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Interactive networks and social knowledge construction behavioral patterns in primary school teachers' online collaborative learning activities

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ABSTRACT

A four-stage online collaborative learning approach to supporting teachers' professional development was proposed and described in this paper. This study investigated primary school teachers' interactive networks and social knowledge construction behavioral patterns in online collaborative learning activities. The subject of this study was 83 primary school Chinese teachers who were participating in a structured online professional development program that was 6 months in duration. By combining social network analysis, content analysis and lag sequential analysis, results showed that interactive networks generated in two rounds of online collaborative learning activities were low reciprocal, and loosely connected with a low cohesiveness. There was no significant difference of behavior distributions between core and peripheral members. Moreover, teachers' social knowledge construction behavioral patterns presented different characteristics in different rounds of activities. In addition, this study identified certain problems in teachers' online learning. Finally, some implications for the design of teacher education programs, limitations and further research plans are proposed.

1. Introduction

With the deepening application of Information and Communication Technologies (ICT) in classroom practices, teachers are faced with increasing demands due to educational reforms, changes in the curriculum, and new pedagogical approaches (Tsiotakis & Jimoyiannis, 2016; van den Bergh, Ros & Beijaard, 2015). Teachers' professional development has been considered as a critical factor for their growth and educational reforms (Chen, Chen, & Tsai, 2009; Matzat, 2013). Teacher professional development programs have provided multiple opportunities for teachers to improve their instructional design knowledge and skills (Chen, 2012; Liu, Zhang, & Wang, 2015). The most traditional and popular approach is that teachers attend a training course and listen passively to experts. Yet, these approaches come out to have low impacts on teachers' faith to put innovative teaching methods into practice (Duncan-Howell, 2010). As a result of the increased demands and the complexity of instructional activities, collaboration and interaction among teachers have become increasingly important.

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With the development of internet technology, online learning becomes an important method for teachers' professional development in addition to face-to-face approaches. Online learning offers authentic, flexible, and personalized opportunities for teachers to interact and communicate with each other (Chieu & Herbst, 2016; Duncan-Howell, 2010). Teachers can online discuss evidence of how successful an approach is in the classroom with their colleagues and then decide whether to try the suggested approaches or strategies themselves (Chen et al., 2009; Kent, Laslo, & Rafaeli, 2016). Online learning supports the sharing of educational experiences and co-construction of knowledge by means of fostering effective social interactions (Chen et al., 2009; Hou, 2015). In recent years, Web 2.0 tools, course management systems (CMS) and virtual learning environments (VLE) such as Moodle are commonly used to build teachers' online learning communities. Teachers have the opportunities to share resources and develop their pedagogical skills and strategies in an online learning community (Chen et al., 2009). While online learning has been one useful strategy to enhance teachers' thinking and practice (Cherrington & Loveridge, 2014), nonetheless, it would be too simple to assume that the implementation of online professional development programs automatically promotes teachers' collaboration and knowledge construction (Vanblaere & Devos, 2016). Collaborative relationship means teachers act on an ongoing basis to develop their knowledge by sharing resources and engaging in critical dialogue (Wenger, McDermott, & Snyder, 2002). Majority of teachers in online learning activities exhibit moderate or even low collaborative relationships (Pavo & Rodrigo, 2015; Tsiotakis & Jimoyiannis, 2016). Pedagogy and social interaction are key factors of an online learning environment and these factors can be used to facilitate collaboration (Wang, 2008). Many researchers have proposed content analysis schemes to evaluate learner's levels of social knowledge construction during online discussion (Gunawardena, Lowe, & Anderson, 1997; Hou, 2012, 2015). Social knowledge construction behavioral patterns which mean sequential relationships between each type of coded discussion content can help to understand the whole sequential pattern of discussion in online learning activities. Compared to the research on behavioral patterns in students' online discussions activities, the issue of exploring the behavioral patterns of teachers' online discussion activities has attracted relatively little attention. Teachers' collaborative relationships and social knowledge construction behavioral patterns in an online learning activity are vital because such relationships and patterns can provide insight into the characteristics and limitations of teachers' online learning activities (Lee & Bonk, 2016).

In this study, on the basis of constructivist learning theories and the interactivity design theory, we propose a four-stage online collaborative learning approach, which consisted of two times of discussing lesson plans and two times of discussing classroom teaching. The objective of this study is to investigate collaborative relationships and social knowledge construction behavioral patterns in primary school teachers' online collaborative learning activities.

2. Theoretical framework

In this section, theoretical foundations that support the design of the four-stage online collaborative learning approach are introduced, followed by a detailed description of the four-stage online collaborative learning approach.

2.1. Theoretical foundations

2.1.1. Constructivist learning theories

Constructivist learning theories provide theoretical support for the design and development of the four-stage online collaborative learning approach. Cognitive constructivists argue that knowledge is actively constructed by individual learners rather than transmitted by others, and learners construct meaningful and conceptually functional representations based on their prior experience and new information (Jonassen, 1991; Wang, 2008). Social constructivists, however, argue that learners construct knowledge collaboratively in processes of information sharing, negotiation, and discussion (Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Wenger, 1998). According to cognitive constructivism, online professional development programs must satisfy the learning intention of individual teachers and should be able to provide various leaning activities and opportunities for teachers to reflect and articulate on the content under study and to apply the knowledge learned to teaching practice. In addition, the design of the online learning environment must enable the mentor to scaffold teachers during their learning process. On the other hand, social constructivists suggest a culture of collaboration among teachers be cultivated to support long-term professional development. Teachers' theoretical knowledge and practical knowledge could be effectively coupled when they collaborated with more experienced and knowledgeable colleagues (Krutka, Bergman, Flores, Mason, & Jack, 2014).

2.1.2. Interactivity design

Among the factors in designing an effective online professional development program, interactivity remains a central concern. Educational researchers believe that interaction must be deliberately incorporated into an online learning design (Chou, 2003; Tang & Lam, 2014). Interactivity refers to real-time dynamics and mutual give-and-take between the learner and an instructional system, and his or her technology-enhanced peers (Merrill, Li, & Jones, 1990; Peng, Chou, & Chang, 2008). Interactivity plays an important role in learners' social knowledge construction and the development of cognitive skills. In an online learning environment, there are three interactive relationships, including learner-interface, learner-content, and learner-people interaction (Hillman, Willis, & Gunawardena, 1994; Liaw & Huang, 2000; Wang, 2008). Learner-people interaction refers to the interaction of learner-instructor and the interaction of learner-learner. Sound design of the interactivity of an online learning environment should be able to promote these three types of interaction. With regard to the