

CHAPTER 1

Introduction

1.1 Statement of the Problem

As teaching technology advances, today's teachers and students are placed in a context of e-Learning, and teachers' professional development and learners' learning are influenced by new technology. These revolutionized teaching methods and technologies have diversified teaching activities. Many studies, however, indicate that most teachers have not yet established the culture of sharing teaching knowledge and experiences (Barab et al., 2001; Tyack & Cuban, 1995); teachers are used to designing instructional activities in isolation (Goodlad, 1984; Rosenholtz, 1991; Tyack & Cuban, 1995), and most instruction-related knowledge is "tacit" and not easily "externalized" (Carroll, et al., 2003). Therefore, when facing instruction-related problems, peers may not be able to acquire relevant experience or solutions from each other to solve bottlenecks in teaching.

Many studies have been conducted to discuss how to use "communities of teaching practice" and how teachers can interact through designed interactive mechanisms or technological intervention (Snow-Gerono, 2005; McCotter, 2001; Olson & Craig, 2001; Hsu, 2004; Carroll, et. al., 2003; Stigler & Hiebert, 1999;

Gibson, Neale, Carroll, & VanMetre, 1999). However, studies have also demonstrated that teachers' interactions in community activities are limited in ways that include motives, content, and performance (Carroll, et al., 2003; Fishman & Pinkard, 2001; Barab, MaKinster, Moore, Cunningham, & The ILF Design Team, 2001; Chancy-Cullen & Duffy, 1999). Therefore, the topic of how to better use technology to facilitate interactions in teacher communities deserves to be explored.

More and more teachers use network technology to assist their teaching. Many studies discuss online instructional strategies, of which project-based learning (PBL) a “learner-centered” teaching strategy, has almost become the most widely discussed or utilized teaching method in the domain of instructional technology. In PBL, a learner can propose and define project topics, gather and analyze data, discuss with peers, solve problems, discover new problems, and share the learning results (Marx, Blumenfeld, Krajcik, & Soloway, 1997; Blumenfeld, et al., 1991; Blumenfeld, et al., 1994; Thomas, Mergendoller & Michaelson, 1999). This is representative of “constructive learning.” However, the meta-research of Thomas (2000) that focused on project-based learning pointed out that in practice, a learner often faces limitations in terms of data analysis (Krajcik, et al., 1998; Edelson, Gordon, & Pea, 1999). Without an in-depth understanding of the data via peer discussion, a learner often treats an online resource as the “solution” to a question directly (Wallace &

Kupperman, 1997; Chang & McDaniel, 1995), resulting in inappropriate inferences (Krajcik, et al., 1998) and affecting the accuracy and depth of online PBL. This limitation of peers' discussion requires guidance and assistance from teachers or intelligent technologies.

By looking at the abovementioned limitations related to online teacher communities and online PBL teaching, we can see that limitations in professional teacher development are correlated with a lack of in-depth interactions/discussions about instructional knowledge in the online teacher community. The limitations related to online PBL are also correlated with a lack of in-depth knowledge interactions/discussions among members in the learner community. If we can come up with appropriate online discussion activities that promote knowledge sharing and increase the depth and frequency of interactions, these limitations may be overcome, and professional development and teaching of PBL could be enhanced.

Recently, many studies have discussed the issues of knowledge sharing, which focuses on the process of knowledge-interaction among community members. This includes the exploration of the "internalization" and "externalization" of knowledge (Hendriks, 1999). Organizations or communities can come up with various knowledge sharing strategies in order to achieve knowledge transition, innovation, and re-use among members (Gilbert & Gordey-Hayes, 1996; Davenport & Prusak,

1998). Many studies on knowledge sharing have discussed the factors that motivate members to share knowledge (Bock et al., 2005; Kankanhalli et al., 2005; Wasko & Faraj, 2005; Hsu, et al., 2007), most of them discussing knowledge sharing in commercial organizations by questionnaires-survey or case observations; technologies have also been proposed to assist knowledge sharing (Li, Montazemi & Yuan, 2006; Ras, et al., 2005; Rafaeli, et al., 2004; Soller, 2004; Roda, et al., 2003).

There have been few recent studies on educational knowledge sharing, and knowledge sharing behavior may differ from one organization type to another (Yang, 2007; Yang & Chen, 2007; Bock et al., 2005). In order to promote knowledge interaction in educational organizations (e.g.: teacher or learner communities), this study aims to explore knowledge sharing activities of teacher/learner communities.

In an e-Learning context, the knowledge of teachers and learners is always shared via online discussion forums. Since the design of online discussion activities has a strong influence on the quality of discussions (Patricia & Dabbagh, 2005; Hewitt, 2003; Vonderwell, 2003; Swan, et al., 2000; Vrasidas & McIsaac, 1999), this study focuses on designing appropriate online knowledge sharing discussion activities for teacher/learner communities,. We also explore behavioral patterns and the content of discussions, as this can help us understand the influence or limitations of a certain discussion activity, and compare differences between proposed activities.

There are not yet many studies targeted at this topic, and it will be useful in terms of the evaluation and development of the online knowledge sharing discussion strategies for teacher/learner communities under a context of e-Learning.

To explore deeper actual online discussion patterns, the analysis process becomes important. Many studies have targeted interactions in asynchronous online discussions (Hewitt, 2005; Fahy, Crawford, & Ally, 2001; Sudweeks & Simoff, 1999; Gunawardena, Lowe & Anderson, 1997; Newman, Webb & Cochrane, 1995; Levin, Kim, & Riel, 1990), and qualitative case analyses of discussion content and quantitative content analysis were often applied to explore interactions. By coding and analyzing discussion content, we can understand the content of discussions, but the results of content analysis alone do not allow us to dissect behavioral patterns and sequential correlation in the whole discussion behavior (e.g., what is the overall discussion pattern of the community? What kind of discussion behavior does a teacher/learner often subsequently have after a certain kind of discussion behavior?). Understanding these sequential correlations allows us to infer overall behavioral sequential patterns, allowing a better understanding of actual situations in overall discussion behaviors and detection of possible limitations in interactions. Lag sequential analysis (Bakeman & Gottman, 1997) allows us to more accurately examine whether the sequential relationship between each discussion behavior has

statistical significance; this method has already been used in studies that explore online discussions (Jeong, 2003; England, 1985; King & Roblyer, 1984; Hou, Chang & Sung, 2007), giving us more inferential information to analyze sequential correlations between interactive behaviors of knowledge sharing.

In summary, most existing studies related to knowledge sharing are directed at commercial organizations; behavioral pattern-discovery research related to knowledge sharing in the educational context is rare. This study tries to understand the limitations faced by community members by applying an online knowledge sharing discussion activity and observing it empirically; appropriate technologies (e-Learning system with knowledge sharing modules) are proposed and developed to conduct knowledge sharing activities. The observations, in turn, allow us to determine how and when guides or technology should intervene.

As peer-assessment instructional strategy receive more and more attention (Cizek, 1997; Shepard, 2000), it is generally accepted that the method of peer-assessment which allows people to observe each other's work and propose questions enhances learners' critical-thinking and meta-cognitive skills (Topping, 1998; Lin, Liu, & Yuan, 2001). Since peer-assessment requires evaluations and discussions between learners, it also encourages learners to be active (Falchikov, 1995), and can be used to promote knowledge sharing discussion. Besides, problem

solving strategy is one of the instructional strategies that is frequently used in group interactive learning (Gagne & Briggs, 1979), and the relevant theories have been widely discussed (Mayer, 1992; Basadur, 1994; D’Zurilla & Goldfried, 1971; Schoenfeld, 1992). This kind of process not only helps solve problems, but can also encourage learners to discuss with peers and develop their cognitive skills.

The two abovementioned strategies are commonly applied and discussed. Peer assessment promotes learner interactions via commenting on the work of peers, with a competitive style. Problem solving promotes learners to interact in a different way, encouraging learners to solve their peers’ problems, with a more collaborative approach. In this study, we integrated the two strategies into fundamental theories of knowledge sharing to create online knowledge sharing discussion activities for teacher/learner communities to assist “internalization” and “externalization” of knowledge in an e-Learning context.

Methods such as questionnaires and case analyses are frequently used in knowledge sharing studies, but long-term, quantitative content and behavior pattern analyses are lacking. The use of content analysis alone does not yield much information about the patterns and limitations of online knowledge sharing discussion activities. This study therefore uses lag sequential analysis, quantitative content analysis, and original protocol analysis to analyze content both in quantitative and

qualitative approaches. We believe that empirical observations can provide us with an in-depth understanding of the depth and behavioral patterns in knowledge sharing between community members as well as the potential difficulties and suggestions.

1.2 Statement of Purposes

The purposes of this study are to:

1. Integrate knowledge sharing theories and strategies commonly used to promote group learning (e.g., problem solving and peer-assessment strategies) and design knowledge sharing discussion activities for teacher/learner communities to assist internalization and externalization of knowledge among members.
2. Design and provide an online knowledge sharing e-Learning environment for observations.
3. Conduct a series of online empirical observations that combine sequential analysis, quantitative content analysis, and original protocol analysis in order to explore the depth of the community members' knowledge construction and behavioral patterns during the above knowledge sharing discussion activities.
4. Discuss and compare the effects and limitations of knowledge sharing discussion activities on teacher/student interactions.
5. Propose suggestions based on the discovered limitations to be used by researchers, teacher educators, or teachers trying to determine timing for

interventions to promote quality online discussions.

6. Propose follow-up suggestions based on the findings that can be applied to design an intelligent agent for providing automatic interventions to promote the quality of discussions in online knowledge sharing systems.

In order to reach these objectives, our study includes three sub-studies targeted at teacher and learner communities. Peer-assessment and problem solving strategies are integrated with the knowledge sharing model to design different activities. The three sub-studies are:

Study I: Exploring the behavioral sequential pattern and content of a PBL knowledge sharing discussion activity that integrates the peer-assessment strategy.

In Study I, peer-assessment and knowledge sharing models are integrated to design and implement an online “peer-assessment knowledge sharing discussion activity” in actual teaching settings in order for us to observe the depth and behavioral pattern in students’ knowledge sharing process.

Study II: Exploring the behavioral sequential pattern and content of a PBL knowledge sharing discussion activity that integrates the problem solving strategy.

In Study II, a problem solving strategy is used as the interaction mechanism

for knowledge-sharing. We combined problem solving with knowledge sharing theories to design an “online problem solving knowledge sharing discussion activity” and implemented it in an actual teaching situation to observe the depth and behavioral pattern in students’ knowledge sharing.

Study III: Exploring the behavioral sequential pattern and content of an online teacher community’s knowledge sharing discussion activity that integrates the problem solving.

Problem solving has been applied in both teaching and teachers’ professional development (Hsu, 2004), thus; we wish to observe teacher community’s knowledge sharing processes that use problem solving strategy to analyze how these activities are used, discuss potential limitations, and offer suggestions.

Except for a few physical workshops, few peer-assessment activities have been recently conducted in online teacher communities. Previous studies show the limitations of teachers’ capabilities in developing/sharing their web-based teaching materials (Sung, Chang & Hou, 2005; Guzdial, Rick & Kehoe, 2001); each teacher may have different computer literacy, and not all teachers in an online community are motivated to upload and share their products for other teachers’ comments. Due to the abovementioned difficulties and limited applications, we did not observe knowledge sharing activities that use peer-assessment in teacher communities in this study.

Related theories, models, and literature are reviewed in the second chapter, methods and results of the knowledge sharing discussion process of Study I are discussed in the third chapter, and the methods and results of Studies II and III are discussed in the fourth and fifth chapters, respectively. The general discussions and conclusions are stated in the sixth and seventh chapter.