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ARTICLE

Pre-service EFL teachers' online participation, interaction, and social presence

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Abstract

Participation in online communities is an increasing need for future language teachers and their professional development. Through such participation, they can experience and develop an awareness of the behaviors required to facilitate their future learners' participation in online learning. This article investigates participation, interaction patterns, and social presence (SP) levels of pre-service English as a foreign language (EFL) teachers in online communication within a longitudinal blended learning setting. A secondary aim of this article is to explore social network analysis (SNA) as an alternative method to measure SP. Data analysis included calculation of number of forum entries and words, qualitative analysis of interaction patterns, content analysis, and SNA. The results indicated that an online course on tutoring skills and SP improved pre-service EFL teachers' online participation skills. Increased interaction and a more cohesive network were observed as the course progressed. The findings are significant in that they suggest a relationship between content analysis for SP (especially the interactive dimension) and SNA measures (centrality, influence, and prestige), implicating SNA as an emerging research method for the investigation of SP. This article concludes with future research perspectives and suggestions for EFL teacher training.

Keywords: *Blended Learning and Teaching, Teacher Education, Research Methods, Computer-Mediated Communication*

Language(s) Learned in this Study: *English*

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Introduction

With increasing availability of the Internet and computer-mediated communication (CMC) contexts, language learners and teachers have been observed to improve their knowledge of foreign language and language pedagogy by sharing, reflection, evaluation, collaboration, and problem-solving activities (Arnold & Ducate, 2006; Dooly & O'Dowd, 2012; Meskill, 2009; Richardson, 2006). In foreign language teacher education, pre-service teachers need to acquire not only the skills necessary to actively and productively participate in online interaction, but also the skills required to facilitate their students' participation and interaction in online contexts. One way to equip pre-service language teachers with these skills is to involve them in blended learning contexts that can offer them opportunities to develop these skills through experiential modeling (Hoven, 2006) and reflective practice (Farrell, 2007; Freese, 2006; Loughran, 2002). However, ensuring continued participation and interaction in online platforms is a challenge (Yuan & Kim, 2014; Whiteside, 2015). Besides, participation and interaction do not necessarily lead to collaboration unless an optimal level of social presence (SP) is achieved (Zhao, Sullivan, & Melleius, 2014). Moreover, although SP levels of online participants have been observed to vary over time (e.g., Shea et al., 2010; Swan & Shih, 2005), the findings of these studies have been inconclusive. Finally, studies that employ social network analysis (SNA) and content analysis for the investigation of

SP are rare (Shea et al., 2010; Wu, Gao, & Zhang, 2014) and their results are contradictory.

Therefore, the present study explores the implementation of blended learning in two English as a foreign language (EFL) teacher education practicum courses delivered over two semesters. Pre-service teachers' participation and interaction patterns, as well as their SP levels, are investigated to observe the development of their participation and interaction skills. By examining the relationship between the centrality of pre-service teachers in the online community and their SP levels, this article proposes SNA as an emerging alternative method to study the concept of SP.

Literature Review

This section defines the concepts of participation and interaction in blended learning settings, and explains the theory of social presence and its components. Next, SNA is introduced, and the section concludes with the ways in which SNA is used to investigate participation, interaction, and social presence in personal and educational online settings.

Participation and Interaction in Blended Learning

Blended learning contexts can potentially support face-to-face teaching by web-based teaching (Garrison & Kanuka, 2004), increase student–student and student–teacher interaction opportunities (Michinov & Michinov, 2008), and enhance learning (Lim & Morris, 2009; O'Toole & Absalom, 2003). However, smooth management of blended learning programs is challenging for teachers in that they require instructors "to think critically about the affordances of the different media in order to continually engage students in meaningful learning and to maintain social presence" (Whiteside, 2015, p. 16). Dropout problems and insufficient amount of participation in professional online communities or online teaching programs have also been documented as major challenges (Yuan & Kim, 2014).

In blended learning contexts, instructors' roles as well as socio-affective bonding among participants seem to be influential in the amount of participation and interaction. Exploring experiences of engineering undergraduate learners and instructors qualitatively, Szeto (2015) observed that the instructor's role as a leader was the most salient factor influencing the design and implementation of the synchronous (videoconferencing) blended program and the attainment of intended learning outcomes. Pawan, Paulus, Yalcin, and Chang (2003) explored learner participation in online asynchronous discussions for three online postgraduate language teacher education courses by quantifying total number of posts, average number of posts per student, and range of posts per student. They identified an uneven amount of participation among students and low instructor participation. Moreover, Çelik (2013) explored class dynamics and socio-affective relationships among pre-service EFL teachers in Turkey in a discussion board as part of a blended course and concluded that negative attitudes were responsible for the limited participation of inexperienced learners.

Nevertheless, low level of participation is not always the case. For instance, investigating online participation patterns of in-service teachers in Singapore for a course on integrating technology into the classroom, Sing and Khine (2006) reported high levels of task-focused interaction and participation in terms of the messages read and comments written in response to others' messages. Hara, Bonk, and Angeli (2000) analyzed participation patterns of college students in an online discussion and found increasingly continuous and engaging discussions over time where learners contributed to multiple message threads simultaneously. Zheng and Warschauer (2015) measured student participation in online asynchronous discussions throughout a school year by quantifying number of posts by students and observed increased online participation over time with highest levels of participation in month seven of an online discussion lasting eight months. They concluded that online interactions became more dynamic and dense with decreasing teacher dominance. Comparing participation levels with results from SNA, they showed that online interactions were most beneficial for increasing participation levels of lower-performing students who were initially at the periphery of the community. Investigating time as a variable in online interaction patterns of teachers, Wu et al. (2014) found that participation increased over time.

However, they concluded that time "did not contribute to marked and incremental development of socio-cognitive presence" (p. 248).

Yet, according to Zhao et al. (2014), participation and interaction do not necessarily directly lead to collaboration in asynchronous discussion boards. They explored interactions of six peer review groups of 18 tertiary students and argued that collaboration required not only participation, evidenced by posting of messages, but also interactive and warm participation, which could be achieved by "an optimal level of social presence" (p. 817). Accordingly, they describe *participation* as independent messages posted on the discussion without any peer response; *interaction* as one-way interaction where an independent message receives peer-feedback, but is not followed by a response from the writer of the first message or from another peer; and *collaboration* as two- and multiple-way interaction where a writer receives peer feedback that is followed by further comments from the writer or other peers. These studies indicate the need for further research on the development of participation and interaction patterns of pre-service language teachers in online communities as part of blended courses in order to better understand the extent to which such courses can support advancement of language teacher education.

Social Presence

SP has been established as a crucial construct for learning online. It has been found to positively predict perceived learner satisfaction in CMC (Gunawardena & Zittle, 1997; Tsai, 2012) and to create a sense of belonging, group commitment, and community feeling among online learners (Arnold, Ducate, Lomicka, & Lord, 2005; Remesal & Colomina, 2013; Tu & McIsaac, 2002; Wegerif, 1998). SP has also been found to promote participation, collaboration (Zhao et al., 2014), and group cohesion (Murphy, 2004).

As a component of the community of inquiry (CoI) framework (Garrison, Anderson, & Archer, 1999), the concept of SP is defined as "the ability of learners to project themselves socially and affectively into a community of inquiry" (Rourke, Anderson, Garrison, & Archer, 1999, p. 50). Rourke et al. (1999) established a content analysis framework to investigate SP in asynchronous online discussions. The framework consisted of affective, interactive, and cohesive indicators. These indicators were used to investigate SP in several online learning contexts and were later adapted by many researchers to suit the particular research context (e.g., Lowenthal, 2012; King & Ellis, 2009; Satar, 2007, 2015; Shea et al., 2010). Yet despite minor adaptations, the indicators have essentially remained unchanged (Lowenthal & Dunlap, 2014).

Within a CoI, where cognitive and teaching presence are the other components, SP is considered a mediating variable between teaching and cognitive presence, maintaining a conducive environment for cognitive development (Garrison, Cleveland-Innes, & Fung, 2010). Based on the sociocultural learning theory of Vygotsky (1978), which suggests that knowledge is co-constructed in social interaction, SP "provides a necessary level of facilitation to support students as they collaboratively construct knowledge and self- or co-regulate their learning" (Shea et al., 2014, p. 15).

In contrast to the view of SP in CoI as a mediating variable, Hauck and Warnecke (2013) indicated that SP is not only a facilitator of cognitive presence, as suggested by Garrison et al. (1999); on the contrary, SP is a basic e-literacy skill that involves the ability to send, read, and interpret SP indicators. Hauck and Warnecke (2013) support Kehrwald's (2010) proposition that SP is developed in interaction through experiential learning, that is, "through seeing and experiencing ... how others interact with one another and how others react to their personal efforts to cultivate a social presence" (p. 47).

Research on SP, as observed in online interactions, indicates that SP seems to vary over time. Vaughan and Garrison (2006) explored SP among a faculty learning community of educators in blended learning with face-to-face and asynchronous online discussions. They identified a decline in affective and interactive measures and a dramatic increase in cohesive measures over time in the online setting, while no changes were detected in the face-to-face context. However, in asynchronous online discussions for graduate courses in educational technology, Swan and Shih (2005) observed a decrease in cohesive indicators over time. According to Garrison and Arbaugh (2007), there should be an overall decrease in

SP measures over time, as the focus of interactions should shift to academic matters. However, Shea et al. (2010, p. 12) compared two online courses in business management and found a decrease in all three SP indicators per student over time only in one of these courses. In the other course, there was an overall increase in the amount of SP with a decrease only in affective indicators. Yet, neither of these studies explored variance in pre-service teachers' projection of various SP indicators over time in asynchronous online discussions. The present study aims to fill this gap in the literature.

Social Network Analysis

One research tool to investigate interaction in online communication is SNA, a visual and statistical analysis that aims to explore the relationships among individuals in a social network (Prell, 2012; Scott, 2013; Wasserman & Faust, 1994). SNA allows researchers to investigate networks at either group (sociocentric approach) or actor (i.e., individual) level (egocentric approach). At group level analysis, it is possible to calculate a *density score* to understand the overall level of connectedness in a group. A higher density score indicates a more connected, cohesive group. At actor level, a *centrality score* can be calculated using SNA. Centrality indicates the amount of interaction between an individual and other members of a network. In online discussions, while *overall network centrality* of an individual includes both mutual and unreciprocated relations or messages, *indegree centrality* is a measure of the number of messages individuals receive in response to an earlier message of theirs and *outdegree centrality* is a measure of the number of messages an individual sends in response to the messages of other participants. As indegree centrality measures incoming responses, it is considered an indicator of popularity or prestige. As outdegree centrality measures outgoing responses, it is considered an indicator of influence, involvement, activity in a network (Prell, 2012). Using SNA, the connection among individuals in a social network can be represented visually in a social network diagram, called a *sociogram*.

The Use of SNA to Investigate Participation, Interaction, and SP

Several studies in personal and educational contexts have used SNA to investigate participation and interaction in online communities. Baek and Kim (2015) used SNA to examine interaction patterns of participants in two Korean informal online discussion communities: a personal interest focused community and a social interest focused community. Their findings indicated that the nature of discussion topics affected participants' interaction patterns. In formal educational contexts, however, different motivations for participation and the teachers' role need to be considered. Aviv, Erlich, Ravid, and Geva (2003) used SNA to investigate knowledge construction processes and group cohesion in two asynchronous learning networks as part of a business ethics course. In structured networks, they observed higher knowledge construction processes and smaller cohesive groups without a central role for the teacher. Shea et al. (2010) also focused on the teacher's role in an online business management course. They concluded that typical measures of centrality "appear to be relatively poor indicators of productive interaction, especially when applied to what might be considered a very central participant, the instructor" (p. 17). According to Shea et al., network prestige (indegree centrality) could be a more appropriate indicator of the interactions of a *strategic instructor*, who posts fewer comments that are directed at course requirements and that can elicit a high number of responses.

Shea et al. (2010) observed similar patterns between density measures of SNA and SP measures obtained through content analysis and proposed that SNA might be an alternative method to *labor intensive* content analysis. In a subsequent study, Shea et al. (2014) explored learner interactions in an online doctoral level research methods course for the relationships between the components of the CoI framework (social, cognitive, learner, and teacher presences) and SNA measures of centrality, prestige, and influence. Their findings suggested that learners with high levels of social, cognitive, and learner presences were central to the network. The only exception was teacher presence indicators, which did not always correlate with centrality measures.

SNA has been used in some language learning and teaching contexts. For instance, Reffay and Chanier (2003) investigated cohesion in discussion forums in a French language course. Duensing, Stickler,

Batstone, and Heins (2006) explored interaction patterns in online synchronous audio communication in a German course. Yet, research that investigates online interaction in language learning or language teacher education through SNA and content analysis of SP indicators is rare. One such example is by Wu et al. (2014), who tracked interaction patterns of three Chinese EFL teachers in professional networks over eight years. They employed both SNA and content analysis to measure the amount of social and cognitive presence. Their results seemed to contradict the studies of Shea et al. (2010, 2014) as Wu et al. (2014) suggested that "peripheral members who had a strong desire to communicate with the key figures of the community" (p. 247) used a higher number of SP indicators. They observed teachers initially attempting to form vertical relationships, contacting more powerful actors in their network. But in time, teachers increasingly interacted with novice participants as well as experts. It is perhaps important to note here that the educational context of the studies by Shea et al. (2010, 2014) was different from the context of the study by Wu, et al. (2014) where language teachers participated in professional networks.

Therefore, although the role of SP in promoting a collaborative and cohesive online learning community seems to be widely accepted, the results of earlier studies on the relationship between the outcomes of two major methods used to investigate participation and interaction (i.e., content analysis for SP and centrality measures of SNA) are inconclusive. This article aims to contribute to the knowledge base (a) by investigating participation patterns, interaction patterns, and SP levels of learners using content analysis and SNA and (b) by exploring the relationships between the outcomes of SP and SNA measures to test whether SNA can be an alternative method to content analysis to measure SP.

Methods

Data for this article were collected and analyzed within a case study methodology (Creswell, 2007; Gillham, 2000; Yin, 2003), because within a case study design, it was possible to collect multiple sources of data using multiple methods of analysis. For the investigation of participation patterns, interaction patterns and SP, mainly quantitative data were collected and analyzed. Qualitative data analysis was conducted to explain, validate, and further investigate the results of quantitative analysis. Case study methodology also allowed us to employ both content analysis and SNA to better understand the relationship between SP and network centrality. The bounded entity studied here was composed of two blended learning pre-service language teacher education practicum courses, and, in particular, their online components.

Context and Participants

Data for this study were collected in the 2012–2013 academic year as part of two undergraduate fourth-year language teacher education courses at the foreign language education department of a university in Turkey. Further information on the program can be found in the article by Satar and Akcan (2014). The courses were taught in fall and spring semesters with face-to-face and online class components, as well as opportunities for teaching experience at practicum schools (primary, secondary, and high schools). At their practicum schools, the students predominantly conducted observations during the fall semester and taught six observed classes during the spring semester. In-class and online discussions comprised the theoretical aspect of the courses and acted as a venue for reflective practice. During face-to-face components of the courses, a specific element of the foreign language classroom was introduced and discussed each week. Pre-service teachers then observed those elements at their practicum schools and reflected on their observations. Each semester lasted 14 weeks.

For the online component, a free online tool, Canvas by Instructure, was used as the learning management system hosting the tasks, asynchronous discussion posts, and introduction pages for each participant. The online component of the fall semester was an online tutoring skills training developed by Hauck and Warnecke (2013). The course aimed at developing pre-service teachers' awareness of online participation skills and SP. While participants discussed certain issues of classroom teaching in the face-to-face setting, they were provided with opportunities to discuss similar issues for online teaching in the online

component, such as ice-breaker activities and participation patterns. Having completed the fall term online tutoring skills training, participants were invited to take part in an online component for the spring term course, which served as a platform for extended discussions of their face-to-face teaching experiences. Pre-service teachers also shared teaching materials developed using several online tools. Moreover, online components provided pre-service teachers with a first-hand experience of and reflection on online learning and participation in a blended learning community. Participation in the online component comprised 10% of the overall course grades.

Online tasks were completed outside of class and each task lasted about two weeks. Fall semester online discussions continued for nine weeks between November and January. Spring semester online discussions lasted for 12 weeks; however, Week 6 was spring break, and there was either no or minimal participation in Weeks 7 and 8. Pre-service teachers were allowed to start their own discussion topics only in the spring semester. Table 1 presents a comparison of the nature of fall and spring semester online discussions. Further details on the tasks and participants' evaluations of the course can be found in Satar and Akcan (2014).

42 pre-service teachers took the fall semester course and 36 of them participated in online discussions. Four instructors acted as online facilitators. In the spring semester, 25 students took the course and 19 students engaged with the online discussions. Two instructors acted as online facilitators. The instructors did not receive any training or guidelines for facilitation of online discussions. Three of them were experts in online communication. All pre-service teachers were Turkish and were 21–23 years old. While most participants used social media for informal communication, they were not active users of online professional networks and had little experience of participating in online formal or educational discussion forums. Participation in the fall semester course was a pre-requisite for registration in the spring semester course. Informed consent was gained prior to participation to the study and all personal details have been anonymized.

Table 1. *A Comparison of the Nature of Fall and Spring Semester Online Discussions*

	Fall Semester Discussions	**Spring Semester Discussions**
Topic	Online tutoring skills by Hauck and Warnecke (2013) with a focus on SP and participatory literacy, pedagogical training, and technical training	Extended practice for the use of Web 2.0 tools (experimentation, creation, and evaluation) and extended discussions regarding teacher trainees' face-to-face teaching experiences
Tasks	Highly structured in three stages (activating prior knowledge, learning about theory, and reflecting on experience), hence the tasks required some background reading before discussions	Product-oriented tasks which did not require preparation; structured in two stages (introduction to tool or topic, sharing of products and experience)
Student Discussion	Students did not initiate any discussion topics	Students initiated their own discussion topics
Participants	36 pre-service teachers and 4 instructors	19 pre-service teachers and 2 instructors
Grading	Participation was graded (10% of overall course grade)	Participation was graded (10% of overall course grade)
Duration	9 weeks	12 weeks, de facto 9 weeks (Week 6, spring break, Weeks 7 and 8, no participation, as students had project submissions and midterm exams during those weeks)

Interaction	Whole-group interaction (8 threads, Weeks 1–7); interaction in three smaller groups (3 threads, Weeks 7–9)	Whole-group interaction throughout the semester (12 threads, 9 weeks)

Data Collection and Analysis

Data for this article were obtained from written records of pre-service teachers' online discussions in fall and spring semester practicum courses. Participants' online participation was analyzed by calculating instructors' and pre-service teachers' weekly number of forum entries and words they produced online in each semester (RQ1).

Second, interaction patterns of pre-service teachers and instructors were examined both quantitatively and qualitatively (RQ2). For quantitative analysis, SNA was carried out to investigate the relations among participants of the online community. SNA uncovers "the social relations …, the structure of those relations, and how relations and their structures influence (or are influenced by) social behaviour, attitudes, beliefs, and knowledge" (Prell, 2012, p. 1). Data for SNA relate to "*who speaks to whom* in the online discussion" (Wu et al., 2014, p. 232). SNA was used to explore and compare interaction patterns in fall and spring semesters at actor level (for each participant) by calculating centrality scores and at group level (as a community) by calculating cohesiveness scores using UCINET 6 (Borgatti, Everett, & Freeman, 2002).

In order to prepare the data for SNA, an interaction matrix was prepared calculating only the discussion entries participants posted in response to another participant's forum entry. The entries in response to the main task or discussion topic were excluded at this stage. These responses to the main topic were accepted as an indication of participation to the course, but not of interaction. Moreover, data pertaining to the last three discussion threads of the fall semester (Weeks 7–9) were excluded. In these threads, participants were divided in three smaller groups. Although all participants could follow the discussions in any group, none posted any comments to the thread for another group. Therefore, given the potential effect of smaller groups on the development of relationships, data from these threads were not included in the interaction matrix.

Another concern for SNA was the duration of the discussions. For comparative SNA, it is important to observe and compare interactions that take place in equal periods of time, because more time would mean higher opportunities for interaction. Therefore, as fall semester SNA results were calculated for the first six weeks of the interactions (as explained previously), spring semester SNA results had to be calculated also for interactions over six weeks to keep time constant and observe interactions within equal timeframes. Thus, interactions that took place in the first three weeks of the spring semester discussions were excluded in order to be able to observe any changes in the nature of the interactions during the initial six weeks with those during the final six weeks of the year.

SNA was followed by a qualitative content analysis of interaction patterns. Qualitative content analysis is defined as "any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings" (Patton, 2002, p. 453). In order to do this, the structures of all discussion threads were explored inductively in terms of which post was sent in response to what and when. Interaction patterns in two representative discussion threads from each semester were then identified.

Third, SP levels of each participant was quantified using content analysis (RQ3) based on SP indicators (see Appendix A) developed by Rourke et al. (1999)[1] and adapted by Swan and Shih (2005) and Shea et al. (2010). Content analysis involves identification of recurring trends and calculating frequencies (Shea et al., 2013). Following Rourke et al. (1999), the unit of analysis for quantitative content analysis was a *theme* or *idea* identified in the message. This provided flexibility to code a single discussion entry for more than one category where needed. After the data were coded, raw SP figures were calculated for each participant. Raw SP figures were then divided by the total number of words produced by each participant

and multiplied by 1000 in order to obtain a density index that indicated frequency of use per 1000 words (for the same approach, see Lomicka & Lord, 2007; Rourke et al., 1999).

In order to ensure reliability, both researchers initially coded one third of the data individually. Before coding, the researchers met and studied the adapted version of SP by Shea et al. (2010).[2] Two of the indicators of the interactive dimension (*continuing a thread* and *quoting from others' messages*) were software dependent and were excluded, as they did not apply to the online platform used in this study. Based on the previous work of Satar (2015), a new category, *intersubjectivity*, was added to cohesive indicators. Intersubjectivity is "sharing of experiential content (e.g., feelings, perceptions, thoughts, and linguistic meanings) among a plurality of subjects" (Zlatev, Racine, Sinha, & Itkonen, 2008, p. 1). In this study, intersubjectivity is operationalized as the act of finding common ground by emphasizing or pointing out similarities between oneself and other participants.

While one of the researchers completed coding on pen and paper, the other used the qualitative analysis software, Atlas-ti 7. The results of each coder were compared and calculated in percentages. The inter-rater reliability was 53%. As this was a low figure, the researchers met to compare the codes before embarking on re-coding of the data.[3] Significant discrepancies were found to be due to different methods of manual and software coding. Other differences in coding were also found in the coding of *personal advice* (interactive category) and *social sharing* (cohesive category). Swan and Shih (2005) define personal advice as "offering specific advice to classmates," exemplified by "*The CEC website might have some references*" (p. 136). However, not all instances of advice in our data exactly matched this explanation. For example, some of the data coded as personal advice functioned as expression of potential future actions (e.g., … *it seems like beneficial, we should just try [and see whether] it [will]work properly or not*) or as providing examples (e.g., *You can see an example of wordle word cloud here*). Sometimes, the instances were implicit in the form of asking questions (e.g., *I generally do not do it but have you tried it?*). Moreover, in the spring semester, pre-service teachers initiated discussion threads stimulated by seeking advice, for example, for ensuring silence in the classroom. When providing advice, participants would describe an activity their cooperating teacher had used and end with an implicit advice: *My cooperating teacher said this tool works almost every time*. As neither Swan and Shih (2005) nor Shea *et al*. (2010) provide further guidance on coding or theoretical grounding for this category, and due to the complexity of identifying personal advice, we decided to remove it from the coding scheme. Another category we removed was social sharing. We realized that one of the coders had misinterpreted the indicator, and that the category did not exist in our data. Similarly, *course reflection* (cohesive category) did not apply to the data and was thus removed (see Appendix A). For the second coding, all data (a total of 62,223 words) were coded individually by each researcher using Atlas-ti 7. Following this second coding, inter-rater reliability was 97% and final coding was accepted following full agreement between the coders.

Once data were coded and SP density scores were calculated for each participant, and in order to track change in the amount of SP, Wilcoxon Signed Rank tests were run comparing SP levels of the pre-service teachers who participated in both fall and spring semester online discussions. These included a comparison in terms of a total SP density score as well as density scores for each category of the SP framework (i.e., affective, interactive, and cohesive).

Finally, in order to find out whether SNA centrality measures could be an indicator of SP (RQ4), Spearman Rho correlations were calculated between the SP measures (total SP, affective, interactive, and cohesive indicators) and centrality measures (network, outdegree, and indegree centrality) of participants in fall and spring semesters. These correlations were run separately for each semester because the number of participants in each semester was different.

Results

RQ1: Participation

This section seeks to find out participation levels of the instructors and pre-service teachers in fall and spring semester online forum discussions. Number of forum entries and number of words per week produced by the instructors and pre-service teachers are presented in Figure 1. Participation during the fall semester continued over nine weeks between November and December. During this time, 36 pre-service teachers and four instructors produced a total of 405 forum entries (43,708 words). The online component for the spring semester lasted from mid-March to the beginning of June, over a total of 12 weeks with a 3-week interval. During the spring semester, 19 pre-service teachers and two instructors produced a total of 244 forum entries (18,899 words). In terms of instructor participation, Figure 1 indicates that instructors were highly active with high online presence during both semesters of the course, amounting to about one third of the total participation.

Figure 1 also shows that in the fall semester overall activity levels peaked during the initial weeks and then gradually decreased. This gradual decline in participation in the fall semester could be attributed to participants' lack of willingness or time to read the background material prior to discussions. Another explanation could be due to the discussions being in small groups. Although pre-service teachers' themselves requested smaller groups, their motivation to participate might have declined based on varying group dynamics.

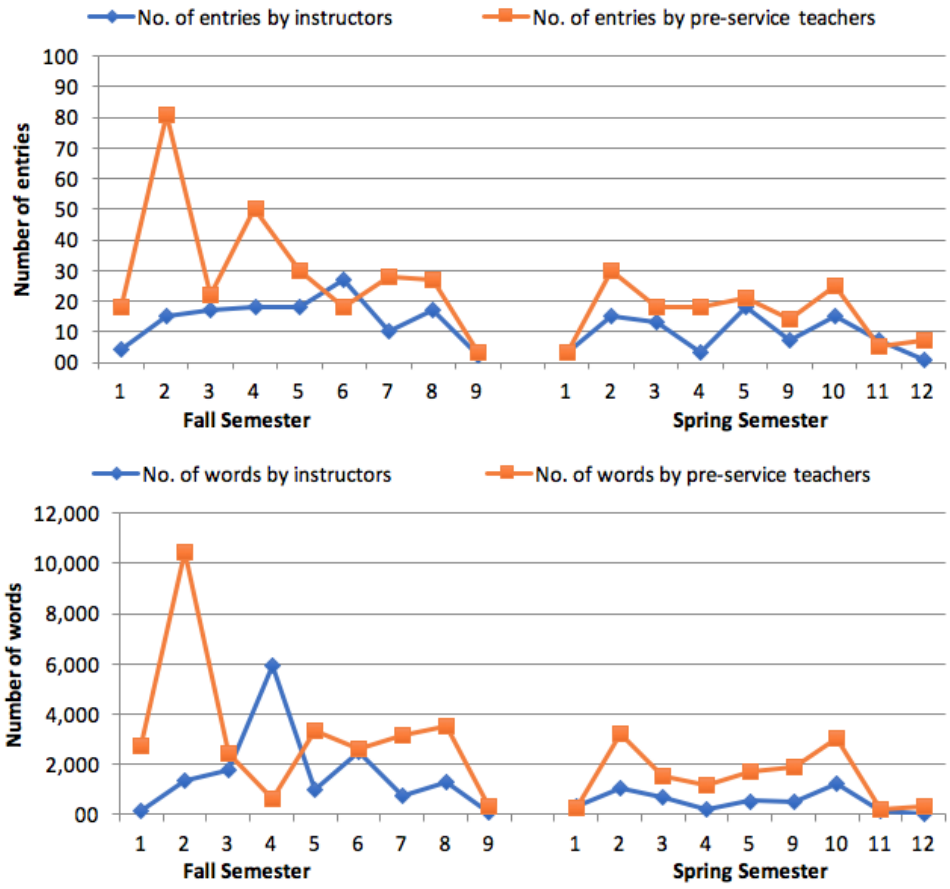

Figure 1. The number of forum entries and words per week.

In terms of number of entries, instructor contribution did not fluctuate much throughout the semester. On

the other hand, pre-service teachers' contribution peaked during Week 2, then decreased and stabilized during the rest of the semester. However, regarding number of words produced, instructors' contribution peaked during Week 4, while pre-service teachers produced the lowest number of words in the same week. This can be explained by the requirements of the task. For Week 4 activities, pre-service teachers created an online poster reflecting their participation patterns. Therefore, discussion entries were either images or links to their posters on external sources, which were not counted in the number of words. Yet, instructors' comments were verbal, interpreting and commenting on the visual elements of the posters.

In the spring semester, pre-service teachers' participation peaked on Weeks 2 and 10, in other words, at the beginning and the end of the semester. Total participation in terms of the number of entries posted also peaked on Week 5, mostly due to an increase in the instructors' number of entries. Participation in the spring semester, especially of pre-service teachers, seemed to stay even with two or three peaks. This may indicate that pre-service teachers were able to transfer the knowledge and skills they practiced in the fall semester course—especially in terms of participation patterns—to their online participation practices in the spring semester course.

It is also possible to interpret the fluctuations in participation patterns considering the nature and topic of the tasks. During the fall semester, highest pre-service teacher participation was observed during Weeks 2, 4, and 8. The topic of the tasks for these weeks were introductions and discussion on the use of personal profiles using the online system, reflecting on and creating posters of participation patterns, and watching a talk on online education and reflecting on the ideas in the talk, respectively. The greatest amount of pre-service teacher participation during the spring semester was observed on Weeks 2 and 10. The topic of the discussion for Week 2 was producing and sharing a task for the first weeks of an online course. Forum discussions during Week 10 centered around three threads. The first one was a task assigned by the instructors asking pre-service teachers to create and share an online story book. Pre-service teachers initiated the other two threads, which focused on classroom management techniques. They asked advice on and shared their experiences of how they ensured silence and smooth transition between the activities while teaching in their practicum schools. Therefore, it is also possible to attribute a more stable participation throughout the spring term to the fact that the participants were allowed to initiate their own discussion topics on issues of immediate relevance. The instructor-assigned topics in the fall semester training were on online teaching, a topic that was highly relevant for future teaching practices of the participants, but that had limited immediate relevance. Moreover, in both semesters, pre-service teachers' participation increased when the topics focused on the design, production, and sharing of online tools and tasks.

RQ2: Interaction

This section reports on the results on interaction patterns obtained from SNA followed by the results of a qualitative analysis of two representative discussion threads.

Actor Level Interaction (SNA)

In SNA, the amount of interaction an individual has with other members in a social network is measured by calculating centrality scores (Wasserman & Faust, 1994). Degree centrality is "the number of immediate contacts an actor has in a network" (Prell, 2012, p. 97) and indicates an individual's involvement or activity in a network. Degree centrality measures are dependent on the number of people (i.e., actors) in a group. When group sizes differ, Freeman's normalized centrality measures are recommended to compare the activity levels of the same actor in groups that have different number of participants (see Prell, 2012).

The normalized degree, indegree, and outdegree centrality measures for the fall semester (see Appendix B) indicated that the most active participants in the online component were three of the instructors (represented with numbers 38, 40, and 37). These instructors had the highest degree, outdegree, and indegree centrality scores, which indicated that they were highly influential and popular central participants in the group. The fourth instructor (represented by number 36 in Appendix B), on the other

hand, did not participate much with zero centrality in all three measures. The mean normalized degree, outdegree, and indegree scores for the fall semester were 7.56, 5.06, and 5.06 respectively. Out of the 36 pre-service teachers in the group, 10 had normalized degree, 7 had normalized outdegree, and 18 had normalized indegree centrality scores above the mean normalized degree scores. Six pre-service teachers were highly active in the group with centrality scores above the mean score in all three measures. These were the participants represented with numbers 2, 3, 4, 10, 12, and 28. In the fall semester online interactions, there were nine isolates (i.e., participants who did not send or receive direct responses to and from other participants).

Spring semester normalized degree, outdegree, and indegree scores for each participant can be found in Appendix B. Accordingly, both instructors were again the most central participants with highest degree and outdegree measures. Yet, two of the participants, represented with numbers 18 and 10, were also quite central with high degree (45 and 40, respectively), outdegree (35 and 25, respectively), and indegree (35 and 30, respectively) measures. These measures were almost as high as or greater than one of the instructor's centrality measures (represented by number 39). In the spring semester, the mean normalized degree, outdegree, and indegree scores were 22.38, 14.76, and 14.76 respectively, which were comparatively higher than the fall semester measures. Out of the 19 pre-service teachers in the group, six had normalized degree, four had normalized outdegree, and six had normalized indegree centrality scores above the mean normalized degree scores. Two pre-service teachers were highly active in the group with centrality scores above the mean score in all three measures. These were the participants represented with numbers 10 and 18. There were no isolates during the spring semester—in other words, all participants had at least one direct communication with another member of the group.

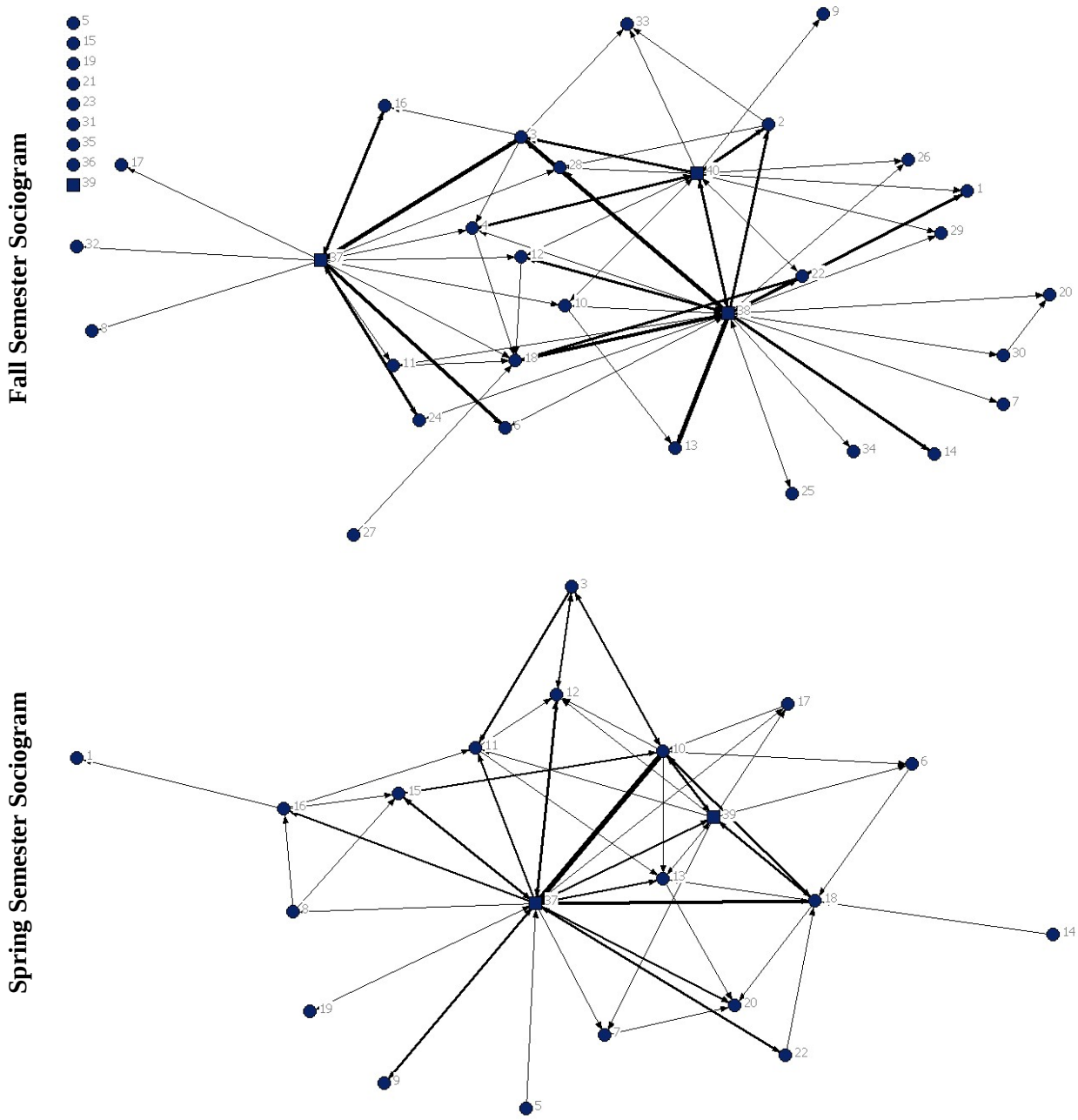

Figure 2. Fall and spring semester SNA results (squares represent instructors; circles represent pre-service teachers). Same numbers in each sociogram refer to the same participants. Line thickness represents the strength of the relationships. The arrows show the direction of the posts. Higher-resolution images of the fall semester sociogram and the spring semester sociogram are available online.

Figure 2 demonstrates the relationships during fall and spring semesters as sociograms. Participants 10 and 18 were highly active in both semesters, while other participants (especially 15, 17, 20, and 22) increased their involvement in the community and became more active participants in the spring semester. In the spring semester, the differences between normalized degree, outdegree, and indegree scores of the instructors and pre-service teachers were smaller, and there were no isolates. While these findings can represent the development of interaction and involvement throughout the courses, smaller group size in the spring semester can also account for improved interaction among the members.

Group Level Interaction (SNA)

Several measures for network cohesion are presented in Table 2 for both fall and spring semesters. The measures were calculated for directed and undirected data. The calculation on directed data considered the direction of the relations (whether sending or receiving), leading to different levels of density and different scores for outdegree and indegree centrality measures. Density of a network represents the proportion of ties that are actually present compared to the number of all potential ties. The density score represents how strongly the participants in a network are linked together. Thus, a network with a higher density score is accepted to be more cohesive (Prell, 2012). As such, in terms of density figures, the spring semester network (0.15 and 0.22) seems to be a more cohesive network than the one in the fall semester (0.05 and 0.08). However, when interpreting density scores, a consideration of network size, centralization, and subgroups is also needed.

Table 2. *Network Cohesion During the Fall and Spring Semesters*

	Fall Directed	**Fall Undirected**	**Spring Directed**	**Spring Undirected**
Nodes (Participants)	40	40	21	21
Degree Centralization	0.54	0.51	0.67	0.64
Out-Central	0.53	0.50	0.63	0.61
In-Central	0.24	0.50	0.32	0.61
Density	0.05	0.08	0.15	0.22
Components	22	10	6	1
Connectedness	0.37	0.60	0.78	1.00
Fragmentation	0.63	0.40	0.22	0.00
Average Distance	2.37	2.18	2.15	1.97
Diameter	5	4	4	4
Compactness	0.19	0.31	0.42	0.58

Regarding network size, smaller networks can have higher density scores because there are fewer potential ties, and hence the chances that the network will reach full potential are higher. Although density scores of the spring semester network seem to indicate a more cohesive community, the size of the spring semester network is also smaller (21 compared to 40). Therefore, other measures need to be compared.

First, "because density is based on how many ties are present in the network, one or two individuals having a disproportionately high number of ties to others in the network might raise the density score" (Prell, 2012, p. 168). In other words, a high network density could be due to a high centralization score. Directed (0.67) and undirected (0.64) centralization scores in the spring semester were slightly higher than those of the fall semester (0.54 and 0.51, respectively). Therefore, although the difference is small, higher density levels in the spring semester might be partly due to higher centralization scores. Moreover, diameter "refers to the shortest path between two actors" (Prell, 2012, p. 171). A smaller diameter means that participants in a network are close to each other. The diameter of the spring semester network is 4 based on both directed and undirected data, compared to the fall semester, with network diameters of 5 and 4, respectively. Given small differences in centralization and diameter scores, these measures do not offer conclusive insights.

Second, "a high network density score can easily result from many subgroups … large networks have fewer cohesive subgroups, and hence less amount of fragmentation" (Prell, 2012, p. 171). During the fall semester, there were 10 subgroups and fragmentation was 40% (0.40), whereas there was one subgroup during the spring semester with 0% fragmentation. The spring semester participants were also more

connected (0.78 and 1.00) than the fall semester participants (0.37 and 0.60). Therefore, in terms of components, fragmentation, and connectedness, smaller network size does not seem to affect higher network density, and thus cohesion, in the spring semester interactions.

Therefore, considering network sizes, density and centralization scores, number of components, fragmentation scores, and diameter of the networks, as well as higher connectedness and compactness with slightly lower average distance between the participants, interactions during the spring semester appeared to be more cohesive than the interactions during the fall semester. Given actor-level SNA results, it is possible to argue that the pre-service teachers were more involved in the discussions in the spring semester. However, higher amounts of interaction and the establishment of a more cohesive network during the spring semester could be better explained by a closer, qualitative investigation of representative forum threads from each semester.

Qualitative Analysis for Interaction Patterns

This section explores interaction patterns in each semester qualitatively by focusing on and comparing structures of two representative forum discussion threads. Extract 1 and Extract 2 illustrate typical interaction patterns in the fall and spring semesters. Each line indicates a forum entry and replies to each entry are indented toward the right. For instance, in Extract 1, Line 6 is a response to Line 1, Line 7 to Line 6, Line 8 to Line 7, and Line 9 is a response to Line 1. The discussion thread in Extract 1 was chosen because it occurred predominantly during Weeks 4 and 5, when the participants had already gotten used to the blended environment and the online tutoring skills training. There was also a high amount of participation in this thread. Extract 2 represents one such thread on the topic of classroom management techniques. This extract is also from a thread with a high amount of participation.

```
1 Task introduction – posted by Tutor 4, Nov 18
2       S 27, Nov 25
3       S 26, Nov 19
4               T2, Nov 19
5               T4, Nov 21
6       S3, Nov 20
7               T1, Nov 20
8                       S3, Nov 20
9       S29, Nov 20
10              T4, Nov 21 (to S3 and S29)
11      S7, Nov 20
12      S2, Nov 20
13              T4, Nov 21
14                      S2, Dec 9
15      T4, Nov 21
16      S28, Nov 21
17              T1, Nov 26
18                      S28, Nov 27
19      S24, Nov 24
20              T2, Nov 26
21      S12, Nov 25
22              T1, Nov 26
23      S10, Nov 24
24              T2, Nov 24
25              T1, Nov 26
26      S13, Nov 24
27              S10, Nov 25
28              T2, Nov 26
29      S11, Nov 25
30              T2, Nov 26
31      S18, Nov 25
32              S22, Nov 26
33              T2, Nov 26
34      S6, Nov 26
35              T1, Nov 26
36      S16, Nov 26
37              T1, Nov 26
38                      S16, Nov 27
39                              T1, Dec 4
40      S4, Dec 2
41              T1, Dec 3
42      S21, Dec 17
```

Extract 1. Fall semester interaction patterns for Weeks 4 and 5, Task 2-2, creating an online poster; T = instructor, S = pre-service teacher.

```
1 Task introduction - posted by teacher trainee 10, March 24
2       S10, March 24
3             T3, March 24
4       S8, March 25
5             T3, March 29
6       S1, March 26
7             T3, March 28
8                   S1, April 6
9       S11, March 27
10            S12, March 29
11            S13, March 30
12            T3, April 2
13            S10, April 12
14      S14, March 27
15            T1, March 28
16            S13, March 30
17            S10, April 12
18                  T1, April 15
19      S12, March 30
20            T1, March 31
21      S3, March 31
22            T3, March 31
23                  S3, March 31
24            T1, March 31
25                  S3, April 2
26                        T3, April 2
27                              S3, April 2
28            S10, April 12
29                  S3, April 13
30      S15, April 1
31            S3, April 2
32                  T3, April 3
33                        S3, April 4
34            S10, April 12
35                  T 1, April 15
36      S16, April 20
```

Extract 2. Spring semester interaction patterns, thread initiated by a trainee on classroom management techniques; T = instructor, S = pre-service teacher.

During fall semester, forum discussions were characterized by pre-service teachers' response to the instructor's initial post (discussion trigger, or initiation), feedback from the instructor to pre-service teacher's response, and a limited number of pre-service teachers posting responses to the instructor's feedback. This interaction closely resembled the teacher initiation–student response–teacher feedback (IRF) sequence with an optional student response to teacher feedback observed in classroom research. This pattern is exemplified in sample posts in Appendix C, Sample 1, representing Lines 16, 17, and 18 of Extract 1. There was also some initial evidence of student–student interaction (Extract 1, Lines 26 and 27 and Lines 31 and 32). In the spring semester, the interaction pattern in the first discussion thread resembled the patterns in the fall semester. However, as the discussions moved on, instructors took on a less-active role with increased evidence of student–student interaction (Extract 2, Lines 9, 10, 11, and 13; Lines 14, 16, and 17; Lines 21, 28, and 29; and Lines 30, 31, and 34). These examples indicate more complex, pre-service-teacher oriented interaction patterns in the spring semester (for sample posts representing Lines 30–34, see Appendix C, Sample 2).

RQ3: Social Presence

In order to investigate differences in participants' SP levels over two semesters, raw SP and density levels were calculated (see Appendix D). Wilcoxon Signed Rank tests were then run comparing density levels for each semester. As shown in Table 3, results of the Wilcoxon Signed Ranks test indicated that there were no significant differences between the semesters for pre-service teachers' overall SP density levels (Z = -1.01, p = .314) or for cohesive indicators (Z = -0.36, p = .717). However, pre-service teachers' affective indicator densities in the spring semester were significantly lower (Z = -2.17, p < .005), while their interactive densities in the spring semester were significantly higher (Z = -3.574, p < .001) than that of their fall semester affective and interactive densities.

Table 3. *Wilcoxon Signed Rank Test for Related Measures for SP Density Levels of Pre-Service Teachers in the Fall and Spring Semesters*

Fall–Spring	Ranks	*N*	Mean Rank	Sum of Ranks	*Z*	*p* (2-Tailed)
SP Total	Negative	10[a]	7.78	70.00	-1.006[e]	.314
	Positive	9[b]	12.00	120.00		
	Ties	0[c]				
Affective	Negative	14[a]	10.64	149.00	-2.173[d]	.030*
	Positive	5[b]	8.20	41.00		
	Ties	0[c]				
Cohesive	Negative	9[a]	9.56	86.00	-0.362[e]	.717
	Positive	10[b]	10.40	104.00		
	Ties	0[c]				
Interactive	Negative	1[a]	1.00	1.00	-3.574[e]	.000**
	Positive	16[b]	9.50	151.00		
	Ties	2[c]				

**p < .05, **p < .01*
[a]*spring < fall*
[b]*spring > fall*
[c]*spring = fall*
[d]*Based on positive ranks*
[e]*Based on negative ranks*

RQ4: Social Presence and Social Network Analysis

A final area of investigation in this study was to explore whether participants' (both pre-service teachers' and instructors') SP levels and interaction patterns based on SNA analysis (i.e., degree, indegree, and outdegree centrality measures) were related. For this purpose, total SP density levels and SP density levels for each category—as well as degree, indegree, and outdegree centrality measures for all participants—were calculated for each semester separately. Spearman Rho correlations were then calculated using these measures (see Table 4).

Spearman's rank order correlations indicated that in the fall semester there were strong, positive, and statistically significant correlations between interactive density scores and centrality ($r_s(40) = .62$, $p = .000$), prestige ($r_s(40) = .58$, $p = .000$), and influence ($r_s(40) = .77$, $p = .000$) measures. A weak, positive relationship was also found between cohesive density and influence ($r_s(40) = .37$, $p = .019$). However, in the spring semester, no significant relationships were found between SP and SNA measures. The existence of negative and weak (fall semester) and almost non-existent (spring semester) correlations between affective indicators of SP and centrality, prestige, and influence is worth noting.

Table 4. *Spearman Rho Correlation Coefficients Between SNA and SP Density Measures in the Fall and Spring Semesters*

	Centrality (Degree)	Prestige (Indegree)	Influence (Outdegree)	SP Total	Affective	Cohesive	Interactive
Centrality (Degree)	-	.970**	.825**	.217	-.249	.285	.621**
Prestige (Indegree)		-	.728**	.238	-.194	.280	.578**
Influence (Outdegree)			-	.286	-.287	.368*	.766**
SP Total				-	.637**	.893**	.433**
Affective					-	.340*	-.078
Cohesive						-	.423**
Interactive							-
Centrality (Degree)	-	.934**	.773**	.094	.049	.225	-.025
Prestige (Indegree)		-	.625**	-.138	.018	.111	-.245
Influence (Outdegree)			-	.227	.051	.182	.230
SP Total				-	.373	.617**	.867**
Affective					-	.418	.135
Cohesive						-	.373
Interactive							-

**p < .05, **p < .01*

Discussion

This article investigated pre-service teachers' participation, interaction patterns, and SP in online components of two blended practicum courses offered over two semesters of one academic year. It also explored the relationship between outcomes of SNA and content analysis as ways of accounting for SP.

First, our analysis in relation to participation and interaction patterns revealed that while participation in the fall semester gradually decreased toward end of the term, more stable and consistent participation was observed throughout the spring semester. Other studies have found increasingly continuous participation and engaging discussions over time (Hara et al., 2000; Wu et al., 2014; Zheng and Warschauer, 2015). However, the effects of time on participation seemed to be less influential in our analysis. Rather, our results indicated a potential transfer of skills presented and practiced in the online component during fall semester to spring semester participation. Results of actor-level and group-level SNA, as well as qualitative analysis of two discussion threads, indicated a more cohesive group in the spring semester with higher amount of interaction, greater connectedness, and fewer subgroups. There were no isolates in the spring semester discussions, and interaction patterns of some pre-service teachers began to resemble that of the instructors as they began to provide feedback on each other's posts. Pre-service teachers with low influence and popularity in the fall semester became more active participants of the community in the spring semester. Increased interaction observed in the spring semester could mean that although outcomes of online tutoring skills training were not immediately visible during the fall semester, acquisition of these skills were observed in further opportunities for online interaction. This has implications for research in evaluating the success of teacher training and skills, suggesting the need for longitudinal studies on teachers' and pre-service teachers' participatory skills. Moreover, as Wu et al. (2014) suggest, time is a potentially significant contributor to change in interactional patterns of teachers. Therefore, learning to participate actively in professional communities may take time. Incorporating greater

opportunities for blended learning in EFL teacher education would perhaps aid pre-service teachers in experimenting with and advancing their interaction and participation skills.

Another factor that could have played a role in the varying levels of participation and interaction over the two semesters could be the nature and topic of the tasks. Baek and Kim (2015) reported that nature of discussion topics affected participants' interaction patterns. In this study, pre-service teachers were allowed to initiate their own discussion topics only during the spring semester. Moreover, spring semester topics were more immediately relevant as they dealt with classroom teaching issues, which could have empowered the pre-service teachers and increased feelings of ownership of the platform. Tasks that required design, production, and sharing were also popular and elicited an increased amount of participation in both semesters. Exploring the effects of topics and tasks on participation and SP is still an under-researched area.

Second, high instructor participation and online presence was observed in both semesters. Instructors were highly active and were key players in the group as central actors, modeling necessary behaviors for participation in online communities. While Szeto (2015) and Pawan et al. (2003) underscore the importance of instructor involvement to encourage learner participation, Shea et al. (2010) argue that strategic instructors do not necessarily have to be the most active participants and that network prestige (i.e., the number of messages instructors receive) could be a more appropriate indicator of posts directed at course requirements, eliciting a high amount of responses from the learners. Similarly, it is possible to argue that while highly active instructors may help model certain participation skills, they may at the same time dominate the discussion and not leave much room or need for student participation or intimidate less-active learners. Future research about the effects of instructors' presence and participation on those of the learners could yield significant outcomes.

Third, Zhao et al. (2014) argue for an optimal level of SP to achieve online participation and collaboration. Our comparison of SP over two semesters demonstrated that overall SP density levels and the amount of cohesive indicators of the pre-service teachers remained stable. Affective indicators decreased, while interactive indicators increased. A decrease in the affective indicators over time is in line with previous research (Shea et al., 2010; Vaughan & Garrison, 2006) and is an indication that the participants established camaraderie and did not need further affective interaction to sustain collaboration.

Finally, SNA has been found to be a potentially powerful tool to investigate interaction and an alternative method to measure SP as high levels of SP were observed in contributions of learners who were central to the network (Shea et al., 2010, 2014). Yet, Wu et al. (2014) observed a higher amount of SP indicators in the posts of peripheral members of a professional teachers' community. We found statistically significant relationships between all SNA measures and interactive indicators of SP in the fall semester, which meant that central participants with high influence and prestige used more of the interactive indicators of SP in their posts (i.e., they asked questions; referred to other participants' messages; and showed appreciation of, agreement with, and disagreement with other messages). However, the lack of a similar pattern in the spring semester and the presence of minimal correlations between SNA measures and affective indicators of SP call for further investigation into the relationship between SNA and content analysis for SP, especially in examining affective interaction. Moreover, qualitative investigations of participation, interaction, and SP in online communities could offer convincing and corroborating evidence.

Conclusion

Totally or partially online teaching activities are increasingly becoming an integral part of EFL instruction. In these environments, teachers need to motivate learners to participate online, regulate learner socio-emotional involvement, and facilitate community building in order to foster online interaction and collaboration (Coleman, Hampel, Hauck, & Stickler, 2012). Coleman et al. (2012) maintain that online teachers "need to be technically literate, employ tools best suited for the task, moderate activities, provide careful scaffolding of tasks, and give detailed instructions" (p. 173). That is

why online teaching skills training, especially through personal experience and reflective practice, should become an essential component of EFL teacher training.

In this article, we investigated participation, interaction patterns, and SP of EFL pre-service teachers in two online discussion boards as part of two blended practicum courses. Our findings pertain to the context in which the blended courses were offered. It was impossible to anticipate to what extent participant interactions were shaped by the dynamics of face-to-face interactions, because only contributions to the online component were investigated. Therefore, future directions for research in blended contexts should include a study of interactions in both face-to-face and online components. Another potential direction for research is to explore the effects of instructor presence and involvement on learner participation, interaction, and SP. The potential of SNA in investigating the affective dimension of SP in online contexts also merits further investigation.

Our results demonstrate that the online training offered in the fall semester practicum course on SP and participatory literacy assisted pre-service teachers in becoming more active members of the online community with more stable participation patterns and increased interaction in a more cohesive community. As the discussions progressed, the focus shifted from more affective to more interactive exchanges, implicating the establishment of a sense of camaraderie with increasing level of collaboration. We also examined the potential of SNA as an alternative method for the measurement of SP and found SNA to be an analytically powerful tool, especially for the investigation of the interactive dimension of the SP framework in the fall semester. Finally, while the CoI framework treats SP as a quality of the group, SNA methods that explore SP treat it as a quality of individuals in the network. In this respect, the latter has greater potential to describe SP as a dynamic quality of individuals, making SNA analysis a potentially unique and powerful method in the investigation of SP.

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Notes

1. For a retrospective on the CoI framework with a discussion on validity, see article by Garrison, Anderson, and Archer (2010).
2. This adaptation of the CoI framework was specifically chosen to produce comparable results for the relationship between SNA and content analysis (see RQ4).
3. We observed that a remarkable amount of variance between the researchers' coding was due to different ways of coding and quantifying the codes (i.e., use of software vs. manual coding). Moreover, the researcher who used software for content analysis had used the coding scheme in her earlier work and was thus more experienced. The second researcher, on the other hand, was using the coding scheme for the first time. Therefore, the first coding procedure functioned like a training period. We found that this was resolved upon a second coding of the data.

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Appendix A. Coding Scheme for Social Presence

Adapted from Rourke et al. (1999), Swan and Shih (2005), and Shea et al. (2010)

SP Categories	Indicators	Definition	Examples
Affective	Expressing emotions	Conventional expressions of emotion	Therefore, I am happy to be a part of it. // It is definitely exciting to read how people label themselves …
	Use of humor	Teasing, cajoling, irony, sarcasm, understatements	I could have used a 'like' button here;)
	Self-disclosure	Presents details of life outside of class, or expresses vulnerability; includes expressions of likes, dislikes and preferences	First of all, it is another good opportunity for such a non-technologic person as me to experience web-based sharing platform
	Emoticons, punctuation, etc.	Unconventional expressions of emotion: repetitious punctuation, conspicuous capitalization, emoticons	Otherwise, it does not go further beyond just doing homeworks, unfortunately. =/ // That is a VERY important thing
	Expressing value	Expressing personal values, beliefs and attitudes	I find a profile is useful to express my ideas, but I like limitations blocking to share all my personality.

Cohesive	Vocatives	Addressing by name	I am also from Mersin like Ayse :)
	Inclusive pronouns	Addresses the group as we., us, our, group	Hi my dear friends, our dear instructor and our coordinating instructors,
	Phatics, salutations	Communication that serves a purely social function; greetings or closures	Hey! // See you guys!
	Intersubjectivity	Finding common ground by emphasizing similarities	I do like this one a lot too. // And I seem to be like you, for example, I can remember what a webpage looked like more than the name of the page.
Interactive	Referring to other's messages	Direct references to contents of others' posts	Most of my friends have written about the drawback of profiles // This is a really nice idea
	Asking questions	Asking questions to other participants	What about turning on or off lights? I generally do not do it but have you tried it?
	Complimenting, appreciation	Complimenting others or contents of others' messages	Thank you for the videos, I'll also watch them :) // Thanks aylin these are very useful tips :))
	Expressing agreement	Expressing agreement with others or contents of others' messages	I agree with you, the student focuses more on giving points than on the lesson in your case. // Exactly! ;)
	Expressing disagreement	Expressing disagreement with others or contents of others' messages	I completely agree about punishment issue but for rewards and praise I think they work in classrooms. // But, I still think that writing a story on pen and paper is not that boring.

Appendix B. Fall and Spring Semester SNA Freeman's Centrality Measures

Fall Semester (36 Pre-Service Teachers, 4 Instructors)

	Degree	NrmDegree	OutDegree	NrmOutDegree	InDegree	NrmInDegree
38	22	56.41	22	56.41	11	28.21
40	14	35.90	14	35.90	6	15.39
37	13	33.33	13	33.33	4	10.26
18	7	17.95	1	2.56	7	17.95
3	5	12.82	3	7.69	3	7.69
4	5	12.82	3	7.69	4	10.26
2	4	10.26	3	7.69	2	5.13
10	4	10.26	3	7.69	3	7.69
12	4	10.26	3	7.69	3	7.69
28	4	10.26	0	5.13	4	10.26

11	3	7.69	1	2.56	2	5.13
22	3	7.69	3	7.69	2	5.13
33	3	7.69	0	0.00	3	7.69
6	2	5.13	1	2.56	2	5.13
29	2	5.13	0	0.00	2	5.13
24	2	5.13	1	2.56	2	5.13
1	2	5.13	0	0.00	2	5.13
16	2	5.13	1	2.56	2	5.13
30	2	5.13	1	2.56	1	2.56
20	2	5.13	1	2.56	2	5.13
26	2	5.13	0	0.00	2	5.13
13	2	5.13	1	2.56	2	5.13
9	1	2.56	0	0.00	1	2.56
7	1	2.56	0	0.00	1	2.56
25	1	2.56	1	2.56	1	2.56
14	1	2.56	0	0.00	1	2.56
27	1	2.56	1	2.56	0	0.00
32	1	2.56	0	0.00	1	2.56
34	1	2.56	0	0.00	1	2.56
8	1	2.56	0	0.00	1	2.56
17	1	2.56	0	0.00	1	2.56
21	0	0.00	0	0.00	0	0.00
15	0	0.00	0	0.00	0	0.00
19	0	0.00	0	0.00	0	0.00
31	0	0.00	0	0.00	0	0.00
36	0	0.00	0	0.00	0	0.00
5	0	0.00	0	0.00	0	0.00
23	0	0.00	0	0.00	0	0.00
39	0	0.00	0	0.00	0	0.00
35	0	0.00	0	0.00	0	0.00

Fall Semester Descriptive Statistics

	M	***SD***	**Sum**	**Var.**	***SSQ***	***MCSSQ***	**Euc Norm**	**Min**	**Max**	***N***
Degree	2.95	4.29	118.00	18.40	1,084.00	735.90	32.92	0.00	22.00	40
NrmDegree	7.56	11.00	302.56	120.96	7,126.89	4,838.26	84.42	0.00	56.41	40
OutDegree	1.98	4.36	79.00	19.02	917.00	760.98	30.28	0.00	22.00	40
NrmOutDegree	5.06	11.18	202.56	125.08	6,028.93	5,003.12	77.65	0.00	56.41	40
InDegree	1.98	2.16	79.00	4.67	343.00	186.98	18.52	0.00	11.00	40
NrmInDegree	5.06	5.54	202.56	30.73	2,255.10	1,229.29	47.49	0.00	28.21	40

Spring Semester (19 Pre-Service Teachers, 2 Instructors)

	Degree	NrmDegree	OutDegree	NrmOutDegree	InDegree	NrmInDegree
37	16	80.00	15	75.00	9	45.00
39	9	45.00	9	45.00	4	20.00
10	9	45.00	7	35.00	7	35.00
18	8	40.00	5	25.00	6	30.00
11	6	30.00	2	10.00	4	10.00
13	6	30.00	2	10.00	5	25.00
12	5	25.00	2	10.00	5	25.00
16	5	25.00	3	15.00	2	10.00
15	4	20.00	2	10.00	3	15.00
20	4	20.00	0	0.00	4	20.00
3	3	15.00	3	15.00	2	10.00
6	3	15.00	2	10.00	2	10.00
7	3	15.00	1	5.00	2	10.00
8	3	15.00	2	10.00	1	5.00
17	3	15.00	1	5.00	2	10.00
22	2	10.00	2	10.00	1	5.00
9	1	5.00	1	5.00	1	5.00
14	1	5.00	1	5.00	0	0.00
19	1	5.00	1	5.00	1	5.00
5	1	5.00	1	5.00	0	0.00
1	1	5.00	0	0.00	1	5.00

Spring Semester Descriptive Statistics

	M	*SD*	Sum	Var.	*SSQ*	*MCSSQ*	Euc Norm	Min	Max	*N*
Degree	4.48	3.58	94.00	12.82	690.00	269.24	26.27	1.00	16.00	21
NrmDegree	22.38	17.90	470.00	320.52	17,250.00	6,730.95	131.34	5.00	80.00	21
OutDegree	2.95	3.44	62.00	11.86	432.00	248.95	20.79	0.00	15.00	21
NrmOutDegree	14.76	17.22	310.00	296.37	10,800.00	6,223.81	103.92	0.00	75.00	21
InDegree	2.95	2.34	62.00	5.47	298.00	114.95	17.26	0.00	9.00	21
NrmInDegree	14.76	11.70	310.00	136.85	7,450.00	2,873.81	86.31	0.00	45.00	21

Appendix C. Sample Posts Exemplifying Interaction Patterns in Extracts 1 and 2

Sample 1 (From Extract 1)

Line	Post	Interaction Pattern
16	S28, Nov 21: *<link to glogster poster>*	Pre-service teacher's (S28) reply to initial instructor post
17	T1, Nov 26: *Hi <name of S28>, Looks like you have bit of everything :) I got a warning message that said it could not load everything, but I could see the rabbit, elephant, dolphin and magpie. Which one are you the most? <name of T1>*	Feedback from instructor (T1)
18	S28, Nov 27: *Well there is also a mouse there:) My participation pattern is complicated. I mean I visit most days like elephant. But I don't contribute much especially if others haven't made any comment :) From this aspect, my pattren is like a combination of the elephant and the mouse as I said before :) But of course I don't participate like a magpie :)*	Pre-service teacher's (S28) response to instructor feedback

Sample 2 (From Extract 2)

Line	Post	Interaction Pattern
30	S15, April 1: *One of my cooperating teachers uses the first 5 minutes of the lesson to grasp the full attention of the students. They have a "first 5 minutes rule". At this period, all the students put their hands on the desks and look into the teacher. During this time teacher gives instructions and explains the core of the topic. After, students are more free to talk. When they're really out of control, she shouts to control them.*	Pre-service teacher's (S15) reply to initial post
31	S3, April 2: *In my school, they do something similar. At the beginning of each school day, the teacher and the students sit down on the floor in a circle, and they talk about what they are going to do that day, and what the teacher expects them to do and how she expects them to behave. Only after this discussion, they go back to their seats and their class starts. This way, they let the students know what they will be doing that day so that they can pay attention to them as they go.*	Feedback from a pre-service teacher (S3) to another pre-service teacher (S15)
32	T3, April 3: *So they (the teacher and students) set up their expectations for the daily routine and follow them to make things go smoothly. I think setting up expectations/rules can be one of the thumbs-up principles for creating a learning community.*	Feedback from instructor (T3) to pre-service teacher (S3)
33	S3, April 4: *Yes, when students know what they are expected to do, they often maintain their interest and they can see that if they follow the class activities, they will fulfill the expectation, which in turn will hopefully lead to an effective learning.*	Pre-service teacher's (S3) response to instructor feedback
34	S10, April 12: *This is a very good idea, too. The beginning of the lesson is very clear and the students know what they are supposed to to [sic] at that time. They are aware of their responsibilities. I like 'clarity' :)*	Feedback from a pre-service teacher (S10) to another pre-service teacher (S15)

Appendix D. Social Presence Results for Participants Who Contributed to Discussions in Both Fall and Spring Semesters

	Fall	Spring
Total No. of Words	14,670	11,891
Total SP	691	684
Total SP Density	47.10	57.52
Expressing Emotions	13	7
Use of Humor	18	10
Self-Disclosure	167	59
Emoticons, Punctuation, etc.	97	103
Expressing Value	92	41
Affective Total	387	220
Affective Density	26.38	18.50
Vocatives	29	65
Inclusive Pronouns	126	100
Phatics, Salutations	52	34
Intersubjectivity	7	13
Cohesive Total	214	212
Cohesive Density	14.59	17.83
Referring to Other's Messages	34	107
Asking Questions	18	33
Complimenting, Appreciation	31	69
Expressing Agreement	7	35
Expressing Disagreement	0	8
Interactive Total	90	252
Interactive Density	6.13	21.19

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