People participate because they personally identify with the topic. Networks are loose and informal because there is no joint enterprise that holds them together. Their primary purpose is to collect and pass along information. (p.95)

Based on Krainer's description, the present study attempts to investigate the context of a community in a project that tries to build a community through strengthening a partnership. The partnership between a university and high schools plays an important role in the project, in that preservice teachers in the university have teaching practices in the high schools.

Whereas research on communities has investigated the principles or characteristics of communities, we have only a limited understanding

of mathematics teachers' learning in the community experience. Hence, this study aims to investigate a learning community of mathematics teachers and to examine their noticing as learning from the community experience. For the purposes of this study, the two major research questions are addressed as follows:

(1) What do teachers notice in the context of a learning community using a partnership?

(2) How does the partnership contribute to building a community?

Ⅱ. Backgrounds

1. Learning from a sociocultural perspective

Whereas learning has traditionally been discussed from psychological perspectives before 1990s, there have been many efforts to understand learning from a sociocultural perspective (Henderson, 2007; Lave & Wenger, 1991; Rogoff, 1994; Wenger, 1998; Wenger, McDermott, & Snyder, 2002). For instance, Lave and Wenger (1991) develop 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 along with new activities, tasks, functions, and understanding. While talking about schooling and learning, they stress that legitimate peripheral participation is not an educational form or pedagogical strategy, but a way of understanding learning. They emphasize the shift of analytic focus from learning as an individual effort to learning as participation in a social world, and from learning as a cognitive process to learning as a process of social practice.

Much research on individual teacher learning from a psychological perspective has been conducted. According to Stein and Brown (1997), educators use a sociocultural perspective to understand teacher change, not to compete with psychological perspectives. The *adult-* and *children-run* forms of instruction are based on one-sided learning. In contrast, learning in a *community of learners* is a process of shifting participation, which means two-sided learning (Rogoff, 1994). In the present study, teacher learning involves two-sided learning, which has different relations operating among the learners in sociocultural activities and shifts teachers' participation.

Wenger (1998) develops the concept of *community of practice* (CoP), which originated in Lave and Wenger (1991). His theory integrates four components to characterize social participation as a process of learning: meaning, practice, community, and identity. He considers community to be a constituent of learning characterized by social participation. The CoP involves three dimensions of practice: mutual engagement, a joint enterprise, and a shared repertoire. In the CoP, in other words, members mutually engage with practices, endeavor jointly with collective negotiation, and share resources among members. Henderson (2007) states, "Wenger (1998) argues that at a community level, both practice and identity sustain a community and therefore learning." Since teachers engage with some practices and develop their identity from professional development programs, the CoP provides a useful lens to research teacher learning

in a community. The present study investigates teachers' learning from their participation, which includes the categories of meaning, practice, community, and identity.

2. Learning to notice

Researchers (Jacobs, Lamb, & Philipp, 2010; Mason, 2002; Sherin, Jacobs, & Philipp, 2011; Sherin & van Es, 2005; van Es & Sherin, 2002) have examined the development of teachers' noticing in terms of investigating students' thinking in classrooms. Sherin and her colleagues explore a video-based professional development environment, called a video club, and argue that the context of the video club supported teachers' learning to notice (Sherin & Han, 2004; Sherin & van Es, 2005; van Es, 2011; van Es & Sherin, 2002)[2]. For example, Sherin and Han (2004) investigate ten video club meetings in which the participants are four middle school mathematics teachers and two researchers. The results show that the teachers change what they discussed and how they discuss student conceptions and pedagogy. They become to think more about student conceptions as opposed to focusing only on pedagogical issues, which they have done in the initial meetings.

In their latest study related to noticing, van Es. (2011) construct a framework for learning to notice student mathematical thinking. Based on what and how teachers notice, she proposes a framework that consists of four levels: Baseline, Mixed, Focused, and Extended. The framework describes a trajectory of development in the two "particular dimensions related to what is noticed and how teachers reason about what they observe" (p.138) from Baseline to Extended Noticing. This framework helps us identify teachers' growth in learning to notice students' thinking.

After reviewing the literature, one can see that the majority of studies on noticing consider teacher noticing to be the ability to understand and interpret students' learning in classroom settings. Noticing is focused on a crucial aspect of teaching practices relevant to students' thinking in earlier studies. However, the present study takes into account teachers' noticing as part of the learning that occurs in the context of a teacher community, which includes meaning, practice, community, and identity. The four components to characterize Wenger (1998)'s theory of learning help us understand how the participant teachers discuss their experience, share resources and perspectives, build their social configurations, and create teacher identities. In this sense, the concept of noticing in this study is different from teachers' noticing of student thinking in earlier studies. The present study shows what teachers notice in shared practices and how teachers construct their perspectives and identities in their community.

3. The context of teacher community and learning

Goode (1957) discusses the community of profession in the areas of law and medicine. The

2) van Es and Sherin (2002) propose that noticing for teaching consists of the following three aspects: (a) identifying important things in a teaching situation, (b) using knowledge of the context to reason about and interpret events, and (c) making connections between particular incidents and broader principles of teaching and learning.

professional communities he describes share a sense of identity, role, and common language, and control the reproduction of members through training and education. However, teachers have different understandings of matters related to teaching, the curriculum and their goals, depending on the grade level and subject area they teach, and the type of students they have (Grossman, Wineburg, & Woolworth, 2001). As a result, teachers attempt to build a professional vision for teaching, but there is no professional community for teachers similar to that which exists for practitioners of law or medicine. Hence, researchers need to approach the concept of a community of teachers in a different way.

There are different terms and definitions for teacher community. Some studies (DuFour, 2004; Eaker, DuFour, & DuFour, 2002; Hord, 1997; Huffman, 2003) have regarded the school as a professional community site. Since the school setting can provide a lens to view school culture, those studies investigate characteristics of communities and ways to improve them. Other studies investigate how teachers' communities (e.g., study groups and video clubs) support teacher learning and professional development (Brahier & Schäffner, 2004; Caroll, 2005; Hammerman, 1997; Jaworski, 2007; Katz & Earl, 2010; Krainer, 2001; Sherin & Han, 2004; Tepylo & Moss, 2011). Instead of focusing on schools as a teacher community, those researchers center on teachers to investigate how and what teachers learn from the community experience. Similarly, the present study focuses on the learning of teachers who participate in a community.

We investigate teacher learning from the perspective of Wenger's (1998) community of practice. Specifically in this paper we pursue our endeavor to describe mathematics teachers' learning in a learning community using a partnership. The participant teachers learn from their participation, which includes meaning, practice, community, and identity. A learning community is an educational community in which students, teachers, parents, administrators, and professional teacher educators participate together in learning. The present study is considered the learning community as a group of teachers who share concerns about teaching and learning as they interact regularly. Members of the learning community learn from engaging in practice with shared purposes and develop their identity through social processes. In other words, the learning community is regarded as a community of practice in which mathematics teachers engage in practices and share resources for the purpose of professional development.

Ⅲ. Method

This study used a qualitative research method with a case study (Dyson & Genishi, 2005). The data came from Partnerships in Reform in Mathematics Education (PRIME) 2005-2006, an NSF-funded professional development effort for high school mathematics teachers in northeast Georgia[3]. From 2005 to 2006, the PRIME project intended to build a learning community and to

3) This study used the same data with the earlier study(Kwon, 2010) and re-interpreted the data focused on teacher learning in a community.

promote partnerships through interactions among inservice teachers, preservice teachers, and university supervisors. For the purpose of the project, the PRIME called the inservice teachers *mentor teachers*, the preservice teachers *student teachers*, and the supervisors *university teachers*. The PRIME intentionally tried to strengthen the interactions between mentor teachers and university teachers. In addition, the PRIME researchers referred to each school as a cluster to build a learning community. The author played a role of one of the university teachers in the PRIME.

1. Participants

One cluster among 11 clusters in the PRIME was selected using *criterion-based sampling* (Goetz & LeCompte, cited in Merriam, 1998). Seven teachers who were three student teachers, three mentor teachers, and a university teacher participated in the cluster the researcher selected for this study. The cluster included mentor teachers and a university teacher who had participated in the same project in the previous year. This allowed the members of the cluster to build a learning community more easily than other clusters in which all the members were new participants in the project. Hence, this cluster including three teachers who participated in the PRIME in the previous year was purposefully selected among 11 clusters.

During spring 2006, three mentor teachers from Norris High School participated in PRIME[4]. One of them, Ms. Turner, and two other teachers, Ms. Perry and Ms. Robin, who did not participate in PRIME the previous year, participated in this study as mentor teachers. All had teaching experience of over ten years. There were three student teachers, Tyler, Abbey, and Ella. They observed classes and received advice from the mentor teachers during their field experience period. The university teacher, Gabby, went to the school to supervise student teachers and attend cluster meetings. She had been the university teacher for Norris High School in the previous year as well. As a researcher, the author worked with the university teacher in the cluster.

2. Cluster meetings

The PRIME project arranged for each cluster to have regular gatherings in order to create a learning community. According to Allee's definition (2000), each cluster started as a team in fact. The PRIME project pursued that the cluster shifted from a team to a learning community of teachers. For the purposes of this study, the author selected the Norris High School as a research site. Although the cluster in the Norris High School did not reach a matured learning community, it showed improvements in having practices, sharing norms, developing identities, and building communities. In the cluster, all of the seven members met every Friday after school, according to their preference. A total of nine cluster meetings were held. In these meetings, the participants generally discussed student teachers' questions such as questions about what and how they had done in class as teachers and how their students had responded. The mentor teachers in the Norris High School encouraged the

4) All names are pseudonyms.

student teachers to observe and teach the classes of the other mentor teachers or other mathematics teachers who were not participating in the project. Therefore this was possible to discuss their experiences in several different mathematics classes and to reflect on teaching practice for all of the teachers in the cluster. The university teacher sometimes provided new materials for the members to discuss in the meetings. The topics and activities of the cluster meetings were summarized in Table 1.

3. Data collection and analysis

To investigate the participant teachers' learning, data were collected from multiple sources,

<Table 1> Topics and activities of the cluster meetings

Cluster meeting	Topics/activities
1	Tasks and discussion on alternative assessment Brainstorm for cluster meetings and student teaching Set next meeting agenda
2	Discuss the mathematical situation presented by student teachers (a student's class notes and copies of test problems) Set next meeting agenda
3	Discuss a student's question about whether all procedures in mathematics can be reversed Share about students' struggles in understanding concepts Set next meeting agenda
4	Watch two student teachers' lesson video clips Discuss teaching and learning in the video clips Set next meeting agenda
5	Watch a student teacher's lesson video clips Discuss teaching and learning in the video clips Share teaching procedures and concepts Set next meeting agenda
6	Discuss mathematical situation presented by student teachers (students' understanding was shown in their written answers about trigonometry concepts) Share materials made by teachers Set next meeting agenda
7	Share ideas from a professional development workshop Set next meeting agenda
8	Discuss mathematical situation presented by student teachers (connection between concept and representation) Share activities using observation material that came from the professional development workshop Set next meeting agenda
9	Final reflection (important moments in lessons or cluster meetings)

including the audio tapes of the cluster meetings, observation notes, two interviews, and the participants' written responses to open-ended questions. The semi-structured interviews and written responses asked the participants their practices and perceptions about their cluster. Although they were not the main focus, other documents from PRIME, informal conversations, and e-mail conversations also contributed to the data. The 14 interviews from seven participants in total were audio taped and transcribed.

The data were analyzed in three steps according to the *analysis of narratives* (Polkinghorne, 1995). First, all written documents and oral statements from the interviews were considered as sources of storied narratives and organized by the cases of participant teachers' narratives. Then the general notions appearing in each narrative were identified. Second, the narratives were classified into the three categories of teachers' perception of their community, value of their practice, and difficulties in building the community. The category of "value of their practice" was related to teachers' noticing in their community practice. Finally, the categories were analyzed in terms of learning, focusing on what the participant teachers noticed relevant to their practice in the cluster.

Ⅳ. Findings

1. What do teachers learn in the context of a learning community using a partnership?

Teachers in the cluster meetings participated in various activities such as observing student teachers' video clips, reflecting on teaching moments initiated by student teachers, and exploring new materials provided by the university teacher. Since the cluster included different groups of teachers connected by a partnership, teacher learning in the community was not limited to the noticing of classroom interactions. The activities fostered the participant teachers' learning to notice in four aspects that is in terms of classroom situations, their beliefs about teaching and learning, their own practices, and identities as teachers. This section described the teachers' learning to notice in their community.

1.1 Learn to notice of classroom situations

Noticing is related to using what one knows about the context to reason about classroom interactions (Sherin, Jacobs, and Philipp, 2011). In this study, most of the cluster meetings included discussion about student teachers' teaching situations. For instance, in the fifth meeting, the participants described what they noticed while watching a five-minute video of the lesson taught by the student teacher Abbey. As the group asked her to explain the classroom situation, Abbey responded that she was teaching syntactic division to make students be able to factor in polynomials. She then talked about her noticing of classroom interactions including her teaching and her students' learning;

> But today was just review of long division and polynomials, review of syntactic division and polynomials. So I was kind of, trying to get through it, but I guess something that I notice … I thought bother me that in all the reviews, I

didn't really let them I had all written in overhead already, and I just kind of moved it to show it which I know I hate, as a student, when teachers, you're trying to figure it out and they are already moving in the next step to showing you the answers before you have get chances to do it in your head which I did like the whole time so.

Other teachers in the cluster discussed their noticing about the teaching and learning relative to this classroom situation. For instance, the university teacher remembered the other day's Abbey's class and said, "the interesting thing is … you were in the middle of sentence, then you stop and said 'but' and as you said 'but', then all the students changed their answers because they knew what they said were wrong." The discussion initiated by a lesson video clip extended the teachers' noticing of teaching and learning from the lesson in the video clip to a lesson that they had experienced or lessons in general. This situation was similar to what Sherin and her colleagues reveal in earlier studies of video clubs. It is the first potential aspect of noticing documented in a learning community using a partnership.

1.2 Learn to notice of beliefs about teaching and learning

Activities in the cluster meetings helped the participants understand other teachers' beliefs about teaching and learning mathematics. This category of noticing is different from the teacher noticing that Sherin and her colleagues discuss in that it is related to understanding other teachers' thoughts not understanding students thinking. For example, in the seventh meeting, the university teacher shared materials originated from a teacher development program with other teachers. The materials included some mathematical tasks for secondary school students. One of the mathematical tasks was to explain how to find the number of tiles surrounding 3 X 3 tiles. The university teacher also showed a short video clip including students' presentation about the task. Then the university teacher asked how other participant teachers thought of the task in terms of using them in class and how they saw the discourses in the video clip. This question led the mentor teachers and student teachers discuss what we counted as a student's mathematical discourse or not. The student teachers in this discussion were hard to express their opinions because they were not familiar with classroom discourses other than they had taught. However, this discussion helped teachers understand what other teachers think of some concepts faced in teaching situations.

In the fourth meeting, after all the participants watched a short video clip that Ella had taught, they were aware of Ella's classroom interactions presented in the video. The student teacher Ella would like to know how her transition as a teacher was. Beyond the noticing of Ella's classroom situations, the discussion in the cluster helped the group understand what Ella was thinking as a teacher. It also allowed the mentor teachers to notice how the student teachers interpreted the situation differently and enabled the student teachers to notice how the mentor teachers and university teacher differed in thinking about teaching and learning mathematics. From the university teacher's interview, Gabby said that she was better able to understand the student teachers

and mentor teachers by listening to their opinions in the meetings. In other words, discussion with different groups of teachers facilitates noticing how other teachers think of certain situations and what other teachers believe about teaching and learning mathematics. This is another aspect of noticing that occurred in the learning community using a partnership.

1.3 Learn to notice of teachers' own practices

The teachers had opportunities to reflect on their own classrooms during the meeting. Watching the short video clips in the fourth and fifth meetings encouraged the student teachers to reflect on their teaching practices in that particular situation. For instance, in the fifth meeting, Abbey brought up a video clip showing that she was teaching 'synthetic division'. After watching the video clip, a mentor teacher Ms. Robin talked about what and how she had taught the strategy of synthetic division and how her students responded. Other teachers added comments on Abbey's teaching practices. Like this, the teachers in the cluster participated in reflections on their own practices beyond just discussing student teachers' practices.

In other meetings, the mentor teachers also had opportunities to look at things missed or hidden in the classrooms. For example, in the sixth meeting, a student teacher raised questions about how to teach trigonometric functions. Ms. Robin recalled a teaching material that she had made for trigonometric functions in her class and showed the material to the group. In her presentation, she reflected on her teaching and her students' responses to the material. In this way, the learning community can provide a learning environment that encourages participants to notice their own practices. This is the third aspect of noticing related to reflection on practice in the learning community.

1.4 Learn to notice of identities as teachers

As another kind of noticing, the participants developed identities as teachers. In the cluster, all the members participated in activities as mathematics teachers even though they had different levels of knowledge and teaching experience. When they examined and discussed students' work, they all reflected on their experiences and discussed their ideas as mathematics teachers. These reflective discussions helped the student teachers establish their identity as teachers in particular. In his interview, Tyler, one of the student teachers, said, "I feel that I'm a professional. The atmosphere has been that I'm up here, I'm another teacher here, not a student, and I think in our cluster meeting, it's kind of the same way". The teachers in the cluster considered him as a teacher, not a college student, when they shared ideas in the learning community. Sharing ideas with mentor teachers and university teachers in the cluster helped student teachers develop their identity as a teacher.

The mentor teachers also developed their identities as teachers through collaborating with other teachers and realizing their roles in the partnership. For example, the mentor teacher Ms. Robin stated in her interview that the community activities increased her desire to meet with other teachers because they allowed her to understand

other teachers and helped build teacher collaboration. Another mentor teacher, Ms. Perry, said in her interview that mentor teachers assisted teacher education in a practical way by participating in cluster meetings and mentoring student teachers. In other words, their activities in the learning community using a partnership allowed the mentor teachers to recognize their colleagues as well as the role of mentors in the partnership; this is the fourth aspect of noticing.

In summary, the cluster as a learning community gave the participants various opportunities to notice classroom situations, including teachers, students, and mathematical tasks; to notice different perspectives on teaching and learning mathematics; to notice their own practice; and to notice and develop teacher identity.

2. How does the partnership contribute to teacher learning?

To understand how the partnership contributed to the teachers' learning in this study, it is helpful to review the project design. The PRIME researchers attempted to understand the role of professional learning communities in the professional growth of teachers who work with student teachers and to investigate the construct of mathematical knowledge for teaching within learning communities. To do so, they created a learning community in each partner school and promoted partnerships through interactions among inservice teachers, preservice teachers, and university supervisors. The partnerships that the project aimed to construct had three characteristics: reinforced relationships between inservice teachers and university supervisors, apparent role assignments, and efforts to create various learning communities. In the sense of learning, these special characteristics contributed that participant teachers engaged in practices and had meanings of the community experience.

First, the partnerships pursued a reinforced relationship that would be stronger than the traditional partnerships among teachers. Traditionally, in partnerships, the relationship between inservice teachers and university supervisors is not as strong as the relationship between inservice teachers and preservice teachers because the preservice teachers work with the inservice teachers as mentors during their field experience. Moreover, the university supervisors visit partner schools and talk with the inservice teachers only a limited number of times during the field experience period. In this situation the university supervisors cannot have sufficient interactions with inservice teachers. On this account, to strengthen the interactions between inservice teachers and university supervisors, PRIME intentionally made efforts as follows. All the inservice teachers and university supervisors shared a big idea in an initial meeting and discussed expectations. To supervise student teachers, the university supervisors had regular meetings with inservice teachers in each cluster and designed cluster meetings based on each school circumstances. Those efforts strengthened the partnerships between the schools and the university.

Second, the titles of teachers in the cluster assigned apparent roles to the participant teachers. The PRIME called the inservice teachers *mentor teachers*, the preservice teachers *student teachers*,

and the supervisors *university teachers* to build a learning community of *teachers*. The PRIME researchers recognized that these teacher titles would shape the participants' perceptions of their characteristics and roles in the learning community. When supervisors from a university presented at a school, inservice teachers tended to step back because they understood that supervisors play the role of investigator or evaluator for preservice teachers. The mentor teachers were aware that they had the responsibility of acting as mentors for student teachers. These awareness led three mentor teachers in this study try to make statements as often as possible concerning the kind of noticing relevant to classroom interactions and students' thinking in mathematics. To build a learning community to support collaborative efforts among teachers, the given titles helped the participants of cluster in this study not only to understand their roles in the community but also to treat all members equally as teachers.

Third, the project sought to create various learning communities with different members. such as clusters and university teachers' community. In the sense that each cluster was considered as a learning community, the PRIME had 12 learning communities including 11 clusters and a university teachers' cluster. In fact, there were 12 different clusters to build learning communities of teachers. Since each school had different situations, the learning communities were varied in terms of the number of teachers and the discussion time period. For example, the Noris high school had three mentor teachers, three student teachers, and a university teacher, whereas the Oak high school had two mentor teachers, two student teachers, and two university teachers. Some clusters had different topics for each meeting and longer discussion time than others, etc. Hence, according to Grossman, Wineburg, Woolworth's model of community (2001), each cluster was at a different status in the maturity of community.

In addition, the university teachers also tried to create a learning community within the university. To work as a discussion facilitator in the cluster activities, all university teachers gathered every week at the university to discuss their work, including what they would or should do in their clusters and what difficulties they encountered. The university teachers engaged in discussions to build a learning community at their university that was similar to the cluster meetings that occurred in the schools. These multi-learning communities helped the participant teachers learn in various ways.

Ⅴ. Conclusion and Discussions

This study investigated teachers' learning with a particular focus on teacher noticing in a learning community that included a partnership. In cluster meetings designed by a project PRME, the participant teachers watched classroom videos, reflected on teaching moments, and explored materials for professional development. Through these activities, the teachers learned to notice classroom situations, to notice their own or their colleagues' beliefs about teaching and learning, to reflect on their own practices, and to develop their identities as teachers. The partnership initiated by the project played an essential role in the teachers'

learning to notice. It reinforced relations among teachers, helped the teachers understand their roles in the community, and facilitated their reflection on community membership.

Whereas Sherin and other researchers (Sherin, 2003; Sherin & Han, 2004; Star, Lynch, & Perova, 2011) suggest that video is a useful tool for helping teachers notice students' thinking, this study found that participating in various discussions in a learning community foster teachers' learning to notice in different ways. The teachers in the cluster meetings often said that they became aware of things that they did not notice in their own classrooms while talking about their observations of student teachers' lessons or questions that student teachers had asked. These statements about their noticing are consistent with the results of Sherin and her colleagues. Since the teachers in the present study engaged in collaborative thinking process with topics of teaching and learning mathematics, the noticing used in this paper was applied to expand the meaning of noticing to professional knowledge rather than narrowing to noticing of students' thinking.

As the cluster in this study was composed of three groups of teachers (i.e., mentor teachers, student teachers, and a university teacher), teacher noticing was not limited to the noticing of classroom interactions. The teachers were able to get advice from their colleagues and sometimes have novel ideas from the student teachers or the university teacher. The collective thinking process with different groups of teachers facilitates the teachers to understand the other teachers' beliefs and knowledge. In addition, the process of sharing ideas let the teachers reflect on their practices. The diverse members afford an opportunity that the cluster creates a novel atmosphere for a teacher community.

Teacher educators should focus on the context in which teacher learning occurs. The results of this study implicate that the context of community encourages teachers to explore a different kind of learning to notice. One of the key elements of professional development programs is the context in which professional development occurs (Borko, 2004). According to Kastberg, D'Ambrosio, McDermott, and Saada (2005), students learn in various contexts. In terms of teacher learning, different professional development programs can give teachers chances to learn from the different context of the programs. When teachers are considered as learners, various beliefs and knowledge can be identified from the novel context. Teacher educators may research the context itself or teacher learning in that context in depth. Future studies should investigate various contexts as a critical component of teachers' professional development.

Many studies attempts to reinforce teachers' professionalism in Korea. Kwak, Yin, Min, Baek, and An (2014) suggest the possibility of using teachers' professional learning communities as one of the ways to educate teachers. The context of communities can give teacher educators novel environments to design and implement professional development. As indicated in this present study, the context of communities can have great impacts on participant teachers' learning. Therefore, future researchers studying on communities should get interested in the aspects of learning in communities as the core of research.

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학습 공동체의 맥락에서 일어나는 교사의 노티스(Noticing)

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본 연구의 목적은 공동체의 맥락에서 일어나는 교사 학습을 관찰하는데 있다. 이를 위하여 공동체에서 교사가 노티스(주목) 하는 것의 종류와 공동체를 구성하게 한 파트너십의 역할에 관한 연구 문제를 제기하였다. 본 연구에서 관찰한 학습 공동체는 PRIME이라는 전문성 발달 프로젝트를 통해 대학과 학교간의 파트너십을 기반으로 생성된 팀들 가운데 하나로 세 명의 멘토 교사와 세 명의 예비교사, 한 명의 대학에서 온 감독관이 참여하였다. 연구를 위하여 학교에서의 미팅은 오디오 녹음으로 자료화하고 관찰 노트와 인터뷰 등의 여러 자료를 내러티브 분석법을 이용하여 분석하였다. 연구 결과 참가자들은 학습 공동체에서의 활동을 통하여 교실 활동 상황을 포함한 교수 학습에 관한 활동과 자신들의 교수 학습에 관한 신념 등을 새롭게 노티스하게 되었다. 파트너십은 교사들 간의 관계를 강화하고 임무를 할당하며 다양한 공동체를 구성하는데 필수적인 역할을 하였다.

* 키워드 : 교사 학습(Teacher learning), 주목(Notice), 공동체(Community), 파트너십(Partnership), 수학 교사(Mathematics teacher)

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