Levels and Patterns of Participation and Social Interaction in an Online Learning Community for Learning to Teach

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Abstract: This study was aimed to understand how members participate in an online community for learning to teach. Members' levels and patterns of participation and social interaction were examined via social network analysis of activity logs and content analysis of interviews. The results of the analyses show that: 1) members' levels and patterns of participation varied across time, member types, and tools; 2) members' identity and levels of participation were reciprocally associated; 3) there were similarities and differences in members' usage of computer-mediated communication (CMC) tools, and members showed growth of their knowledge and skills for teaching via mutual engagement, creating joint enterprise, and establishing shared repertoire supported by CMC tools; and 4) lack of time influences members' levels of participation.

Introduction

Rapid advances in ease of access and affordability of the Internet has led to expansion of online learning in higher education. Researchers have also been exploring alternative forms to traditional course-based learning to meet challenges. One such form that has potential in the field of teacher education is the use of online communities of practice (CoP). Researchers in teacher education have particular interest in CoP as a method for diminishing the gaps and disconnection between the stages of teachers' professional development. Previous studies have recognized the importance of a professional continuum of learning that spans pre-service teacher education, induction of beginning teachers, and continued professional development (e.g., Feiman-Nemser, 2001). Some cases of applying online systems to support the continuum of teachers' professional development have been found effective but not easy to sustain. (Job-Sluder & Barab, 2004; Gray & Tatar, 2004; Roup, Gal, Drayton, & Pfister, 1993; Desimone, Porter, Garet, Suk Yoon, & Birmnan, 2002). To better understand how teachers can be supported and sustained in an online community of practice, this study investigated the participation and interaction of the online learning community via examining members' actual and overtime levels and patterns of participation in the online learning community of practice, NETwork (Nurturing Elementary Teachers' work).

CoP in Science Teacher Education

Wenger (1998) defined CoP as groups of people who join together with a common purpose and share a common practice. Further, Wenger indicated that "Knowledge, belonging, and doing are not separable: What we know, who we are and what we do seamlessly come together in one experience of participation" (Wenger, 1996, p.22). Thus, learning and membership within CoP are intertwined. Members benefit from community membership by having a sense of belonging and having others to ask for support (Wellman & Gulia, 1999).

Since the 1990s, teachers' professional development has attempted to move beyond simply supporting teachers' knowledge and skill acquisition by changing the training format from one-shot professional development to long-term professional learning development (Vescio, Ross, & Adams, 2006). One effective approach to meeting the needs of long-term professional development is the establishment of professional learning communities (PLC) based upon a CoP framework (Wenger, 1998). A CoP framework has been identified as an effective model to support the reform of teacher practice and teaching reflection by a number of teacher education researchers (Hollins, McIntyre, DeBose, Hollins, & Towner, 2004; Andrews & Lewis, 2002; Strahan, 2003). CoP supports teachers as they integrate practice, meaning, identity, and community as components of learning and knowing in their interaction. Previous studies have found that PLC provides teachers opportunities to collaborate and supports continuous teacher learning (Berry, Johnson, & Montgomery, 2005; Phillips, 2003; Englert and Tarrant, 1995; Hollins et al., 2004). However, the professional learning communities studied were face-to-face not implemented online, instead they required teachers to travel to particular locations and coordinate tight schedules for meetings. Taking time to meet is problematic because teachers indicate that they do not have much time to talk or share with fellow teachers in their own buildings. Teachers' daily teaching schedules have occupied most of their time (Scribner, 2003). Thus, teachers' time commitment has been a challenge for participating in PLC. Given the geographical distribution of teachers upon graduation from a university, this poses a challenge for establishing a long-term PLC across teacher education to school practice.

Taking advantage of computer-mediated communication (CMC) tools and the Internet, researchers have constructed teachers' PLC in online learning environments. Some of the most prominent online PLC's for

teachers are LabNet (Roup, et al., 1993), Inquiry Learning Forum (Barab, Makinster, & Scheckler, 2004), and Tapped In (Schlager & Fusco, 2004). Barab and colleagues found first time participants to mainly be observers, but over time become contributors to the community through discussing, sharing, and creating videos of their teaching (Barab, Hay, Barnett, & Squire, 2001). Studies identify that it is challenging and difficult to sustain members' feelings of a sense of ownership, connections, trust, commitment to the community, and a sharing culture to foster interaction and participation (Barab, Makinster, & Scheckler, 2004; Schlager & Fusco, 2004). A key determinant of how teachers' long-term education can be effectively supported in an online community of practice depends on how well the social interaction can be engaged and sustained by the CMC tools, such as chat room and discussion boards.

A new teachers online professional learning community, NETwork (Nurturing Elementary Teachers' work), was established in 2006 using the Sakai collaborative learning environment to implement the CoP framework. The purpose of NETwork is to diminish the current distance between teacher education and school practice by providing pre-service and in-service teachers a shared, long-term environment for collaborative learning. NETwork members are expected to discuss teaching issues and share their theoretical and practical perspectives so as to expand pre- and in-service teachers' practical experiences as well as their knowledge and skills of learning theories and new teaching polices. Additionally, being able to discuss teaching issues is a growth opportunity for the practicing teachers. NETwork allows in-service teachers to discuss their practical issues and to meet knowledge and skill needs they have encountered on the job. Furthermore, the shared experience can lead to an improved community and sense of membership in a professional development community. Both pre- and in-service teachers improve practice by contributing what they experience in class or practice to the online discussion and learning from what has been shared by others. In-service teachers not only receive feedback about their practice but serve as experienced mentors to guide pre-service teachers as they begin learning to teach. Participating in NETwork may change how members think about themselves as teachers (identity) and about how able they are to teach. These changes may occur over time and as they move from peripheral to core participation. Little is known about how to best sustain participation, the variety of ways that teachers may participate, and how sustained participation changes teachers, but the establishment of NETwork provides a test-bed for exploring participation in CoP.

Social Interaction of CoP

Because online PLC's operate through CMC tools and systems, how to facilitate and foster online social interaction within the CoP becomes a critical factor for the success of teachers' professional development in the online learning community (Gess-Newsome, Blocher, Clark, Menasco, & Willis, 2003). Researchers found that when people communicate or interact through online learning environments, the nature of the tools and how social constructs are established in the contexts influence members' participation and interaction (Picciano, 2002; Rovai, 2002). Hara and Kling (2000) discovered that communication and technical difficulties experienced by students in online learning environments can frustrate them and impede interaction. This is critical because levels and types of interaction influence members' sense of community and participation (Lally & Barrett, 1999). It is difficult for members to interact and contribute in a community if the online learning environment cannot support what they expect to do. Additionally, studies have shown that without sufficient social interaction, students experience a sense of isolation even though they do appreciate the flexibility and convenience of the virtual learning space (Abrahamson, 1998; Rahm & Reed, 1998). Students' feelings of isolation were found to be a primary reason for higher dropout rates in distance education (Carr, 2000). Similarly a lack of social interaction is a factor that depresses students' satisfaction in online learning (Arbaugh, 2000). Also, students' perceptions of their interaction and sense of presence were found to have positive relationships with their perceived performance in an online environment (Picciano, 2002). Similarly, researchers discovered that teachers' interaction and participation in CoPs were associated with the effectiveness of their learning, collaboration, and how they can apply what they learn (Job-Sluder & Barab, 2004; Gray & Tatar, 2004; Schlager & Fusco, 2004).

Measurement of Participation and Interaction of CoP

According to the framework for CoP (Wenger, 1998), learning outcomes of a CoP include not only the knowledge or skills gained in the CoP but also changes of social constructs, such as sense of community, social ability, identity, levels of participation, and social relationships with others. These changes happen when members interact with others through textual communication. Textual information created or generated during members' interaction is the primary source for examining members' changes of social interaction. However, Paccagnella (1997) found limitations in studying a community only through reading the textual messages and logs. Only analyzing the textual messages ignores members' actual experiences of their participation and interaction when working in front of their computers. Also, the logs do not record the nature of turn taking that happens in chat or emails and the time of typing a reply message, which helps form the experience of

collaborating in the community. Similar to Paccagnella, Mason (1999) found that in only reading the posted messages the researchers miss out on the actions that happen around the messages. In addition to only analyzing the content of messages Mason (1999) indicated that using an online survey or email interview are important methods for studying a text-based virtual community. These findings suggest that studies, such as the current study of the NETwork community should not only analyze textual messages and activity logs but also implement survey and interview approaches in order to understand members' experiences.

Wurman (1989) identified five different methods for transforming data into information for exploring particular phenomena, including category, time, location, alphabet, and continuum. Wurman (1989) suggests that the data of studies such as this one classify data by types (i.e. survey data, interview transcripts, textual messages, and activity logs), location (i.e. activity logs or transcripts of discussion in Resources, Discussion Board, or Chat room), and time. Since the fundamentals of a community require time to develop in electronic social environments (Tu & McIsaac, 2002), a short-term observation or record of members' actions is not likely to thoroughly describe the formation of an online learning community nor represent the dynamics of a community adequately. Tu and Corry (2003) indicated that longitudinal studies are required that allow the community and participants to develop mature social learning processes. Based upon varying data types, several methods of analysis, including content analysis for textual messages and transcripts (Henri, 1992; Gunawradena, Lowe, & Anderson, 1997; Sing & Khine, 2006), frequency calculation, social network analysis, and visualization techniques for activity logs (Koku & Wellman, 2003; Gray & Tatar, 2004; Kling & Courtright, 2003) have been recommended by researchers.

Research Question

The purpose of this study was to understand how members participate in an online learning community for learning to teach. Two research questions guided the study.

1. What are the characterizations of member activity that represent different levels of participating in the community, and to what extent did members participate?
2. What are the characterizations of member activity that represent different patterns of participating in the community? Are there differences in the patterns of participation for experienced members and new members and for pre-service and in-service teachers?

Research Method

Research Context and Participants

An online teacher community, NETwork (Nurturing Elementary Teachers' work), has been in place using the Sakai 2.0 course management system to support K-8 science teaching since August 2006. The purpose of NETwork at the University of Missouri is to overcome the current disconnection between pre-service teacher education and in-service teaching practice and to provide pre-service and in-service teachers a collaborative learning environment. Table 1 shows the number of members types of in- and pre-service teachers. Members who participated since Fall 2006 semester were classified as old members and new members are members joining in Spring 2007.

Table 1 Member Types

Types of NETwork Members		N
Old Members (Since Aug. 2006)	Pre-service Teachers (PO)	38
	In-service Teachers (IO)	17
New Members (Since Jan. 2007)	Pre-service Teachers (PN)	30
	In-service Teachers (IN)	7
Total		92

Note. "P"=Pre-service Teachers; "I"= In-service Teachers; "O"=Old Members since Aug. 2006; "N"=New Member during Jan. 2007

Data Collection

A set of semi-structured serial interviews, semester-end interviews, members' activity logs recorded in the Context-aware Activity Notification System (CANS, Amelung, 2005), and discussion content recorded in the Sakai system were collected and analyzed to articulate members' behaviors in NETwork. Table 2 shows the number of participants.

Table 2 Research Participants

Types of NETwork Members		N	Serial Interviews	Semester-end Interviews
Old Members (Since Aug. 2006)	Pre-service Teachers (PO)	38	2	2
	In-service Teachers (IO)	17	1	2
New Members (Since Jan. 2007)	Pre-service Teachers (PN)	30	2	4
	In-service Teachers (IN)	7	0	0
Total		92	5	8
Time for Participation			During Spring 2007 semester	End of the Spring 2007 semester

Data Analysis

Social Network Analysis (SNA) was applied in analyzing CANS data for characterizing members' levels and patterns of participation in discussion board (DB), chat room (CR), and resource sharing space (RS). Additionally, the qualitative data, including transcripts of serial interviews and semester-end interviews and descriptive discussion content, were analyzed via content analysis. A combination of the framework of Community of Practice (Laffey, 2005) and Interaction Analysis Model (IAM) developed by Gunawardena et al. (1997) were adapted to develop coding schemes.

Results

In the interest of the brevity needed for the proposal the statistical indices of SNA and the detailed explanation and quotations from participants of content analysis will be included in the final paper but are excluded from this proposal.

Results of SNA

The results of the social network analysis can be classified into four primary sections, including login frequency, levels and patterns of participation in DB, RS, and CR. Table 3 and 4 summarize members' login frequency and levels of participation in DB, RS, and CR across months and member types.

Table 3 Average of Activity Frequency for Login, DB, RS, & CR

Included Discussion Activities	Nov 06	Dec 06	Jan 07	Feb 07	March 07	April 07	May 07
Login Frequency	n/a	n/a	102	↘ 85	↘ 69	↗ 78	↘ 43
DB: Posting Activity	n/a	n/a	2.8	↗ 9.3	↘ 7.3	↘ 3.6	↘ 0.9
DB: Reading Activity	n/a	n/a	3.4	↗ 101.2	↗ 120.3	↘ 64.3	↘ 25.9
RS: Reviewing Activity	n/a	n/a	13.1	↗ 14.6	↘ 8.0	↗ 22.1	↘ 4.7
RS: Uploading Activity	1.06	↘ .13	↘ 0	→ 0	→ 0	↗ .16	↘ .14
CR Chatting Frequency	n/a	n/a	3.8	↗ 4.0	↘ 1.5	↘ 0.2	↘ 0

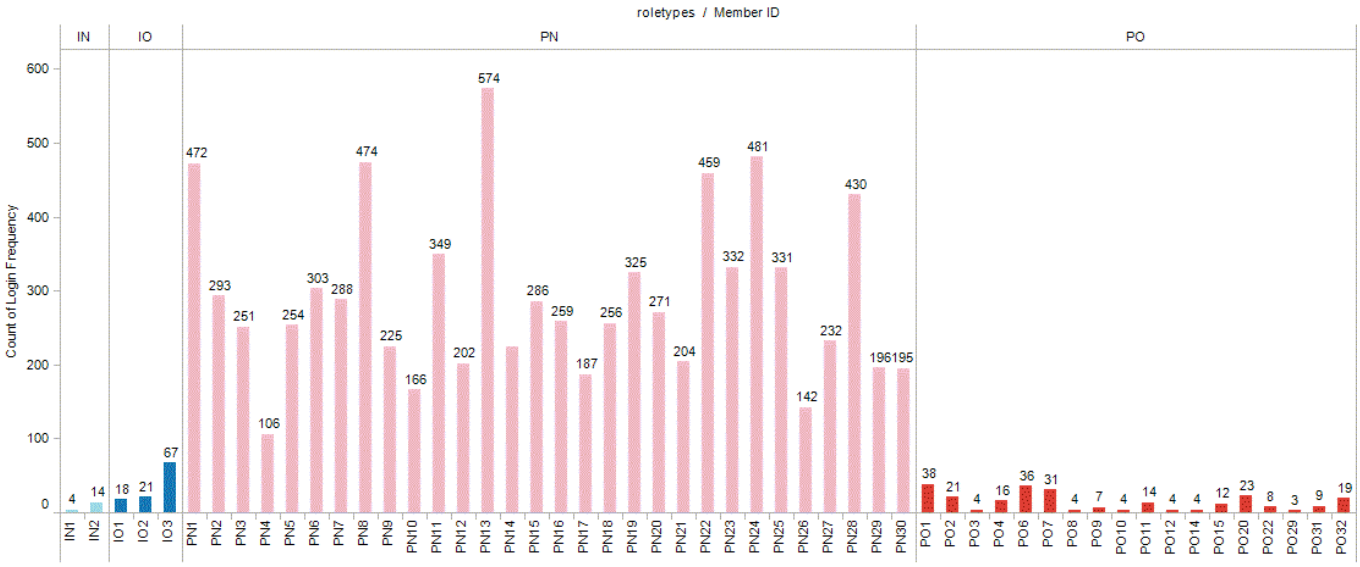
Note. n/a represents "not applicable"; ↗represents "increase"; ↘ represents "decrease"; → represents "no change." The average is the mean number of events per day for the number of days in the month.

Table 4 Average of Activity Frequency during the Whole Semester

Included Discussion Activities	PN	PO	IN	IO
Login Frequency	292.4 (**1**)	14.1 (**3**)	9 (**4**)	35.3 (**2**)
DB: Posting Activity	19.6 (**1**)	2.0 (**3**)	0 (**4**)	9.0 (**2**)
DB: Reading Activity	260.1 (**1**)	40.6 (**3**)	13.5 (**4**)	141.7 (**2**)
RS: Reviewing Activity	49.9 (**1**)	15.3 (**2**)	5 (**3**)	4 (**4**)
RS: Uploading Activity	0.2 (**2**)	.97 (**1**)	0 (**3**)	0 (**3**)
CR Chatting Frequency	7.2 (**2**)	26 (**1**)	0 (**4**)	1 (**3**)

Note. Values with in the brackets present the ranking order; 1 to 4 indicates high to low. The average is the mean number of events per member in the member type.

NETwork, members' login frequency started relatively high in January 2007 and remained fairly consistent throughout the semester but dropped at the end of the semester. Comparing the login frequency across member types, the rank from high to low frequency were PNs, POs, INs, and IOs. Figure 1 presented members' individual login frequency across member types, and Figure 2 showed the comparison of member types' monthly login frequency.



'igure 1. Comparison of Login Frequency

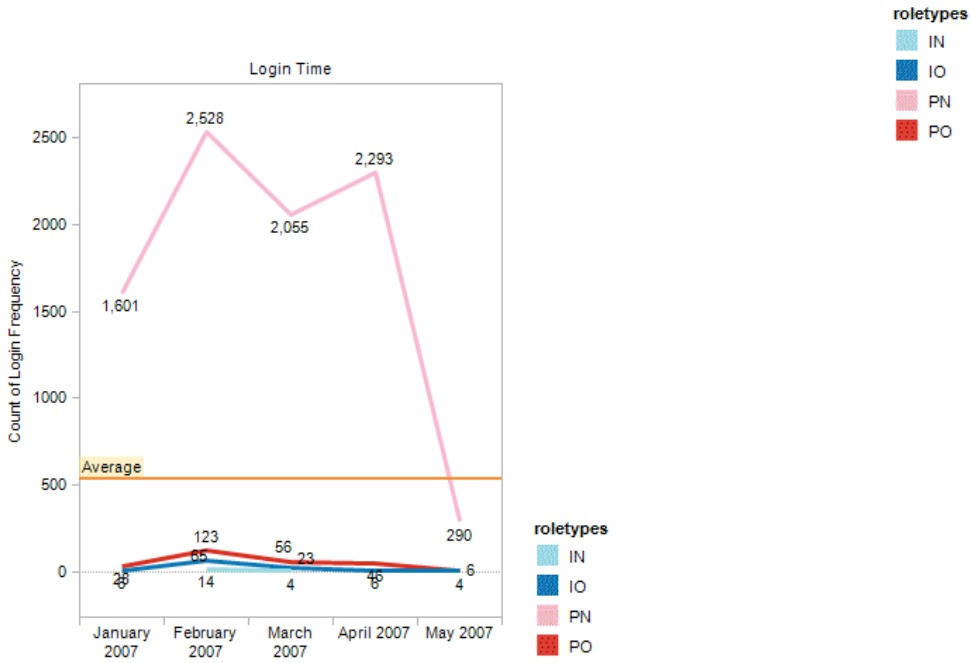


Figure 2. Monthly Trajectory of Login Frequency

For members' levels and patterns of participation in DB, members' posting activity increased in February but kept decreasing in March, April, and May. The frequency of reading activity in the DB increased in February and March but dropped in April and May. Comparing the posting and reading activity across member types, the rank from high to low frequency was PNs, IOs, POs, and INs.

According to Figure 3, the social network diagram of members' interaction in DB, PNs had most intensive interaction within their group, but most of them also read messages that originated from POs, IOs, and INs. Especially PNs read a lot of messages posted by some particular POs and IOs who had more reading activity compared to other POs and IOs. These active POs and IOs also had more reciprocal interaction with PNs. Some POs and INs were identified as peripheral members because they did not post or only posted few messages but had more reading activity. These members were easily ignored by other members because their messages were rarely read by other members.

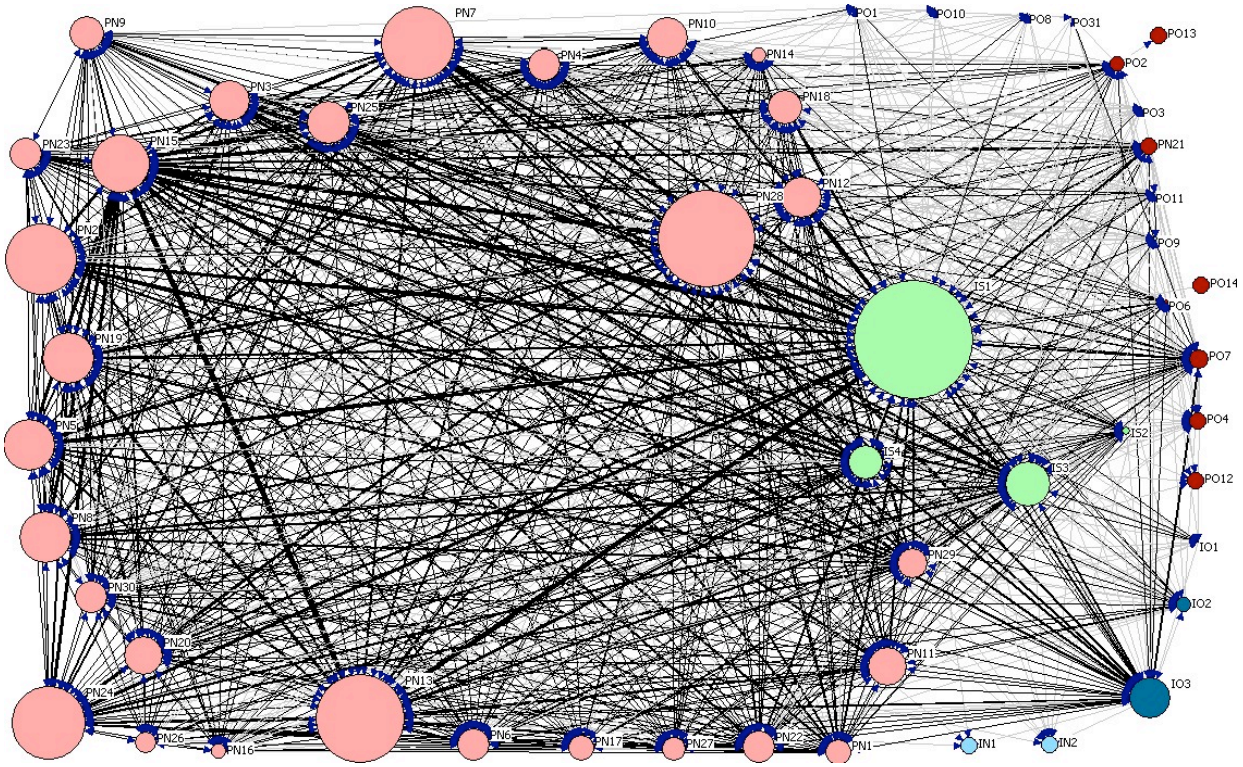


Figure 3. Interaction Patterns Diagram for Discussion Board

Note. a. Each node of the diagram represented one member and each color represented one type of members. b. Lighter blue nodes represent IN. Darker blue nodes represent IO. Lighter red nodes represent PN, as well as darker red nodes for PO. Green color nodes represent instructors (IS). c. The lines between a pair of nodes indicated interaction between two members, and the gray lines indicated the one-way interaction as well as black lines were reciprocal

In RS, most of the resources were uploaded by the professors and POs when they were taking the field experience courses in Fall 2006, while only a few PNs and professors uploaded resources in Spring 2007. Members' frequency of reviewing resources was different across member types. The ranking level from high to low of reviewing frequency by member types was PNs, POs, INs, and IOs. In the Figure 4, the node sizes among the members who uploaded the resources are fairly even because most of them uploaded only 1 resource. The instructors have bigger nodes because they were the primary people to upload resources. Members who reviewed resources but did not upload any were represented with a small circle. By examining the directions of information flow, many one-way direction arrow lines were from POs to PNs and in-service teachers.

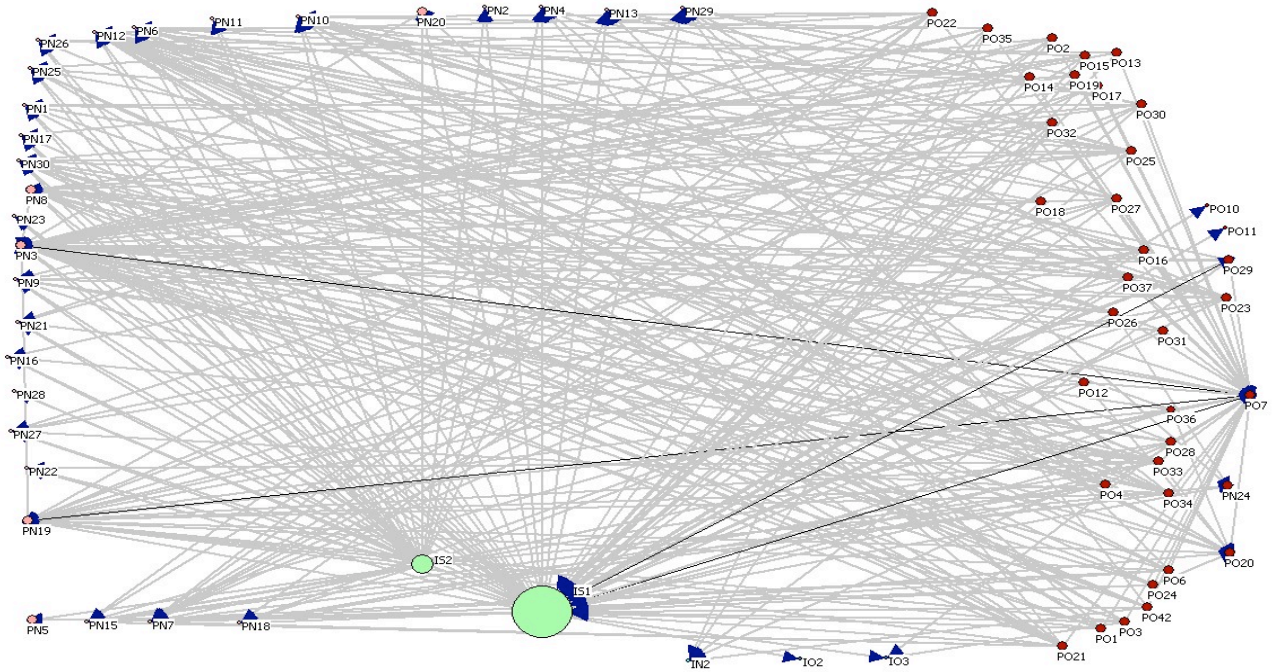


Figure 4. Interaction Patterns Diagram for Resources Sharing Space

In CR, members' overall chatting frequency was higher during the time periods when discussion topics were scheduled. Chatting frequency increased in February, and dropped gradually in March, April, and May. Compared to the arranged discussion topics, members' ad hoc chatting activity contained more social information. Members participating in discussion topics mostly started their conversation with some socialization sentences and moved to focus more on the discussion topics, which was different from the non-scheduled chatting when included more social information to ask for help or suggestions. Figure 5 presented members' individual chatting frequency across member types and Figure 6 showed the comparison of member types' monthly chatting frequency.

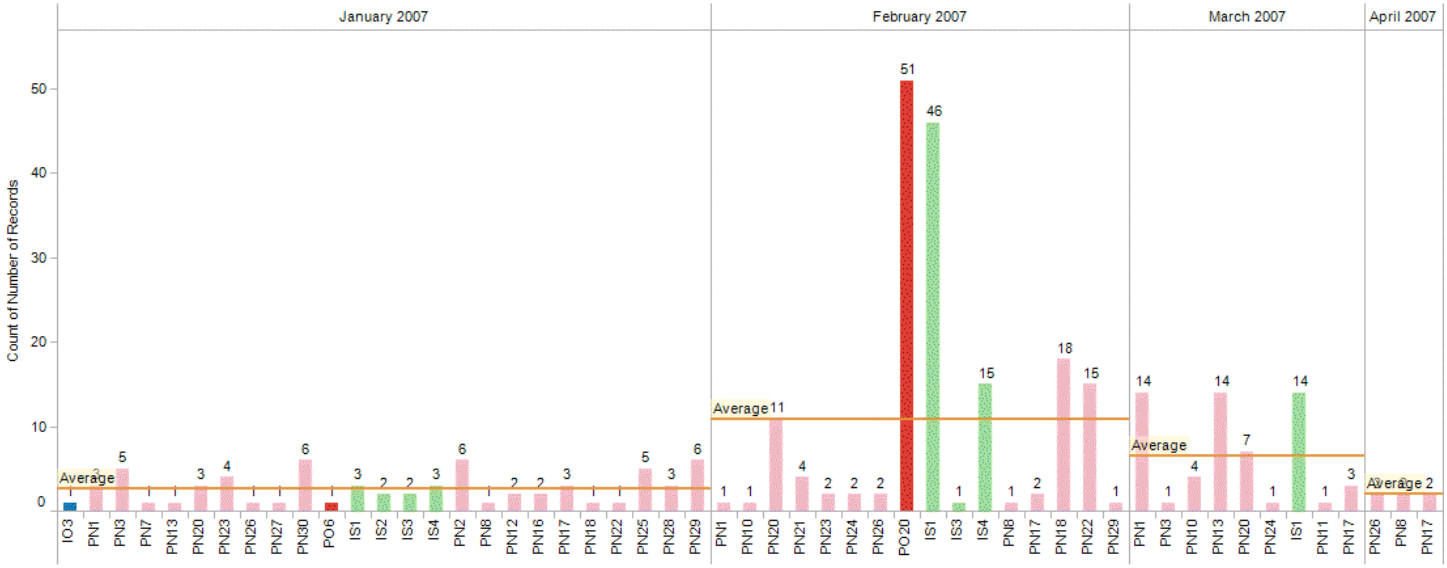


Figure 5. Comparison of Chatting Frequency in Chat Room

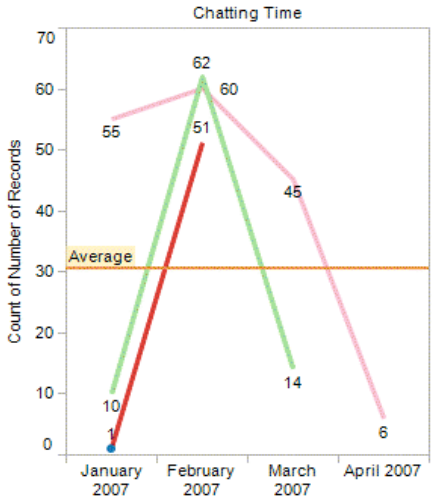


Figure 6. Monthly trajectory of Chatting in Chat Room

Results of Content Analysis

The purpose of the content analysis for members' DB and CR messages was to examine if the ways members discussed teaching issues could be used to identify patterns of participation in the community of practice. Five themes were found through the coding the discussion content in DB. The themes include: 1) members mostly participated in DB by providing information and sharing experience but rarely responded with opposing opinions or deeper negotiation; 2) both professors and members with in-school experiences shared their experience and provided emotional support when responding to others' messages; 3) members' social interaction in DB was shaped by the relevance of the discussion topic to immediate and practical concerns; 4) members' messages were oriented by the foci of the discussion topics; and 5) members provided more emotional supports when discussing their concerns about future teaching and field experience. Additionally, two themes were identified through the content analysis of CR discussion content, including: 1) members' social

interaction during the scheduled discussion topics was different depending on what topics were discussed; and 2) members had more socialization messages as well as asking for help or information about finding resources when chatting in the non-scheduled discussions.

The purpose of the content analysis for members' serial and semester-end interview transcripts was to examine members' perceptions of participating in NETwork in terms of how they interacted with others. Six themes were yielded from the content analysis of semester-end interviews. The themes include: 1) the participation patterns of the in-service teacher (IO2) who participated in the serial interviews changed over the course of the semester; 2) pre-service teacher/new members' attitudes about participating in NETwork changed through the semester; 3) levels of participation of the pre-service teachers/old members who participated started low and remained low; and 4) members perceived advantages of DB, CR, and RS when participating in NETwork. Additionally, six themes were yielded from the content analysis of semester-end interviews. The themes include: 1) members perceived the information provided from different types of members differently and constructed an identity and role for themselves that related to their position in the community; 2) pre-service teachers who were taking field experience courses perceived the voluntary and required discussions in NETwork differently; 3) members participation in discussion topics was influenced by their interests; 4) members saw advantages of NETwork tools (i.e. DB, CR, and RS); 5) pre-service teachers/new members' attitude of having NETwork as part of their learning changed over the semester; and 6) members stated that a lack of time has been an issue for their participation of NETwork.

Discussion

Similar to what was found in prior studies (Fusco, 2002; Kling and Courtright, 2003) examining members' levels of participation in teacher online learning communities (Tapped In and ILF), time is a variable related to members' levels of participation. While Kling and Courtright (2003) examined members' participation across a longer time period, such as 9 months, 1 year, or 3.5 years, than the present study, the present study provided detailed monthly trajectories of more forms of members' participation. These trajectories provide a picture for comparing members' changes in participation across time and member types simultaneously. The results show members' participation levels varied across communication tools. Although prior studies used time as a variable to examine changes in the levels and patterns of participation, the forms of examination were limited to only login frequency and number of messages posted. Fusco (2002) employed members' login frequency as a way to assess members' levels of participation, and Kling and Courtright (2003) used both login frequency and members' numbers of messages posted to describe members' levels of engagement and participation. Going beyond prior research (Gray & Tatar, 2004; Fusco, 2002; Kling and Courtright, 2003), the present study utilized multiple indicators, including members' posting and reading activity in DB, chatting activity in CR, resources reviewing and uploading activity in RS, to show a broad range of behaviors for interacting and participating in activities via these tools. Additionally, Fusco (2002) and Kling and Courtright (2003) addressed members patterns of participation by presenting the average of members' login frequency during a particular time period, which was limited to providing the overall change of a group of members' participation by logging-in or posting messages. This study employed the social network diagrams and statistical indices to present members' patterns of participation across member types and communication tools.

According to Preece (2000) and Wenger (1998), members in an online learning community are governed by policies and norms generated and practices undertaken in the community. The findings reported above support this premise by showing that participation was shaped by expectations, roles and events of the community. Members' levels of participation varied across member types and were influenced by the requirements of the field experience courses, how the discussion activities were arranged, how others participated in the discussion, and how members socially interacted with each other. Additionally, Lave and Wenger (1991) indicated that activities, which are inherently social and shaped by the context, influence one's sense of identity, how and what is learned, and the meaning of practice. The way members interacted with each other and how they perceive social constructs in online learning and what they have learned in NETwork supports Lave and Wenger (1991) assertion. For example, PNs interacted with some particularly active POs and in-service teachers. Their understanding of practical teaching and teaching in science was shaped not only by the courses they were in but also via conversation with teachers who had practical experiences. PNs were found to have more interaction and had higher sense of community within the PNs group than with the other role groups. PNs explained in the interviews that it was because that they were taking courses together and frequently met during the semester. Also, members' varying levels of participation can be explained by the practice and their role in the community, which lead to different levels of participation and different perceptions of their identities as well. For example, the POs and IOs who had the most reading activity, had more reciprocal interaction with PNs. Some POs who were less active, did have substantial reading activity within the PO group. Some POs and INs who had little posting activity but more reading activity were identified as peripheral members, and these members were relatively ignored by other members in the community.

Wenger (1998) indicated that members' identities are formed via participation and non-participation

(i.e. being an outsider or peripheral and marginalized participant). The present study found that members' levels of participation and the way they perceived their role in the community were reciprocal. Members' perceptions of their identities in the community were shaped through discussions with others, learning from diverse perspectives about practical teaching, and associating with others during community evnet. The PNs, POs, and in-service teachers perceived their role and NETwork as a community differently. PNs started with an attitude that participating in NETwork was annoying because they felt the required participation was something extra added to their original course work load. However, this attitude changed after participating in some voluntary discussion in NETwork because they learned that the discussion topics were relevant to their immediate and practical concerns they had for future teaching. They found value in having interactions with members with practical teaching experience. Also, the in-service teachers saw themselves as a helper to share practical teaching experience with pre-service teachers at the beginning of the semester; however, as they participated in the discussion and interacted with other members, they found that they gained ideas from the multiple insights of members (including pre-service teachers and other in-service teachers) about teaching. They even found that they applied what they read about in the discussions to their in-school teaching.

Further, Kling and Courtright (2003) found that members, including pre- and in-service teachers, in ILF did not show the levels of engagement and critical reflection expected. They described how members' discussion primarily consisted of questions or opinions that were irrelevant to discussing planned video topics. However, the present study found that NETwork members who participated in DB and CR topic discussions were engaged and focused on the arranged topics by sharing their experiences and suggestions. Differing from Kling and Courtright (2003), professors facilitating members' discussion guided the discussion by providing appropriate prompts, questions, or suggestions; thus, while members did have some social conversation the discussions were always relevant to the topics. To conclude, effective online discussion needs to have members' continued participation and presence and supportive CMC tools (Watson, 1997). However a discussion facilitator, such as professors or members with authority, may also be needed to facilitate and monitor the discussion. Additionally, the present box and daily email digest (social awareness notification tools) were identified by the members to be very helpful. Members gained a sense of other members' social presence when seeing their names showing in the present box as well as feeling not alone when working in NETwork. These remarks by members show that social awareness can foster a shared sense of community for maintaining work relationships and communication (Dourish & Bly, 1992). The information content in daily email digest provided members an overview of discussion topics and what happened during the past day, which was found by members to be very helpful as it reminded them to participate in the discussion or provided them information about discussion content when they were off NETwork. Overall, the results of members' usage of DB, CR, RS, and other social awareness tools in Sakai supported what previous studies have shown. Previous studies found that CMC tools can deliver social awareness information and facilitate social interaction in online learning environments (Carroll, et al., 2003; Alavi, 1994; Dourish & Bly, 1992) as well as facilitate communities of practitioners for solving practical problems (Jonassen, et al., 1995). These results were consistent with prior research that studied teachers' professional learning (Gray & Tatar, 2004; Job-Sluder & Barab, 2004) and found CMC tools can foster and support members' asynchronous and synchronous discussion.

According to Wenger (1998), mutual engagement of participants, joint enterprise, and shared repertoire are three dimensions of the community of practice. The discussions in DB and CR showed NETwork members' mutual engagement as well as joint enterprise for teaching practice. Wenger (1998) said that "Practice does not exist in the abstract. It exists because people are engaged in actions whose meanings they negotiate with one another" (p. 73). In NETwork, members were engaged not only in NETwork discussion and chat room discussion but also sharing resources in Resources. During the interaction, they negotiated meanings of practical teaching and of what others presented in the community. For example, they discussed the strategy: "Give me 5" on the discussion board, where through discussion they negotiated a common meaning for using this strategy in practice. Additionally, joint enterprise is a source of community coherence and is generated via members' collective processes of establishing members' mutual accountability (Wenger, 1998). Member's growth in understanding teaching knowledge and skills as expressed in the NETwork discussion and interviews revealed joint enterprise in teaching practices. Members expressed how they appropriated others diverse insights into their own thinking and opinions. For example, pre-service teachers mentioned that a good teacher should be able to communicate with parents efficiently after participating in the NETWork discussion topic: "Parents." The growth of members' joint enterprise is a result of interacting with others in the community. Further, shared repertoire is developed in a pursuit of joint enterprise when negotiating meanings of practice. One substantial example is that the resources shared in RS by professors or other members in NETwork were recognized by members to be supportive for their learning to teach.

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