The Effect of Discussion Protocol and Modeling Example on Students' Participation, Quality, and Perceptions of Asynchronous Online Discussion

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ABSTRACT

This study examined the effects of two scaffolding strategies: (a) discussion protocol and (b) modeling examples on students' active participation, quality of online discussion and student perceptions of online discussion in an undergraduate online course. The results proposed that using both discussion protocol and modeling examples could improve students' qualitative participation and higher quality of posts, but no significant influence on students' quantitative participation and perceptions of online discussion.

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CHAPTER I

INTRODUCTION

Online teaching and learning is becoming more the norm than the exception for many teachers and students today (Wright, Sunal, & Wilson, 2006). It refers to electronic means of distributing and engaging with learning – typically via Internet and other related electronic media services (Schifter & Stewart, 2010). Online teaching and learning offers many potential benefits that traditional instruction methods struggle to achieve. There is no doubt that learners being able to learn anytime and anywhere is one of the best benefits of online learning. Online teaching and learning also provides a student-centered learning environment. Thus, the role of online teacher is more like a facilitator than a provider of content. Instead of being a passive receiver, students actively construct knowledge by themselves through engaging in the self-pace and self-regulated learning environment (Anderson, Rourke, Garrison, & Archer, 2001; Bump, 1990; Chun, 1994; Sullivan & Pratt, 1996; Warschauer, Turbee, & Roberts, 1996). Online teaching and learning, moreover, can easily accommodate students' different learning styles and skill levels. Each student is unique and different from others with respect to prior knowledge, learning styles, and characteristics. In online learning community, slow learners can slow down their learning if they need more time to attain the desired targets and vice versa. In addition, utilization of advanced technology also makes students' different learning modalities develop (Duffy & Kirkley, 2003; Stephenson, 2001). Through technology, instructors can track students' online learning performance. In addition, students can access course content and information such as discussion posts and learning progress whenever they want during or even after the semester (Moore & Kearsley, 2005).

On the other hand, isolation and a physically dispersed learning environment are becoming an inherent issue for online teaching and learning. Students who are geographically dispersed find it hard to share and exchange their ideas freely. To enhance online students' communication, asynchronous online discussion has been perceived as an important component in online teaching and learning to facilitate computer-mediated communication (CMC) and generate student-to-student and student-to-instructor interaction. Berge (1997) found that 41 of the 42 respondents used discussion as an online teaching method. Online discussion is a "teaching and learning strategy that emphasizes participation, dialogue, and multi-way communication" (Heming, 1996, n.p.). It provides a safe and free communication environment. All students can articulate their own opinions under full consideration, challenge other's ideas, hear multiple perspectives, ask questions and make social communication at different times (Brookfield & Preskill, 1999; Heming, 1996). Teachers and students each have equal chances and enough time to participate in the discussion (Jonhnson, Aragon, Shaik, & Palma-Rivas, 2000; Markel, 2001). Students who are shy, slow-thinkers, or are intimidated by traditional classroom discussion can especially benefit from online discussion. In addition, online discussion shifts the class from teacher-centered to student-centered. Students construct knowledge by actively interacting with course materials, peers, and teachers via discussion. Consequently, student-centered online discussion changes the role of online teachers (Bump, 1990; Chun, 1994; Sullivan & Pratt, 1996; Warschauer, Turbee, & Roberts, 1996). Previous studies have indicated that student-centered online discussion can facilitate students' learning, foster knowledge construction and promote higher-order of thinking skills (e.g., Carswell, Thomas, Petre,

Price, & Richard, 2000; Mandernach, dailey-Hebert, & Donnellie-Sallee, 2007; Romiszowski & Mason, 2004; Schrie, 2006; Stahl, 2004). In asynchronous online discussion, the process of composing initial posts and replying to others' posts encourages students' reflection on what they have learned and promotes their learning and higher-order thinking skills through thoroughly thinking about their ideas, analysis, synthesis, evaluation, criticism, and formulating their opinions (Newman, Johnson, Webb, & Cochrane, 1997). Online discussion also encourages students' interaction and the computer-supported collaborative learning (CSCL) (e.g., McGiven, 1994; Wagner, 1993; Waltonen-Moore, Stuart, Oswald, & Varonis, 2006). Jonassen (1996) proposed that online discussion is "a naturally collaborative technology. It fosters collaborative meaning making by providing multiple perspectives on any problem or idea".

Statement of the problem

Although asynchronous online discussion affords many benefits for online teaching and learning, it still has many issues. Limited student participation in online discussions appears to be a persistent and widespread problem (e.g., Cheung & Hew, 2004; Hewitt, 2005; Wan & Johnson, 1994). Students tend to only post the minimum number of messages required, particularly if participation is voluntary (e.g., Fung, 2004; Hara, Bonk, & Angeli, 2000). Some students had been found to have never participated in online discussions throughout the semester (e.g., Cheung & Hew, 2004). The online discussions, moreover, did not lead to the expected interaction in online learning. Unless response from students was required, students did not seem to have read other postings or respond to their peers (e.g., Benfield, 2000; Berge, 1995). Online students also appeared to have less learning motivation than students attending traditional face-to-face classes.

Brooks and Jeong (2006) found that students failed to communicate effectively due to a lack of motivation. Low quality of posts was also a main and persistent issue of online discussion. Cheung and Hew (2005) found that the majority of the students' level of knowledge construction tended to be low because students would like to simply answer group members' queries, rather than exchange opinions about the issues. Newman, Webb, and Cochrane (1995) had similar findings that students were less likely to brainstorm ideas in online discussion, although they have equal chances and enough time to express and exchange their own opinions.

Many previous studies have suggested that helping students understand teachers' expectations and feel prepared is of primary importance in making sure students succeed in achieving high quality online discussion, as well as promoting their learning motivation. Jung, Choi, Lim, and Leem (2002) found that providing students with more discussion guidelines would improve students' active participation and learning achievement. However, unclear expectations would make student participation flounder because students did not know how much they were to contribute or what their messages should look like (Dennen, 2005). Various methods of showing teachers' expectations in online teaching and learning have been examined in many prior experimental studies. Tollision (2009) found that showing students worked examples could increase student participation and improve their higher-order thinking skills. However, student's perceptions of web-based instructional (WBI) experiences, preparedness and learner control were not significantly changed. In Tollision's (2009) study, worked examples simulated a discussion process produced by several students who were not in the class. It might inspire students' ideas by reviewing peers' posts, but it was not clear enough to

show the teacher's expectation of students' knowledge construction and high cognitive skills in online discussion. The discussion protocol is regarded as another effective way to show teacher expectations. Moore and Marra (2005), however, found an opposite result that using an argumentation protocol negatively affected students' level of knowledge construction. The argumentation protocol created by Toulmin (1958) clearly elaborates four main components of arguments: thesis, evidence, assumption, and synthesis. The authors explained that students found the required protocol too abstract and difficult to implement when they formulated their posts.

Statement of the Purpose

Although helping students understand teacher's expectations and prepare well is important for students to achieve high quality online discussion, it becomes a big challenge for online teachers to appropriately show their expectations and help students understand exactly what they should do and how they can improve performance. Previous studies have examined the effects of discussion protocol and modeling examples on showing teacher's expectations in online discussion. However, the results showed that students might feel a protocol is too abstract to understand and implement in practice. On the other hand, modeling examples are too concrete to be aware of the underlying meaning of teacher's expectations for students.

The purpose of this study is to fill in the gaps and examine the effectiveness of using both discussion protocol and modeling examples to see whether this method can show online teachers' expectations clearly and prepare online students to be successful in online discussion. This study aims to investigate the effect of exposing students to teachers' expectations by using both the abstract discussion protocol and the concrete

modeling discussion examples on improvement of students' quality of posts and make them feel more prepared, confident, motivated, and satisfied in online discussion.

Research Questions

Based on the purposes of this study, the following research questions will be examined:

1. Did discussion protocol and modeling examples have significant effects on student active participation in the online discussion?
    a. Were there significant main effect and interaction effect of discussion protocol and modeling example on students' number of posts?
    b. Were there significant main effect and interaction effect of discussion protocol and modeling example on students' post time of initial posts?
    c. Were there significant main effect and interaction effect of discussion protocol and modeling example on students' length of initial posts?
    d. Were there significant main effect and interaction effect of discussion protocol and modeling example on students' propositions of initial posts?
2. Did discussion protocol and modeling examples have significant effects on student quality of initial posts in the online discussion?
3. Did discussion protocol and modeling examples have a significant effect on student perceptions about online discussion?
    a. Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of preparedness for students?

b. Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of motivation for students?

c. Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of confidence for students?

d. Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of satisfaction for students?

Significance of the Study

In order to encourage discussion participation, promote knowledge construction and improve critical thinking skills in online discussion, many instructional interventions have been examined in previous studies such as *types of discussion topics* (e.g., Kanuka, Rourke, & Laflamme, 2006; Han & Maushak, 2012; Wang, 2006); *assigned roles of discussion leaders* (e.g., An, Shin, & Lim, 2009; Han & Cheon, 2011; Hew & Cheung, 2008; Wever, Keer, Schellens, & Valcke, 2009); *structured discussion groups* (e.g., Brooks & Jeong, 2006; Han & Crooks, 2012); *structured discussion guidelines* (e.g., Han & Cheon, 2011; Moore & Marra, 2005; Tollision, 2009); and *different discussion media* (e.g., Dringus, Snyder, & Terrell, 2010; Oomen-Early, Bold, Wiginton, Gallien, & Anderson, 2008).

Some studies also examined *the effect of the size* of discussion group (e.g., Du, Zhang, Olinzock, & Adams, 2008), *students' individual differences* such as students' GPA, majors, and technical background (e.g., Krentler & Willis-Flurry, 2005; Spatariu,

Quinn, & Hartley, 2007; Han & Crooks, 2012) and *students' perceptions* on online discussion (e.g., Du, 2008; Tollision, 2009). All these studies have focused on one or more influential elements in online discussion, which were identified by previous literature for future research in regards to the effective conducting of online discussion. Many of these studies have come to the general conclusion that students will have better online learning experiences if they are provided appropriate scaffoldings and if they can clearly understand the teacher's expectations. In an online learning environment, students and teachers are separated geographically. Therefore, it is much more important for online students to get clear and detailed course information online and accurately understand teacher's expectations than in traditional classes. If online teachers cannot provide clear guidelines, online students tend to have failed learning experiences since they cannot expect to receive teachers' feedback or help immediately.

Encouraging active participation is a constant aim in online discussion. Many studies have used the number of postings, post length, and post time to indicate students' active participation (e.g., Baran & Correia, 2009; Cox & Cox, 2008). Previous studies have proposed that students' active participation is closely related to the roles of online teachers. Jung, Choi, Lim, and Leem (2002) found that clearly stating learning guidelines could motivate students' participation. Tollison (2009) also noted that students made more numbers of posts when they were exposed to the worked examples in online discussion, although their post length did not show significant differences. Han and Maushak (2012) further examined the relationship among all these indicators in online discussion. The study revealed that the number of students' responses was positively related to the quality of initial posts. In addition, the posting time of initial

posts was negatively related to the quality and the number of replies. However, the length of initial posts had no relationship to students' responses. This study has vital implications for future studies to holistically consider students' participation. Measuring students' active participation is complex, rather than simply calculating the number of students' posts. The interplay of all these indicators affects students' active participation in online discussion and need to be fully considered.

Another important and typical strand of research focuses on improving students' meaningful participation in online discussion. Many studies have made efforts on promoting students' knowledge construction via online discussion. Students are expected to achieve higher level of knowledge construction through receiving appropriate instructional facilitation in online discussion to effectively share information, exchange ideas, synthesize others' opinions and generate their own statement. Dennen (2005) addressed that online teachers should set up clear guidelines and make sure the guidelines are made visible to students. Providing learners with a clear expectation of quality and quantity is crucial to help students succeed in online discussion and achieve higher level of knowledge construction.

Most previous studies have conducted the research from teachers' perspectives to examine the effects of instructional intervention on students' discussion performances. Very few studies have looked into students' perspectives to examine the influence and changes of students' perception in online discussion and see the relationship between their learning performances and perceptions. Many studies have not found the expected findings of students' perception of online learning and online discussion. Jung et al. (2002) found that there was no significant difference in students' perceived learning

outcomes and WBI experiences when students were provided different levels of guidelines. However, the satisfaction of learning experience appeared significant difference when students received clear guidelines. Tollison (2009) found a significant change in the productive learning environment, but no changes in preparedness and learner control when students were exposed to worked examples in online discussion. These experimental studies showed that students' perception about online discussion is an important indicator to measure the effectiveness of online discussion.

Piaget (1972) and Inagaki (1981) suggested that discussion can be promoted when guided by experienced teachers. Online teachers need to prepare themselves well first to help students have successful online learning experiences. Therefore, the main significance of this study is to help online teachers understand the importance of the effect of their expectations on students' online learning. Furthermore, this study is beneficial to the design of online discussions by providing experimental evidence of the practical ways of showing teachers' expectations. Both discussion protocol and modeling examples have been considered as effective ways to address and express teachers' expectations to students, although previous studies have shown that both of them have strengths and weaknesses. This study tries to create a new path for teachers to effectively show their expectations in online discussions. It combines the two instructional scaffolding strategies to make up for each one's shortcomings and make them complementary. Through this study, online teachers can attain the experimental evidence of verifying the effectiveness of this new method and shed light on their future online teaching and the design of online discussion activities.

Online discussion is a complex thinking, creating and communicating process. All the elements interplay with each other to affect how well the online discussion works. Many previous studies have only examined the single factor in the online discussion and made the inferences. These studies provided implications for future research to investigate more factors and their relationships to make the conclusions more reasonable, accurate, and practicable. Therefore, as mentioned above, this study focuses on more scaffolding strategies or instructional interventions and tries to exhibit their relationship in online discussion. Moreover, a large number of studies only examined the students' participation and quality of discussion posts individually. This study pays attention on their relationships to deeply probe into the effect of the new combining method (using both discussion protocol and modeling examples) on online discussion. Students' perceptions of online discussion including preparedness, motivation, confidence, and satisfaction are also examined in the study to show the relationships between students' perception and their online learning behaviors. Knowing more about students' feeling about online learning would help teachers better reflect on their online teaching.

This study is based on the findings of previous studies, but, tries to further the previous studies and provides an optimal method for online teachers to be successful in their online teaching by clearly showing their expectation to online students. It also follows and extends the research line of students' perceptions of online learning to exhibit more aspects of students' perspectives. The whole design of this study is based on the implications from the prior studies and suggestions.

Overall, this study makes an effort to look at online discussion as a complex and holistic teaching and learning process. It avoids probing into online discussion from only

single aspect and ignoring the relationships among the influential factors. It depicts a more holistic picture of online discussion and puts up with practical suggestions and ideas for online teachers to effectively design the online discussion activities. The implications of this study shed light on the future research to investigate more factors that may affect the participation and the quality of online discussion and understand the online discussion should be considered as a holistic process including various influential aspects.

Limitations

This study has the following limitations on the design of the research and the generalizability of its findings. As mentioned above, online discussion is a complex and holistic process. Various factors interact with each other to affect students' learning behaviors and perceptions. This study has made efforts to make a relatively complete consideration in the research to exhibit more aspects and relationships in online discussion. However, many variables are not able to be examined in the study such as students' critical thinking skills and social presence. When designing this study, extraneous factors have been constrained to make sure the results of the research are more reliable and valid.

Second, the participation is restricted to an undergraduate level and computer skill based course. Students who are in different academic levels have different characteristics. These differences directly lead to their different learning behaviors and perceptions. In this study, the course content focuses on basic computer skills and digital literacy. Courses are different from subject to subject and from natural science to social science. Therefore, the participation in this study would not necessarily be representative of other

student populations who are not in undergraduate academic level or take courses in different fields.

Third, there are many types of discussion activities such as sharing information, debating, problem solving, and case study. Each type has its strengths and constraints. Several previous studies have indicated that debating discussion can enhance students' participation, knowledge construction, and even critical thinking skills (e.g., Brooks & Jeong, 2009; Han & Cheon, 2011; Kanuka, bourke, & Laflamme, 2006) because it could provide students with more opportunities to find supportive evidence and synthesize others' opinions. Consequently, the findings of this study may be difficult to be replicated if researchers conduct different types of discussion activities.

Definition of Terms

The following terms have been defined for use in this study:

1. Asynchronous online discussion. The term of "asynchronous online discussion" is defined as "a text-based human-to-human communication via computer networks that provides a platform for the participants to interact with one another to exchange ideas, insights and personal experiences" (Hew & Cheung, 2003, p.249).
2. CMC. The Term "CMC" is an abbreviation for computer-mediated communication and refers to "the use of networks of computers to facilitate interaction between spatially separated learners; these technologies include electronic mail, computer conferencing, and on-line databases" (Jonassen, Davidson, Collins, Campbell, & Haag, 2009).

3. Distance education. The term, "distance education", was defined by Moore (1990, xv) as "all arrangements for providing instruction through print or electronic communications media to persons engaged in planned learning in a place or time different from that of the instructor or instructors".
4. Discussion protocol: The term of "discussion protocol" refers to the "the rules and guidelines for discussion board participation and are important for establishing appropriate discussion board interactions" (Moore & Marra, 2005).
5. Modeling example: The term of "modeling example" was defined by Atkinson, Derry, Renkl, & Wortham (2000) as "an expert's problem-solving model for a learner to study and emulate". (p182).
6. Online teaching and learning. The term of "online teaching and learning" refers to "the teaching and learning that takes place over a computer network of some kind (e.g., an intranet or the Internet) and in which interaction between people is an important form of support for the learning process" (Goodyear, Salmon, Spector, Steeples, & Tickner, 2001). (P.68).
7. Proposition is defined as a statement asserts or denies something (Blignaut and Trollip, 2003).
8. Scaffolding: The term of "scaffolding" refers to "the temporary assistance by which a teacher help a learner know how to do something, so that the learner will later be able to complete a similar task alone" (Gibbons, 2002).

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to review the literature pertinent to this study. In order to create a foundation for this study, this chapter first provides an overview of online teaching and learning. The first section explains the differences between online teaching and learning and distance education, briefly describes the evolution of online teaching and learning, and reviewed the historical themes of online teaching and learning research. This chapter also focuses on the issues related to computer-mediated communication (CMC) in online teaching and learning. It describes the importance and issues of CMC in an online course. The theoretical frameworks, the community of inquiry and the theory of scaffolding, are also described to support the whole study. The models or protocols of analyzing content of online discussion are reviewed to point out the importance of assessing the quality of online discussion. Lastly, this chapter reviews the literature of two means of showing teacher's expectations in online discussion (modeling example and discussion protocol) and the indicated relationship between these two scaffolding approaches.

Historical Themes in Online Teaching and Learning Research

Two terms, distance education and online teaching and learning, have frequently appeared in prior literature to refer to the new teaching and learning ways different from traditional face-to-face education. The widely accepted definition of "distance education" is "the institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors (Schlosser & Simonson, 2006, p1). Institutionally based, separation of

teacher and student, sharing of data, voice, and video, and interactive telecommunications are the four components of this definition of distance education (Figure 2.1).

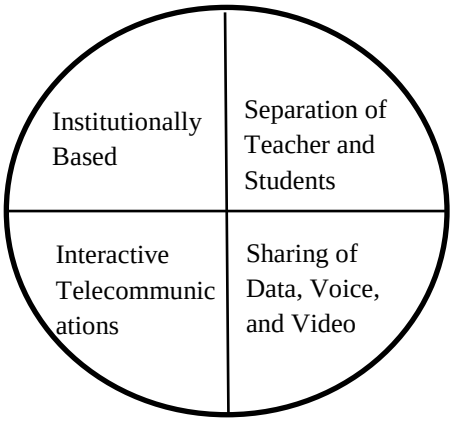

Figure 2.1 Components of distance education, from Simonson, Smaldino, Albright, and Zvacek (2009)

Distance education has more than a one century history. It can be rooted to the year of 1833 that a Swedish advertisement touted "Composition through the medium of the Post". With the development of technology, distance education is quickly growing. From the 1920s to nowadays, the dominant medium of distance education has developed from radio, broadcast television, satellite, fiber-optic system, to high speed Internet. When internet becomes indispensable in education, online teaching and learning becomes a mainstream of distance education. Online teaching and learning refers to "the teaching and learning that takes place over a computer network of some kind (e.g., an intranet or the Internet) and in which interaction between people is an important form of support for the learning process" (Goodyear, Salmon, Spector, Steeples, & Tickner, 2001). Similarly, its definition includes four components as the definition of distance education. The only difference is the medium of interactive telecommunications for online teaching and learning only refers to a computer network. Online teaching and learning can be looked

as one of the forms of distance education (Figure 2.2). This study focuses on the online discussion in an online course delivered by Blackboard via the internet. Therefore, using the term of "online teaching and learning" is more suitable to fit the focus of this research.

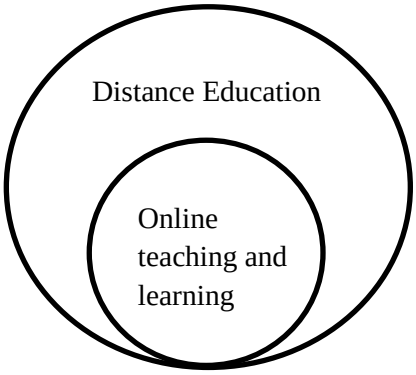

Figure 2.2 Relationship between distance education and online teaching and learning

Reigeluth and Carr-Chellman (2009) proposed that (1) the advancement of learner-centered psychological principles and methods of instruction and (2) the development of advanced technologies allow the standardized, time-based education shift to the customized, attainment-based education. These two developments also make online teaching and learning to be possible and feasible. From the perspectives of constructivism, learning is enhanced when students individually construct knowledge based on their prior knowledge. This view is in the same vein of Piaget's theory of assimilation and accommodation, which shifts learning from teacher-centered to student-centered. In an online learning environment, the role of online teacher is more like a facilitator rather than a provider of content. Rather than being a passive receiver, the online students are more likely to actively construct knowledge by themselves through engaging in the self-pace and self-regulated learning environment. Besides the psychological theories, technology plays a central role in online teaching and learning because it is a form of computer-mediated education. The advanced technology makes

the different learning modalities possible such as auditory, visual, kinesthetic and tactile. Thus, they facilitate effective learning for online students who have different learning styles. Technology also allows teachers to easily track their students' online learning performance and adjust their teaching based on these data. The students benefit by being easily able to access the course content and important course information whenever they want during, and even after the semester.

Although online teaching and learning has tremendous benefits as mentioned above, without effective instructional design, all those strengths could be barriers or issues at the same time. Previous studies have proposed many issues they found in online teaching and learning. Several main issues based on empirical evidences are summarized below.

First, although online learning is very flexible for students, it does not make the teacher's immediate feedback available to students as well as direct instruction does in traditional classrooms. The teacher's feedback or guidance can become the catalyst to facilitate students' online learning. However, Ertmer, Richardson, Belland, and Camin (2007) found that a lack of instructor feedback is considered as the most reason for withdrawing from online courses. Ko and Rossen (2001) also noted that due to a lack of immediate instructor feedback, students in online courses are more likely to disconnect from the material or environment than students attending face-to-face courses. In online discussion, the instructor's response is also a critical factor influencing students' online discussions (Markel, 2001). Zhang, Gao, Ring, and Zhang (2007) indicated that without the instructor's intervention and assistance, students' online discussion lacked directions.

Second, online learning creates a free and safe environment for all the students equally engaging into learning activities, however, the active participation does not seem to occur voluntarily. Moore (2002) found that the interaction between the instructor and students is the most significant factor in student satisfaction and student learning outcomes. However, early studies have indicated that limited student participation in online discussions appears to be a persistent and widespread problem (e.g., Wan & Johnson, 1994; Cheung & Hew, 2004; Hewitt, 2005). Students tend to only post the minimum number of messages required, particularly if participation is voluntary (e.g., Fung, 2004; Hara, Bonk, & Angeli, 2000). In addition, unless the response among students was required, students did not seem to read and respond to their peers posts (e.g., Benfield, 2000; Berge, 1995). Cheung and Hew (2005) also found that the majority of the students' level of knowledge construction tended to be low because students preferred to simply answer group members' queries, rather than exchange opinions about the issues. These studies show that the online discussions do not lead to the expected quality and quantity of interactions in online learning.

Third, online teaching and learning strongly relies on social constructivism. Social constructivism considers learning an active and social process. It is strongly influenced by Vygotsy's theory of social interaction (1978), which emphasizes that the interaction between people and context play an important role in learning. Wenger (1999) noted that the identities of the participants and the ways in which we create a sense of belonging are critical factors in the creation of community. The learning can be enhanced when students feel they are involved in a warm, safe and democratic environment. However, McInnerney and Roberts (2004) stated that feeling of isolation is

still one of the major barriers for online students. It makes the difference between a successful and unsuccessful online learning environment. Du, Zhang, Olinzock, and Adams (2008) also reported that a sense of isolation is one of the negative online learning experiences perceived by students as a weakness of online learning.

Finally, in comparison to the learning in traditional face-to-face education, online learning has many inevitable issues. For example, it requires learners to be more motivated and self-regulated due to the lack of face-to-face moderation (Blumenfeld, Kempler, & Krajcik, 2006). Technology makes online learning possible. But it also restricts effective online teaching and learning. For instance, social presence, defined as "the degree to which participants are able to project themselves affectively within medium" (Garrison, 1997), is linked to learning outcomes and learner satisfaction with online courses (Gunawardena & Zittle, 1997). The greater the level of social presence, the harder it is to achieve satisfaction due to the restrictions of technology.

Computer-mediated Communication (CMC)

At the root of many problems of online teaching and learning, spatially separated students and teachers are a key and inherent issue in online learning environments. It leads to problems such as lack of sense of community, lack of immediate feedback, and lack of communication. Thus, computer-mediated communication is critical for online teaching and learning and has emerged as a vital research area (Hara, Bonk, & Angeli, 2000; Romiszowski & Mason, 2004). CMC refers to "the use of networks of computers to facilitate interaction between spatially separated learners; these technologies include electronic mail, computer conferencing, and on-line databases" (Jonassen, Davidson, Collins, Campbell, & Haag, 2009). It has two typical modes: one mode is asynchronous

communication which happens at the same time from different locations, such as text-based online discussion and email; another mode is synchronous communication which happens at different time from different locations, such as video conferencing and chat rooms (Fernandez, 2007). Although the synchronous mode makes communication occur in real time, asynchronous communication is preferred to synchronous because it provides the equal opportunity for each individual with flexible and enough time to participate and communicate with each other (Driscoll, 1998). One of the most widely used asynchronous communication ways in online courses is threaded text-based online discussion (Yukselturk, 2010). Asynchronous text-based online discussion is defined as "a text-based human-to-human communication via computer networks that provides a platform for the participants to interact with one another to exchange ideas, insights and personal experiences" (Hew & Cheung, 2003, p.249). Interaction in CMC is the most striking factor to affect learning in online teaching and learning (Harasim, 1989). A great number of prior studies have shown that interaction in online discussions is critically important for an online course (e.g., Fulford & Zhang, 1993; Picciano, 1998; Sherry, 1996). Garrison, Anderson, and Archer (2001) found that interaction in online discussions can help students construct knowledge through thinking about the questions, coming up with their own opinions, challenging others' viewpoints, and synthesizing their new statements. Jeong (2003) also noted that online discussion plays a vital role in an online course to help students construct knowledge. Furthermore, previous research has indicated that asynchronous CMC also can promote students' critical thinking skills (Carswell, Thomas, Petre, Price, & Richards, 2000; Mandernach, Dailey-Hebert, & Donnellie-Sallee, 2007; Romiszowski & Mason, 2004; Schrire, 2006; Stahl, 2004). The

process of creating messages encourages students' higher level of learning such as analysis, synthesis, and evaluation through thoroughly thinking and communication (Newman, Johnson, Webb, & Cochrane, 1997).

However, all these positive evidences pertinent to asynchronous CMC need to be attained when appropriate scaffolding strategies are provided within the students' zone of proximal development (Zhu, 1998; Hara, 2000; Vygotsky, 1978). Kanuka, Rourke, and Laflamme (2006) found that across the five activities (nominal group technique, debate, invited expert, WebQuest, and reflective deliberation), Webquest and debate could help students achieve higher level of cognitive presence. Han and Cheon (2011) had similar findings that debating discussion activity could better improve students' knowledge construction than other types of activities such as sharing information, problem-solving and case study. A great deal of research has put emphasis on the roles of discussion leaders in CMC. Although instructors' participation has been identified as an important factor in effective online discussion (e.g., Hara et al., 2000; Zhu, 1998; Wise et al., 2006), research found that more instructors' participation may not lead to more students' participation and higher quality of discussion (e.g., Mazzolini & Maddison, 2003; Rourke & Anderson, 2002). Mazzolini and Maddison (2003) detected that the more the instructor posted, the shorter the students responded. Rourke and Anderson (2002) also indicated that although instructor-led discussion is not equivalent to instructor-dominated discussion, instructors' participation may create an "authoritarian presence" to affect students' participation. Han and Cheon (2010) found that instructor-led discussion did not lead to the higher level of knowledge construction for students than tutor-led discussion or peer-led discussion. To overcome the challenges of instructor-led

discussion, some research explored the student-led facilitation strategies in online discussion. Baran and Cooreia (2009) found that student-led discussion can motivate students' participation and enhance the sense of learning community through providing a risk-free and relaxed learning environment for participants. Students in peer tutor-supported discussion also tend to reach higher level of knowledge construction (Wever, Keer, Schellens, & Valcke, 2009). Brooks and Jeong (2006) initiated a new strand of research about CMC in online discussion. They examined the effects of pre-structuring discussion on students' performances when their messages were labeled as arguments, challenges, supporting evidence and explanations. The results suggested that pre-structured discussion could increase frequency of argument to challenge exchanges. However, the label was found to discourage students from challenging others' opinions and responding to challenges from other students in Jeong and Joung's following study (Jeong & Joung, 2005).

Based on the literature of CMC via asynchronous online discussion, this study fully considered the influential factors and carefully designed the discussion instruction. Debating discussions were designed to motivate students' participation and facilitate students achieving higher level of knowledge construction because it could provide students with more opportunities to find supportive evidence and synthesize others' opinions. In order to eliminate the teacher's "authoritarian presence" and provide a free learning atmosphere to students, the whole discussion process in this study was student-led and the teacher only played the role as a facilitator or a moderator. The teacher had the responsibility of posting the discussion questions, initiate the discussions, answer students' questions, and adjust students' improper behaviors in online discussions.

However, the teacher was not expected to affect students' individual thinking, participation, and learning. All the discussions were the student-centered and expected students to construct knowledge by fully thinking and communicating in the discussion activities. At last, due to the controversial evidence of message labels, this facilitation strategy was not considered them when conducting this study.

Community of Inquiry (COI)

Various theories have been established to support online discussion teaching in CMC such as community of inquiry (COI) (Garrison, Anderson, & Archer, 2001), productive discussion (Gao, Wang, & Sun, 2009), Media Richness Theory (Daft & Lengel, 1986), and salmon's five stages (Salmon, 2000). Each theory has different purpose and focus. For example, media richness theory, also known as theory of media use, puts emphasis on the media use in the communication efficiency. It posits that choosing the appropriate media to match students' task information needs will improve communication efficiency (Daft & Kengel, 1986). Salmon's model is a well-known theory in online teaching and learning. Her model describes a five-stage approach to progressively engage students in the online discussion through this online scaffolding process. The five stages include access and motivation, online socialization, information exchange, knowledge construction, and development. Although many studies have found positive feedback by using Salmon's model in their online discussion design (e.g., Churchill, 2005; Daw & riding, 2002) this model was argued by Moule (2007). Moule (2007) pointed out that this model is too narrow and only focuses on the social learning approach while not all online teaching and learning occurs within a community. Jefferies

and Seden (2006) also indicated that Salmon's model lacks both a preparation and a post-evaluation phase, which are important steps in many online courses.

To describe the holistic process in CMC, Garrison et al. (2000) proposed the community of inquiry as a conceptual framework (see Figure 2.3) in online teaching and learning. It presents a process of creating a meaningful learning through the development of three elements: cognitive presence, social presence, and teaching presence in online teaching and learning. This theory is stemmed from Dewey's (1933) concept of practical inquiry. John Dewey is acknowledged as the foremost philosopher in the twentieth century to advocate "new education". Traditional education is teacher-driven and the teacher delivers knowledge to the student. Dewey contrasts this approach and states that "there is an intimate and necessary relation between the processes of actual experience and education" (p.20). Dewey's theory emphasizes on the collaborative constructivism and practical inquiry. He believes that individual development is dependent upon community and learning occurs through the contextually based and socially situated experiences. He also points out that the process of inquiry is essential for the educative experience. Dewey is known as the most influential educational theorist of the twentieth century (Kolb, p.5) and his theory greatly influences many theories in the field of experiential learning such as Kolb's experiential learning model. Garisson et al. (2000) draws upon the contributions of Dewey's theory to construct their own theoretical framework, community of inquiry, for online teaching and learning. This framework assumes that learning results from the interaction of three components (cognitive, social and teaching presence) within a community of inquiry (Anderson, Rourke, Garrison, & Archer, 2001). The essence of the COI framework is the integration of community,

critical reflection, and knowledge construction in learning online (Garrison & Archer, 2000, p.91). Moreover, COI takes all the stakeholders into account such as students, teachers, and even designers (Figure 2.3).

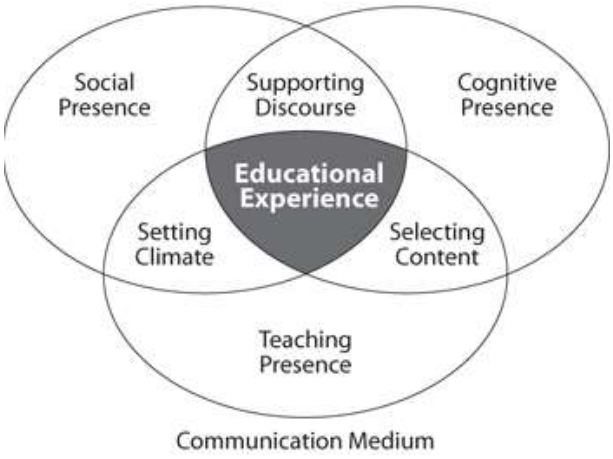

Figure 2.3 Community of inquiry model for discussion approach, from Garrison, Anderson, & Archer (2000)

Within the COI, Garrison et al. (2001) defined cognitive presence as "the extent to which participants are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry". Garrison et al. (2000) identified four phases of cognitive presence: triggering event, exploration, integration, and resolution. It refers to the higher-order thinking and knowledge acquisition (Garrison et al., 2001). Another component, social presence, refers to "the ability of participants in a community of inquiry to project themselves socially and emotionally through the medium of communication being used" (Garrison et al., 2000). It is the longest researched component of the three presences in the COI framework because of the concerns that online students might lack sense of community with other students and teachers in CMC. Social presence can be "the degree to which participants in computer-mediated communication feel affectively connected one to another" (Swan, Garrison, &

Richardson, 2009). Rourke, Anderson, Garrison, & Archer (1999) identified three categories of social presence indicators: affective expression, interactive, and cohesive responses. The last element in COI is teaching presence, which defined as "the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson, Rourke, Garrison, & Archer, 2001). It includes three categories: design and organization, facilitating discourse, and direct instruction. Swan et al. (2009) pointed out that it is an extraordinary challenge to manage the multi-faceted responsibilities of teaching presence in the asynchronous text-based online learning environment.

Different from many other theories or frameworks which only focus on one aspect, COI puts emphasis on the interaction among all the elements and stakeholders in the online teaching and learning. The COI framework is a great fit for online discussion teaching, which highly values the interaction in learning. Moreover, COI is more effective for the instruction that intends to promote students' higher-order thinking skills and acquire complex knowledge, rather than teaching basic knowledge or asking students to believe particular things. Swan et al. (2009) noted that prior studies "related to the COI framework has focused mostly on single presences instead of the framework as a whole…but, the research tells us that the influence of each presence and their categories, interact and shift over time, and possibly across courses". Therefore, this study focuses on the effect of teachers' facilitation (teaching presence) in online discussion on students' knowledge construction (cognitive presence) and aims to investigate the relationship among students' perception, teachers' facilitation, and students' knowledge construction.

COI framework not only guides the whole design of this study, but validates this framework as well.

Assessing Discussion Quality

A great deal of studies pertinent to online discussion put emphasis on assessing students' learning performance and outcomes through measuring the quality of their discussion posts. There are various coding models or protocols for assessing discussion quality such as Henri's model (1992), interaction analysis model (2000), Mewman, Webb and Cochrane Model (1997), and the Garrison et al. model (2001). The common point of all these models is to analyze the quality of students' discussion based on Chi's (1997) eight-step method for quantifying qualitative analysis of verbal data (Table 2.1).

Table 2.1 Chi's eight steps for coding and analyzing verbal data, from Chi (1997)

Step 1	*Reducing or sampling the protocols.*
Step 2	*Segmenting the reduced or sampled protocols (sometimes optional).*
Step 3	*Developing or choosing a coding scheme or formalism.*
Step 4	*Operationalizing evidence in the coded protocols that constitutes a mapping to some chosen formalism.*
Step 5	*Depicting the mapped formalism (optional).*
Step 6	*Seeking pattern(s) in the mapped formalism.*
Step 7	*Interpreting the pattern(s).*
Step 8	*Repeating the whole process, perhaps coding at a different grain size (optional).*

In other words, Chi's method provides a means to report quantitative results from a qualitative coding. As Chi mentioned in his eight steps, the key point of content analysis is to seek an appropriate protocol or model to fit with the purpose of instruction and the studies. Each protocol has its unique features, measures different variables, and

has different coding methods. Overall, there are two main differences among all these models. One is the purpose of their measuring; for example, some of models measure students multiple learning performance and outcomes in online discussion. Some of other models focus on single aspect such as critical thinking skill or knowledge construction. Another difference among these models is the choice of the unit of analysis. In general, there are two ways to analyze the units. One is to use thematic units, which code data based on paragraphs or sentences. Another way is to look at one message as a whole unit and use the highest one as the whole message's level. Hearnshaw (2000) pointed out that the choice of the unit of analysis affects the accuracy of the coding and determines which data reflect the true meaning for the original discourse.

Henri is a pioneer to provide an initial framework for content analysis in online discussion. Her model (1992) identifies five key dimensions for analysis in online discussion including participative, social, interactive, cognitive, and metacognitive knowledge. Each dimension comprises different numbers of categories. For example, the cognitive dimension is broken down into five categories: elementary clarification, in-depth clarification, inference, judgment, and strategies. This instrument uses thematic unit by coding discourse through phrases, sentences, or paragraphs. However, her model lacks further detailed criteria for systematic analyzing electronic discourse (Howell-Richaradoson & mellar, 1996). Wever, Shcellens, Valcke, and Keer (2005) also pointed out that her model does not provide the code-recode reliability or the inter-rater reliability for the instrument. Adapted from Henri's model, Hara, Bonk, and Angeli (2000) added several categories and precise criteria to her framework to match their needs. Then, they used adapted model to examine five variables: student participation, electronic interaction

patterns, social cues within student messages, cognitive and metacognitive components of student messages, and depth of processing within message posting in an online course. By conducting this study, they suggested that modifications to Henri's model to better understand the impact of online discussion are needed in the future.

Garrison et al. (2000) proposed the COI model for CMC as mentioned above and identified cognitive presence as four phases: triggering event, exploration, integration, and resolution. When using this model, complete messages are chosen as the units of analysis. McLoughlin and Mynard (2009) adapted this model from four to five phases which added the fifth phase, "social or other", to fit their study. They explained that since there is lack of replication studies looking at higher-order thinking by using this model in online discussion, they aimed to assess the repeatability through this study. But, they did not identify any specific indicators for the new category of "social or other".

Based on Garisson's five phases of critical thinking and Henri's cognitive skills, Newman et al. (1995) developed a content analysis instrument which comprises ten categories: relevance, importance, novelty, outside knowledge, ambiguities, linking ideas, justification, critical assessment, practical utility, and width of understanding. The critical thinking ratio is calculated by using positive (+) or negative (-) indicators. Similar to Henri's model, this model also codes data by thematic units. Continuing down the path of seeking evidence of knowledge construction in online discussion, Gunawardena, Lowe, & Anderson (1997) developed interactive analysis model (IAM). They acknowledged prior models, but pointed out that Henri's model was developed based on a teacher-centered learning paradigm and some models such as Henri's model and Newman et al. model, are "not very specific on how to evaluate the process of

knowledge construction that occurs through social negotiation in CMC" (Gunawardena et al., 1997, p.402). IAM was established based on a constructivist paradigm designed to detect evidence of knowledge construction (Gunawardena et al., 1997). It attempts to describe the processes of negotiating meaning and knowledge construction in a collaborative online discussion environment. It contains five phases (Table 2.2). Gunawardena et al. (1997) posited that knowledge is constructed by moving through five phases (not necessary sequentially). This model has been widely used for content analysis in online discussion and been validated by a great many studies (e.g., Beaudrie, 2000; Kanuka & Anderson, 1998; Marra, Moore, & Klimczak, 2004; Moore & Marra, 2005; Schellens & Valcke, 2005).

Table 2.2 Five phases of Interactive Analysis Model (IAM)

IAM Phase	Phase Description
Phase I. Sharing/comparing of information	Statement of observation or opinion; agreement between participants.
Phase II. Discovery/exploration of dissonance/inconsistency amongst participants	Identifying areas of disagreement; asking and answering questions to clarify disagreement.
Phase III. Negotiation of meaning/knowledge co-construction	Negotiating meaning of terms and negotiation of the relative weight to be used for various arguments.
Phase IV. Testing/modification	Testing the proposed new knowledge against existing cognitive schema, personal experience or other sources.
Phase V. Phrasing of agreement and applications of newly constructed meaning	Summarizing agreement and metacognitive statements that show new knowledge construction.

Marra, Moore, and Klimczak (2004) compared IAM model with the Newman et al.'s model and indicated that IAM provides "a more holistic view of discussion flow and knowledge construction", however, the model of Newman et al. provides "focused and segmented coding on certain potential indicators of critical thinking". IAM also looks at one message as an analyzing unit. Each coding protocol has its advantages and disadvantages. Choosing the coding protocol for assessing discussion quality depends on the purpose of the study and how coders look the unit of meaning for one message.

Theory of Scaffolding

In the past two decades, a large number of studies have used the concept of scaffolding to describe the role of instructors, adults, or more knowledgeable peers in guiding learners' learning (Stone, 1998; Bochner & Duchesne, 2003; Hammond, 2002; Daniels, 2001). The term scaffolding was firstly introduced by Wood, Brunner, and Ross (1976) in their study which attempted to describe "a 'scaffolding' process that enables a child or novice to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts" (p.90) during an interaction between a tutor and a child to construct a wooden pyramidal puzzle.

The theory of scaffolding is in the vein of the works of Piaget and the Vygostsy's social-constructivist perspectives. Piaget's greatest contribution to the child development is to look at child as active constructor (Berk, 2002; Krause et al., 2003; McDevitt & Ormrod, 2002). He proposed that the traditional educational instruction, which given directly by adults to students, should shift to the child-centered which emphasizes on the independent discovery by the child. He underscores the values of human nature and the individualistic interactions with the physical and representational worlds on the child's

construction of the experience of time, space, and causality (Toulmin, 1972). From this view of learning, all the instructional scaffolding should be designed and applied based on child's natural interest and motivation to help them become self-motivated lifelong learners.

Taking Piaget's view of the child as an active learner, Vygotsky (1978) further developed his theory and put emphasis on the role of social interaction in teaching and learning. From social constructivist's view, children and adults are both active agents in the process of child's development (Verenikina, 2008). Vygotsky (1978) pointed out that students' development can be described as two different levels. One is actual development level which refers to "a student's current independent capabilities or understandings and is a result of completed development cycles" (Many, 2002). Another is potential development level which means "a student is capable of doing with the support and guidance of others" (Many, 2002). Vygotsky (1978) defined the distance between a child's "actual development level" and "potential development level" as the "zone of proximal development" (ZPD). In other words, ZPD is "the distance between what children can do by themselves and the next learning that they can be helped to achieve with competent assistance" (Raymond, 2000, p176).

Vygotsky's the social-cultural theory and the notion of the zone of proximal development has been considered as the heart of the concept of scaffolding (Berk, 2001; Daniels, 2001; Wells, 2001; Krause et al., 2003; McDevitt & Ormrod, 2002). Gordon Wells (1999) viewed the scaffolding as "a way of operationalizing Vygotsky's concept of working in the zone of proximal development" (1999, p127). Mercer and Fisher (1992) noted that the notion of ZDP that transferring responsibility for the task to the student is

the major goal of instructional scaffolding. They proposed that the instructional scaffolding should include three features: "first, it could enable the student to carry out the task which they would not be able to manage on their own; second, it could eventually enable the student to achieve the task on their own; last, the student finally could be able to achieve greater level of independent competence during the scaffolding experience" (Wells, 1999, p.221). These views of scaffolding are highly based on the concept of ZDP provided by Vygotsky (1978) which stresses the interaction between the teacher and the student and the process between students can do with and without help.

With the wide acceptance and use in an increasing number of educational studies, the interpretation of scaffolding has become extremely diverse (Jacob, 2001; Hammond, 2002). Hammond and Gibson (2001) categorized scaffolding into macro and micro scaffolding. The macro scaffolding refers to the whole course design including setting up goals and objectives, selecting appropriate instructional activities and technologies, and so on. On the other hand, micro scaffolding can be narrowed down and only focus on individual learners. Similarly, Douglas and Kataoka (2008) proposed that scaffolding in literature can be defined in either narrow or broad ways. The narrow definition of scaffolding is often utilized in a specific situation or context. For example, Stryker and Leaver (1997) defined scaffolding as "providing background knowledge…to help students build the schema essential for coping with authentic materials and facilitate the learning of new information". This definition is often used in reading instruction in a foreign language class. On the other hand, a broad definition of scaffolding is not limited within a specific context, but appropriate to all types of learning. Gibbons (2002) states that "scaffolding is thus the temporary assistance by which a teacher helps a learner know

how to do something, so that the learner will later be able to complete a similar task alone". Sawyer (2006) defined scaffolding as "the support given during the learning process which is tailored to the needs of the student with the intention of helping the student achieves his or her learning goals". From the view of broad definition of scaffolding, demonstrating learning processes and temporarily guiding learners are two keys of instructional scaffolding in all types of teaching and learning.

However, Verenikina (2008) criticized the current diverse interpretations of scaffolding in his study. He pointed out that due to the diverse interpretation of scaffolding some researchers misunderstood the scaffolding and did not achieve successful teaching (Verenikina, 2008). He refers to Lave and Wenger's study (1991), which viewed scaffolding as a one-way communication process. In this study, the role of teacher is to construct scaffolding and present it to the students alone (Daniel, 2002, p. 59). This narrow interpretation leads instructional scaffolding to be understood as a variation of direction instruction which given instruction directly by the teacher to students without interaction between them. It is not consistent with Vygotskian ideas of social-cultural theories and original intention of Wood et al.'s theory of scaffolding. Donovan and Smolkin (2002) also took the critical views of the narrow interpretation of instructional scaffolding. Their study researched the effect of different levels of scaffolding on the child's writing. The results revealed that scaffolding may assist children, but, when maximum assistance is provided, scaffolding may became counterproductive and hinder children' learning. This study confirms Verenikina's concern about narrow interpretation of scaffolding. Stone (1998) pointed out the twofold of scaffolding. On the one hand, the interpretation and application of scaffolding can be

"more than a novel label or a graphic description of a phenomenon" (Stone, 1998, p. 344). On the other hand, it can hinder "further understanding of the phenomenon" if not appropriately used (Stone, 1998, p. 344).

Rather than determining the definition of scaffolding, many educators or researchers proposed specific characteristics or a comprehensive list of elements for instructional scaffolding. McKenzie (1999) listed eight characteristics of scaffolding as providing clear directions, clarifying purpose, keeping students on task, offering assessments to clarifying expectations, pointing students to worthy sources, reducing uncertainty, surprising and disappointment, delivering efficiency, and creating momentum. Douglas and Kataoka (2008) defined scaffolding as a process and pointed out that it should include four elements: "(1) providing temporary support from a teacher or capable peers until a learner can complete a similar task alone; (2) demonstrating a learning process and joint engagement in the process; (3) using an interactive approach which encourages genuine dialogue between the student and teacher as well as student-to-student; (4) conducting activities that develop higher order cognitive skills rather than factual recall". These concepts of scaffolding pointed out more specific and applicable features of instructional scaffolding.

When scaffolding becomes an umbrella term for any kind of teacher support (Jacobs, 2001), it has been gradually applied to broad learning context and areas as well. Pea (2004) reviewed the history of development of scaffolding and indicated that in Wood et al.'s original study, scaffolding actually happened naturally and was not the designed or technologically mediated one. However, since scaffolding rooted from Vygotsky's theory, Pea (2004) proposed that "Vygotsky's social-historical views of

human development which brought together the informal and the formal, the natural and the designed" assert that scaffolding can be applied in more learning contexts. As technology has become increasingly used in teaching and learning, scaffolding is destined to become so broad as to comprise the features of technology (e.g., Tikhomirov, 1981; Pea, 1985). Scaffolding has been widely used in a number of learning areas such as mathematics (e.g., Plummer, 2004; Siemon & Virgona, 2003; Clarke, 2004), reading and writing (e.g., Dixon-Krauss, 1996; Devlin, 2000; Donovan & Smolkin, 2002); second language teaching and learning (e.g., Hammond, 2002), and the technology (e.g., Savery & Duffy, 1996; Merill, 2002).

In short, instructional scaffolding is a learning process designed to promote higher order cognitive skills. Based on Vygotsky's social-historical conceptions and ZPD, both the teacher and the student are co-participants in negotiating meaning and knowledge construction (Many, 2002). Students are the positive constructors and have responsibilities to construct knowledge in social context. Instructional scaffolding should start from what students have already known and can do to the new levels. It supports the process of knowledge construction based on students' prior knowledge. Moreover, Vygotskian theory also shows that learning proceeds from the concrete to the abstract. Likewise, scaffolding should begin with concrete, external, and visible models and end with abstract, internal and hidden thoughts.

A large number of studies have indicated various scaffolding strategies. Echevarria, Vogt, and Short (2004) categorized scaffolding techniques into three types: (1) verbal scaffolding which focuses on language development; (2) procedural scaffolding which relate to group activities; (3) instructional scaffolding which refers to

the tools that support learning. Based on Wood et al. (1976) article, Pea (2004) put scaffolding into two primary groups: (1) channeling and focusing which refers to "reducing the degree of freedom for the task at hand by providing constraints that increase the likelihood of the learner's effective action and focusing attention of the learner by making relevant task features"; (2) modeling which means "more advanced solutions to task."

Protocol and Modeling Example

Online discussion provides online students with an opportunity to construct knowledge by interacting with teachers and students. However, many previous studies have found that students' level of knowledge construction in online discussion tends to be low and limited evidence shows that online discussion can facilitate higher-order thinking skills (e.g., Cheung & Hew, 2005; Garrison, Anderson, & Archer, 2000). These negative results reflect that students appear to not understand teachers' expectation and lack the abilities of achieving higher level of knowledge construction through the whole discussion process. Based on the theory of scaffolding, appropriate scaffolding strategies should be provided within the students' zone of proximal development and eventually help students achieve the goals of online discussion (e.g., Zhu, 1998; Hara et al., 2000).

Protocol

Protocol has been considered as a scaffolding strategy in literature to help students understand online teachers' expectations. Discussion protocol refers to the "the rules and guidelines for discussion board participation and are important for establishing appropriate discussion board interactions" (Moore & Marra, 2005). Anderson (2008)

noted in his book, "The theory and practice of online learning", that due to the inherent nature of CMC, students may have many questions during online learning to ask online teachers to respond to. To deal with the influx of emails from students, creating a protocol to clear students' misunderstandings or questions prior to emailing teachers is one effective strategy in online teaching and learning. He underscored that planning and designing online courses completely, prior to opening to students, is very important and building strong support units can help both online teachers and students to achieve effective online teaching and learning experiences. Through interviewing online mentors, Easton (2003) found that online mentors were frustrated with online students who tended to jump around and missed obvious information in web-based courses. They felt that establishing a common protocol for threaded online discussion was very important. Easton (2003) further pointed out it is much easier for both teachers and students in face-to-face classes to establish an explicit protocol in which all the goals, objectives, teachers' expectations, course activities and assessments could be explained very clearly in a formal class meeting time. However, in online learning environment, teachers need to establish more clearly and detailed protocol to make students more deeply understand communication patterns and teachers' expectations. Webb, Gill, and Poe (2005) compared in-class discussion and online discussion in a graduate MIS survey course. Each discussion was conducted according to one or two protocols. The findings of this study showed that online discussion appeared to increase the level of student-peer interaction and the length of discussion was substantially longer than in-class discussion. They further argued that the traditional classroom discussion tended to be led by directive instructor and hinder students' interaction. Online protocol plays a vital role in online

discussion because it is intended to lead student-centered learning and can be easily replaced under any context or situation.

Discussion protocol appears to be twofold in the literature. On the one hand, the appropriate protocol can enhance students' online learning. Gilbert and Dabbagh (2005) examined the effect of posting protocol on meaningful asynchronous online discussions. The results revealed that posting protocol impacted meaningful online discussions and students' deeper understanding of the course content. Jung, Choi, Lim, and Leem (2002) examined the effect of three types of interactions on students' learning achievement, discussion participation, learners' attitude towards online learning, and learners' satisfaction on online discussion. The three interactions were: (1) academic interaction, which is content-centered. There are not any other discussion guidelines provided; (2) collaborative interaction, which provides a collaborative protocol to students to show teacher expectation and guide students' discussion; (3) social interaction, which involves a detailed direction of discussion. This study found that students who were in a collaborative group were more satisfied with their learning experience and students who were in social interaction groups increased much more in learning achievement than students in academic groups. Students in academic groups posted fewer messages than students in other two groups. Moreover, taking an online course regardless of the type of interaction can guide students to view the online learning positively. The study shows that as the teacher provides more guidelines, the students are more satisfied with the learning experience and possibly actively engages more in the online discussion and have higher learning achievement. On the other hand, protocol can limit or hinder students' learning as well, if it is inappropriate. Vonderwell and Alderman (2007) explored the

assessment criteria and protocols in five masters' level online courses. All the courses assessed students' online participation and learning through assessment criteria or protocols. Two courses employed threaded discussions and other three used non-threaded discussions. The findings of this study indicated that students' quality and quantity of posting messages directly complied with the protocol provided by teachers. Most students just met the minimum requirements in the protocol in which asked students to post at least one question and respond to at least one other post per discussion. This evidence showed that there is a strong connection between students' discussion and assessment protocols. This study appeals to future research to investigate how assessment protocols and criteria are used in online discussion and to what extent they impact students' engagement in online learning. Moore and Marra (2005) found an opposite result that using an argumentation protocol negatively affected students' level of knowledge construction. They discussed that one of the causes was that the required protocol was too abstract to understand and implement when students formulated their posts.

Modeling Examples

Modeling example is another scaffolding strategy to be used in this study and refers to the examples modeling the phases of knowledge construction showed in the protocol. Atkinson et al. (2000) defined it as "an expert's problem-solving model for a learner to study and emulate". According to what and how teachers want to model for students, it is called by many names such as "worked example" (e.g., Tillosion, 2009), "collaborative model" (Rummel, Spada, & Hauser, 2009), "worked out example" (Renkl, 1997), or "exemplary dialogs" (e.g., Cox, Makendree, Tobin, Lee, & Mayes, 1999) in the

literature. The idea behind this strategy is that observing the modeling examples can help students fast pay attention on the key points of the content and exactly understands teachers' expectations. Kirschner, Sweller, Clark (2006) argued the superiority of guided instruction in their study. They indicated that although constructivist, discovery, problem-based, experiential, and inquiry-based teaching are well acknowledged by facilitating students via minimal guided instruction, the key point is that "the advantages of guidance begins to recede only when learners have sufficiently high prior knowledge to provide internal guidance". Aulls (2002) conducted a qualitative study to observe a number of teachers who implement constructivist activities in their classes. The findings showed that providing students with modeling procedures for identifying and self-checking important information can help them achieve all the learning goals.

Macknight (2000) pointed out in his study that teachers actually play a key role on fostering students' critical thinking through using web communication tools. He underscored that modeling questioning techniques by faculty can enhance social interaction and dialogue and support students' critical thinking. Teachers have the responsibility to model thinking processes for students, then at some point students will gradually take on the responsibility. The conclusion of this study is that online discussion cannot facilitate students' critical thinking skills only if modeling, coaching, questioning, reflection, and task structuring strategies are used. Young (2006) investigated student views of effective online instruction in higher education; he collected data from 199 online students by using a web-based instrument which included seven core groups: adapting to student needs, using meaningful examples, motivating students to do their best, facilitating the course effectively, delivering a valuable course,

communicating effectively, and showing concern for student learning. His study found that students viewed effective communication as one of the most important elements for a successful online course. They thought it was of critical value that "instructors can model good communication skills and, following their example, students learn to do the same".

Rummel et al. (2009) conducted a study to examine the effect of a collaborative model and a collaborative script as scaffolding strategies on students' ability to collaborate in a computer-mediated setting. The results showed that both model and script showed positive effects on students' collaborative process, learning outcomes, and their individual knowledge about characteristic features of a good collaboration. Following this line, they conducted serial studies to compare model and script in online courses. Their current study (2009) further probed the effect of model and script within conditions on promoting students' quality of collaborative process and learning outcomes. The elaboration support including instructional prompts and guided self-explanation were designed added into the model and script. They called these two new conditions were "model-plus and script-plus". After comparing five groups (model, script, model-plus, script-plus, and control group), the findings showed that students in model condition group had better performance in planning and coordinating of the collaboration. They could better manage their time, divide tasks, and maintain a higher task orientation. However, the results of students' perceptions were not very clear. Although students in model condition group tended to have more interests in the activity and feeling of helpfulness of the collaborative model, their responses were not statistically significantly more positive than those in other groups. Keeping in the same line of research, Tollision

(2009) conducted a study to examine the effect of worked examples on the students' quality of discussion and perceptions from 61 undergraduate students. This study found that when students were exposed to worked examples, student participation and their higher-order thinking skills were increased. However, student's perception of web-based instruction (WBI) experiences, preparedness and learner control was not significantly changed. Worked examples in this study inspired students' ideas by reviewing peers' posts, but it was not clearly showing the teacher's expectation about quality of their posts.

Drawing on the implications in prior experimental studies, both discussion protocol and modeling example are considered and designed in this study to provide appropriate scaffolding strategies within students' zone of proximal development. The study aims to motivate more students' active participation, improve their level of knowledge construction and promote their perceptions of online learning and discussion through the concrete, external, and visible learning through to the abstract, internal and hidden thoughts by using this combining method.

CHAPTER III

METHODOLOGY

The literature review indicated that it is necessary to explore more scaffolding strategies to better prepare students for interactive online discussions. Previous research suggests that not only the quantity and quality of students' behaviors, but also student perceptions of online discussions need to be examined. The present study was intended to substantiate that using discussion protocol and modeling examples holds the potential to better improve students' online discussion behavior and perceptions. This chapter describes the research design and data analysis methodologies. It includes five sections: (1) a description of research setting and student population; (2) an explanation of the online discussion process; (3) a description of the discussion protocol and modeling example; (4) a description of data collection and the instrument of student perception of online discussion; (5) a report of data analysis techniques.

Research Setting

This study was conducted in an online course entitled, "Computing and Information Technology". All the students were undergraduate students who had various major backgrounds. This course was one semester in duration and entirely delivered online by using Blackboard WebCT. It was a required course for students whose majors related to education, but was selective for all the other undergraduate students. In the whole semester, all the course content, course assessment, and course participation were conducted via Blackboard WebCT. The content presented in this course covered basic technology skills such as the application of Word, Excel, Access, and PowerPoint and hot topics about digital literacy such as Internet search, copyright, cyber security, multimedia,

and Web2.0. All the discussion topics were pertinent to these technology skills and hot topics as well.

Because previous studies have shown that if participation is voluntary, students tend to post a minimum number of messages, or not participate in online discussions the whole semester (e.g., Wan & Johnson, 1994; Cheung & Hew, 2004; Hewitt, 2005; Fung, 2004; Hara, Bonk, & Angeli, 2000; Cheung & Hew, 2004), discussion participation in this study accounted for 10% of each student's final grade in this study. Moreover, online discussion played a vital role in this course, helping students with built in opportunities to communicate online, improving their level of knowledge construction and promoting perceptions of online learning.

Description of the Population

Participants in this study were undergraduate students from various majors in a semester-long introductory level of technology information course at Texas Tech University. As a required course for students majoring in education, and a major elective for all the other students, the enrollment in this course represented a wide diversity of majors across campus.

Three sections for this course were taught by three different instructors; all the course content, activities, assessments, instructions were exactly same. A total of 221 undergraduate students enrolled this course; 75 students in section one, 75 students in section two, and 71 students in section three. An online demography survey was conducted to collect students' background information data in three sections. There were 181 students had the records to start the survey, but two of them did not complete it.

Therefore, the valid participants were 179 students; 62 students in section one, 63 students in section two, 54 students in section three. Following sections will describe the characteristics of the population.

Age, Gender, and Ethnicity of Participants

As shown in Table 3.1, 43.6% of the participants were male and 56.4% were female. The majority (91.1%) of participants' ages were between18 to 23, 6.7% were between 24 to 29, and 2.2% were above 30 (Table 3.2).

Table 3.1 Gender of the Participation

		Discussion Group				Total
		1	2	3	4	
gender	Male	21	21	16	20	78 (43.6%)
	Female	23	21	33	24	101 (56.4%)
Total		44	42	49	44	179

Table 3.2 Age of the Participation

		Discussion Group				Total
		1	2	3	4	
Age	18-23	39	38	45	41	163 (91.1%)
	24-29	5	2	2	3	12 (6.7%)
	Above 30	0	2	2	0	4 (2.2%)
Total		44	42	49	44	179

Only 7.8% of the participants were freshman students; all the others were sophomore (38%), junior (27.9%), or senior (26.8%) (Table 3.3). The data in Table 3.4

showed the majority (62.6%) of participants reported their ethnicity as White, 23.5% indicated as Hispanic, and 7.8% reported African American.

Table 3.3 School Year of the Participation

		Discussion Group				Total
		1	2	3	4	
School Year	Freshman	2	5	2	4	13 (7.8%)
	Sophomore	19	17	16	16	68 (38%)
	Junior	15	6	16	13	50 (27.9 %)
	Senior	8	14	15	11	48 (26.8%)
Total		44	42	49	44	179

Table 3.4 Ethnic of the Participation

		Discussion Group				Total
		1	2	3	4	
Ethnic	Asian / Asian American	0	1	1	4	6 (3.4%)
	Black / African American	6	1	4	3	14 (7.8%)
	Hispanic	11	9	10	12	42 (23.5%)
	Native American	1	0	0	0	1 (0.6%)
	White / Causian	26	30	31	25	112 (62.6%)
	Other	0	1	3	0	4 (2.2%)
Total		44	42	49	44	179

Hourly Internet Use Daily

An shown in Table 3.5, 16.8% of participants reported using internet 1-2 hours every day, 35.8% using 3-4 hours, 25.1% using 5-6 hours, 9.5% using 7-8 hours, and 12.8% using either over 8 hours or not at all.

Table 3.5 Internet Use by Participants

		Discussion Group				Total
		1	2	3	4	
Using Internet	1-2	4	10	6	10	30 (16.8%)
	3-4	19	17	12	16	64 (35.8%)
	5-6	6	12	15	12	45 (25.1%)
	7-8	7	3	7	0	17 (9.5%)
	Others	8	0	9	6	23 (12.8%)
Total		44	42	49	44	179

Experience with Online Courses

Table 3.6 shows that 33% of students had never taken any online courses, 22.3% had taken one online courses, 19.6% had taken two online courses, 25.2% had taken more than three online courses in previous semesters.

Table 3.6 Experience with Online Courses of the Participants

		Discussion Group				Total
		1	2	3	4	
Online Course Experiences	0	12	18	13	16	59 (33%)
	1	10	8	16	6	40 (22.3%)
	2	8	9	9	9	35 (19.6%)
	3	5	3	4	3	15 (8.4%)
	4	4	1	3	4	12 (6.7%)
	5 or more	5	3	4	6	18 (10.1%)
Total		44	42	49	44	179

Knowledge of Computers and Technology

Table 3.7 Knowledge of Computer and Technology of the Participants

		Discussion Group				Total
		1	2	3	4	
Computer Knowledge	Extremely Knowledgeable	3	0	3	4	10 (5.6%)
	Moderately Knowledgeable	21	23	27	23	94 (52.5%)
	Slightly knowledgeable	11	13	11	11	46 (25.7%)
	Neutral	5	5	6	5	21 (11.7%)
	Slightly Ignorant	3	1	1	0	5 (2.8%)
	Moderately Ignorant	0	0	1	1	2 (1.7%)
Total		43	42	49	44	178

5.6% of students self-reported extremely knowledgeable computer skills, 52.5% stated that they were moderately knowledgeable, 25.7% said slightly knowledgeable, 11.7% were neutral, and others were slightly or moderately ignorant. No students reported extremely ignorant computer skills (Table 3.7).

English Skills

The data in Table 3.8 shows that 45.3% of students reported their English skills as native proficiency, 24.6% were full professional proficiency, 23.5% were professional studying proficiency, and others were limited studying or elementary proficiency.

Table 3.8 Participants English Skills

		Discussion Group				
		1	2	3	4	Total
English	Elementary proficiency	0	0	1	0	1 (0.5%)
	Limited studying proficiency	4	0	5	2	11 (6.1%)
	Professional studying proficiency	5	9	10	18	42 (23.5%)
	Full professional proficiency	10	12	12	10	44 (24.6%)
	Native or bilingual proficiency	25	21	21	14	81 (45.3%)
Total		44	42	49	44	179

Description of Discussion Procedure

There were two parts of this online course. The first part was pertinent to the basic computer concepts and skills such as Microsoft Office tools and second part was related to digital literacy such as copyright and Web 2.0. Each part had five modules and each module lasted one week. In the first part, students were asked to do computer skills related assignments on MyITLab which is an online learning system every week and

attend an online discussion every two weeks. Therefore, there were two online discussions in the first part. Upon finishing the two online discussions, students were asked to complete the demography survey and student perspective survey about online discussions in the fifth week (the last week of first part of this course). Each discussion topic was pertinent to the corresponding course content and hot topics in first five modules. The purposes of discussion activities were to help students better understand course content, promote computer-mediated communication between students and teachers, provide opportunities to exchange ideas, and improve students' knowledge construction and perceptions of online teaching and learning. Each discussion was began on a Monday morning and ended at a Sunday night in a week, providing a discussion period of over seven days.

Debate discussion was designed and conducted in this study for each discussion topic in order to better facilitate computer-mediated communication and students' knowledge construction. To eliminate the teacher's "authoritarian presence" and provide a free learning atmosphere to students, the whole discussion process in this study was student-led and the teacher only played the role as a facilitator or a moderator, rather than leading or dominating the discussions. The responsibilities of teachers were to design discussion activities, plan discussion guidelines, post discussion topics, and answer students' questions in discussions. During the data collection semester, teachers undertook the same responsibilities across all discussion groups.

To examine the effects of discussion protocol and modeling examples on students' active participation, knowledge construction and perceptions of online discussions, students were randomly assigned into four discussion groups across three course sections.

There were 57 students assigned into discussion group one, 56 students in discussion group two, 56 students in group three, and 52 students in group four. To help students better interact with each other, five or six students were assigned into sub-groups within each discussion group. All discussion groups discussed the same topics and were shown the same basic discussion guidelines and criteria (see appendix A). Discussion guidelines and criteria were used to help students better understand the purpose of discussions, the roles of the teacher, students' responsibilities, and the requirements of discussions. In addition, students in group one were exposed to nothing more than basic discussion guidelines. In group two, students were provided with the additional discussion protocol without modeling examples (see appendix B). Conversely, students in group three were provided with only modeling examples and no discussion protocol (see appendix C). Students in group four, however, were exposed to both discussion protocol and modeling examples. All these discussion guidelines and requirements were included as attachments below each discussion topic for each discussion group in Blackboard (Figure 3.1). During the semester, all students stayed in the same discussion groups for two online discussions.

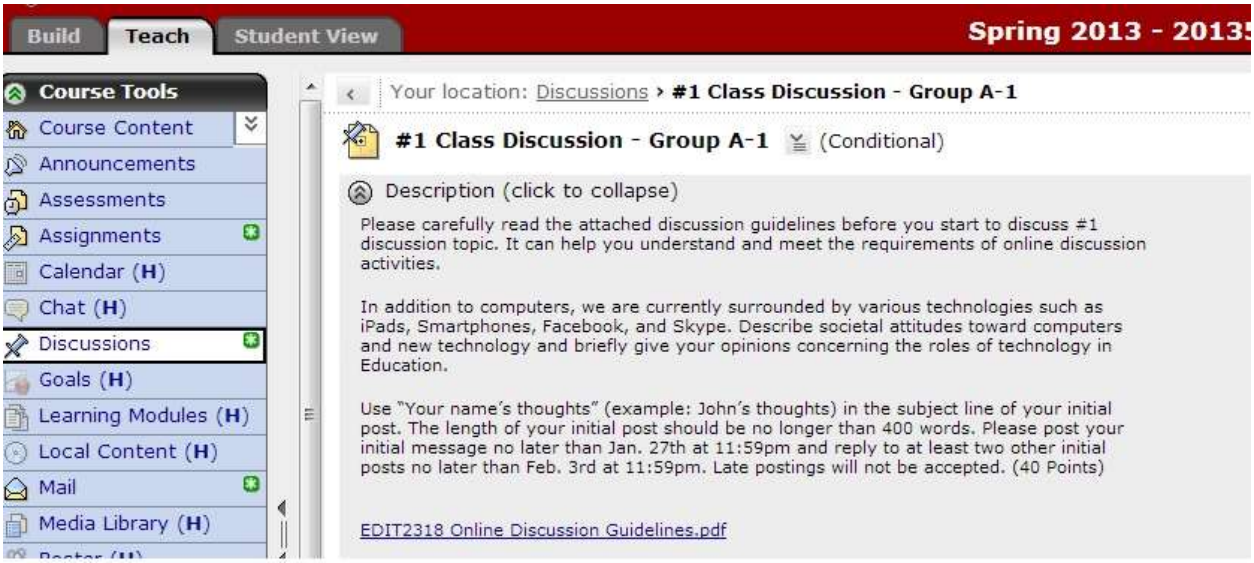

Figure 3.1 Discussion Guidelines in Blackboard

Application of Discussion Protocol and Modeling Example

The purpose of the discussion protocol was to present the process of knowledge construction and facilitate students to think about how to create high quality of posts during online discussions. IAM was used as the discussion protocol in this study. It attempts to describe processes of negotiating meaning and knowledge construction in a collaborative online discussion environment. This model posits five phases (see Table 2.2) that learners may move through (not necessarily sequentially) as knowledge is being constructed (Gunawardena et al., 1997). IAM was not only used as the discussion protocol, but also used as the coding instrument to assess students' quality of posts in this study.

Discussion modeling examples aimed to visually show students post examples that represent different levels of knowledge construction and quality of posts. Students get ideas of what a post with low or high quality should look like, and may also be inspired by the examples to create their own posts. All modeling examples used in this

study were created by students who had attended discussions in previous semesters and were related to computer and technology. Moreover, the examples were selected and coded by two researchers firstly. After two researchers made an agreement with the level of knowledge construction for each post by using IAM, they were used as the examples in this study.

Variables

The independent variables in this study are discussion protocol and modeling examples. Each variable has two levels: use it or not. Students were randomly assigned into four groups based on four possible combination ways of these two variables.

The dependent variables are: (1) students' active participation which measured by the number of posts, post time of initial posts, length of initial posts, and propositions of initial posts; (2) the quality of posts which analyzed by IAM's five phases; and (3) student perceptions of online discussions which assessed by an online perception survey. It is expected that providing students both discussion protocol and modeling examples within the students' zone of proximal development can help students learn from concrete, external, and visible models to abstract, internal and hidden thoughts. As a result, students tend to feel prepared well, achieve higher quantity and quality of online discussions, and finally improve their perceptions of online discussion.

Data Collection

Various data were collected within one semester in this study and analyzed in the area of active participation, quality of posts, and student perceptions.

Active Discussion Participation

A number of previous studies have measured students' participation in online discussions in several ways (e.g., Yukselturk, 2010; Mazzolini & Maddison, 2003; Hew & Cheung, 2008). For example, Mazzolini and Maddison used: (1) post rate by students equal to the total number of student posts divides by total number of students; (2) average discussion thread length defined as total number of student posts divided by total number of discussion threads; and (3) the percentage of discussion threads initiated by instructors, being the number of discussion threads initiated by instructors divided by the total number of discussion threads to analyze student participation. Yukselturk (2010) used the average of number of messages per student posted to indicate student participation and categorized student participation into three groups: actives (the number messages => 5), moderates (the number of messages = < 4), and inactives (no messages). Skinner (2009) examined student participation by counting the number of students who met deadlines for the task in online discussion. Tollison (2009) counted the student's debate posts and calculated the average number of words used per post to measure student participation. Moreover, in field of psychology, a statement asserts or denies something is looked as a proposition. For example, in an online discussion post, the word "not" is a symbol of negative proposition. Blignaut and Trollip (2003) used propositions as one of indicators to measure faculty participation in asynchronous online forums.

Based on these methods conducted by previous studies, this study measured student active participation in four main indicators: (1) the number of initial posts and replying posts, (2) the length of initial posts, (3) post time of initial posts, (4) propositions of initial posts. Initial posts are normally triggered by the discussion topics posted by the

teacher and replying posts are mainly aroused by initial posts or others' responses. The number of initial posts and replying posts were all counted. The length of initial posts was coded by counting the words for each post. Depending on the post day in one week, from Monday to Sunday, the post time for each initial post was coded as one to seven. The propositions of initial posts were counted by the number of statements of asserting or denying each post had.

Content Analysis

Previous studies indicated that quality of initial posts has significant effects on students' interaction in online discussion (e.g., Han & Maushak, 2012). In this study, students' quality of initial posts were coded and analyzed to measure students' cognitive behaviors. Moreover, in order to analyze students' quality of initial posts and level of knowledge construction during online discussions, all initial posts were performed content analysis by using IAM. With respect to the reliability of using this model, Gunawardena et al. (1997) proposed that all messages were coded by two coders independently. If there were discrepancies, two coders discussed with each other and determined the single code for one post. Schellens and Valcke (2005) applied IAM in their studies and reported that the agreement for three coders was 0.69 when coding the 1428 messages. Marra et al. (2004) also used IAM and reported the 0.93 for "codes post inter-rater" for their study.

In this study, two researchers coded initial posts independently in order to test the reliability. Before coding, they made an agreement of the understanding of IAM. Although IAM clearly defines the attributes for each phase, Moore and Marra (2005) pointed out that applying IAM to content analysis for online discussion needs to address

the underlying meaning for the posts. Rourke et al. (2001) also proposed that compared to identifying some easily observable variables, content analysis is somewhat subjective and needs raters' further interpretation pertinent to their studies. Therefore, some sample indicators for each phase of IAM were summarized and listed as below (Table 3.9) to further support coders' rating and make the procedures of rating more practicable and objective.

Table 3.9 Indicators of IAM Five Phases

IAM Phase	Indicator
Phase I. Sharing/comparing of information	I think that… I agree…
Phase II. Discovery/exploration of dissonance/inconsistency amongst participants	I don't think ... I disagree with you about…
Phase III. Negotiation of meaning/knowledge co-construction	Normally, people think… but I think… because… I agree with you about…but I feel it also should be…
Phase IV. Testing/modification	Using citations or personal experiences further argue their opinions
Phase V. Phrasing of agreement and applications of newly constructed meaning	In my own opinions, in the future, we should… Based on what we discussed, I think we should….

When two researchers reached the same understanding of IAM and coding process, they coded initial posts individually. In most cases, one post contained multiple

sentences and includes multiple phases of IAM. Since IAM looks at one message as a whole analyzing unit and the unit of meaning is the entire post, the highest phase of IAM one post had was determined as this post's final code. In other words, the most advanced phase one post had implied the highest level of knowledge construction that the student achieved.

After coding, the inter-rater reliability, which measured the agreement among coders, was calculated and reported (e.g., Neuendorf, 2002; Rourke et al., 2001; Wever, et al., 2006). There are many methods to calculate inter-rater reliability. Some of them only work for nominal data such as percentage agreement and Cohen's Kappa. Some others assume the rating scale is continuous such as Pearson's correlation coefficient. Spearman's correlation coefficient (ρ) was used to test the inter-rater reliability for the ordinal data coded by IAM's five phases. The Spearman's correlation coefficient in this study is ρ = .92. The high coefficient indicates high agreement observed among independent observers. After that, two researchers made an agreement for the level of knowledge construction of each post which was used to determine each post's final quality score.

Student Perception

Student perception is an important variable we attempted to examine in this study. An online perception instrument was designed and the link was sent out to all the students by using Blackboard TTU mailbox after they finished two online discussions. Based on literature review and existing instruments that measure similar variables, four primary domains of student perceptions were designed and included. The definition of each domain is shown in Table 3.10.

Table 3.10 Definition of Each Domain of Student Perceptions

Domain	Definition
Preparedness	Statements related to the extent a student feels prepared and understands teachers' expectations in online discussion.
Confidence	Statements related to the extent that a student feels in control of his or her successful participation in online discussion.
Motivation	Statements related to the extent that a student feels eager to actively attend discussion, express his or her own opinions and exchange ideas in online discussions.
Satisfaction	Statements related to the extent that a student feels satisfaction with their learning experiences in online discussion.

The first domain of preparedness is grounded from the research that students desire to receive clear expectations from teachers and unclear expectations confuse them about what they need to do (e.g., Carswell et al., 2000; Dennen, 2005; Reisetter & Boris, 2004). The second domain of motivation is grounded from studies designed to examine students' motivation in online discussions. When students are motivated, they are eager to actively participate in discussions, exchange their ideas, and express their own opinions (e.g., Blumenfield et al., 2006; Hakkarainen, Lipponen, Järvelä, & Niemivirta, 1999; Xie & Ke, 2010; Xie, DeBacker, & Ferguson, 2006). The third domain of confidence comes from studies about relationships between level of student control and their learning outcomes (e.g., Clark, 2003; Scheiter & Gerjets, 2007). These studies found that when students felt confident to control their learning, it led to positive learning

outcomes. Other research about online students' characters or feelings also contributes to this domain. When students felt fear, anxiety, intimidation, or lack of control, their learning tended to be inhibited (e.g., Bocchi, Eastman, & Swift, 2004; Conrad, 2002; LaPadula, 2003; Perrault, Weldman, Alexander, & Zhao, 2002.) The last domain of satisfaction is rooted in studies showing that satisfaction is a key in producing positive learning outcomes in a course (e.g., Conrad, 2002; Lin & Overbaugh, 2007; Menlove & Lignugaris, 2004).

Validity

The student perception instrument is an attitude scale, which determines what an individual believes, perceives, or feels about. Likert scale was used to ask students to respond to a series of statements by indicating whether they strongly agreed, agreed, are undecided, disagreed, or strongly disagreed with each statement (Gay & Airasian, 2000). The content-related validity was established through a review by a panel of judges capable of offering informed opinions about the adequacy of the instrument (Fraenkel & Wallen, 2003). The expert judges reviewed every question to make sure that each item in the instrument was consistent with the definition of the variable and was appropriate and clearly understandable. Thus, three questions were removed from motivation domain because they were not adequately consistent with the desired content. One question was removed from confidence domain and satisfaction domain to make sure no questions implied same meaning. Four questions were deigned as revised items. Finally, there were 34 questions left for four domains; seven questions for preparedness domain, ten questions for motivation domain, eight questions for confidence domain, and nine questions for satisfaction domain (see Appendix D).

Reliability

To ensure the reliability of the perception instrument, measures of internal consistency were calculated for each domain of student perceptions. The entire perception instrument's Cronbach's alpha is .94. The Cronbach's alpha for each domain is shown as Table 3.11:

Table 3.11 Cronbach's alpha for Each Domain of Student Perceptions

Domains	Cronbach's alpha	Previous Studies
Preparedness	.85	Carswell, Thomas, Petre, Price, & Richards, 2000; Dennen, 2005; Reisetter & Boris, 2004
Motivation	.94	Blumenfeld, Kempler, & Krajcik, 2006; Hakkarainen, Lipponen, Järvelä, & Niemivirta, 1999; Xie & Ke, 2010; Xie, DeBacker & Ferguson, 2006
Confidence	.80	Bocchi, Eastman, & Swift., 2004; Conrad, 2002; LaPadula, 2003; Perrault, Weldman, Alexander, & Zhao, 2002
Satisfaction	.85	Conrad, 2002; Fogerson, 2005; Lin & Overbaugh, 2007; Menlove & Lignugaris, 2004

Data Analysis

Multiple two-way ANOVAs were used to examine the main effect of discussion protocol, main effect of modeling examples, and interaction effect of discussion protocol and modeling examples on (1) students' active participation indicated by the number of replying posts, length of initial posts, post time of initial posts and propositions of initial posts, (2) students' quality of posts measured by IAM, and (3) student perceptions of preparedness, motivation, confidence, and satisfaction of online discussion.

CHAPTER IV

RESULTS

The purpose of this research is to explore the effects of discussion protocol and modeling example on students' active participation, quality of posts, and perceptions of online discussions. Inferential statistics were utilized in the study to determine the statistically significant differences existing among four combination groups. This chapter presents the results of this study in four sections: (a) the statistical analysis of the population, (b) analysis of students' active participation, (c) analysis of the quality of posts, (d) analysis of student responses to items on the perception instrument.

Statistical Analysis of the Population

A total 179 out of 221 student completed the demographic survey online. Multiple chi-square tests were performed to ensure similarities of demographic characteristics across four combination discussion groups. The results showed that four combination groups were similar with respect to gender (χ^2 (1, N = 179) = 3.454, p = .327), age (χ^2 (2, N = 179) = 6.082, p = .414), school year (χ^2 (3, N = 179) = 9.393, p = .402), ethnic (χ^2 (5, N = 179) = 19.510, p = .192), experience with online courses (χ^2 (5, N = 179) = 10.434, p = .792), computer skills (χ^2 (5, N = 179) = 10.215, p = .806), and English skills (χ^2 (4, N = 179) = 19.796, p = .071).

Analysis of First Research Question

Did discussion protocol and modeling examples have significant effects on student active participation in online discussion? In answering the first research question, descriptive and inferential statistics were used to report students' four behavior indicatives of active participation: number of posts, post time of initial posts, length of

initial posts, and propositions of initial posts. The following sections answer the following sub research questions regarding these four indicative behaviors.

Number of Posts

Were there significant main effect and interaction effect of discussion protocol and modeling example on students' number of posts? A total of 174 students participated in two online discussions and contributed 346 posts. 47 students contributed 94 initial posts in group one, 42 students posted 83 initial posts in group two, 48 students posted 96 initial posts in group three and 37 students contributed 73 initial posts in group four. A chi-squared test was used to examine whether the number of initial posts were distributed differently across the four combination discussion groups. The results of the chi-square test showed that there was no significantly different distribution of number of initial posts among four groups (χ^2 (3, N = 346) = 3.942, p = .268).

Table 4.1 Mean and SD for Number of Replying Posts

		Protocol		Total
		Yes	No	
Example	Yes	N = 73 M = 1.93 SD = 1.251	N = 96 M = 2.15 SD = 1.369	N = 169 M = 2.05 SD = 1.320
	No	N = 83 M = 2.02 SD = 1.325	N = 94 M = 1.97 SD = 1.555	N = 177 M =1.99 SD = 1.320
Total		N = 156 M = 1.98 SD = 1.288	N = 190 M = 2.06 SD = 1.436	N = 346 M = 2.02 SD = 1.385

Furthermore, a 2 × 2 ANOVA was conducted to examine the effects of discussion protocol and modeling example on the number of replying posts. Table 4.1 shows the mean scores and standard deviations for number of replying posts. The results showed no significant main effect of discussion protocol, $F(1, 346) = .278$, $p = .599$, no significant main effect of modeling example, $F(1, 346) = .080$, $p = .777$, and non-significant interaction between discussion protocol and modeling example, $F(1, 346) = .810$, $p = .369$.

Post Time of Initial Posts

Were there significant main effect and interaction effect of discussion protocol and modeling example on students' post time of initial posts? In this study, each discussion topic lasted two weeks. One to fourteen is used to indicate the first discussion day to the last discussion day. A 2 × 2 ANOVA was conducted to evaluate the effect of discussion protocol and modeling example on students' post time of initial posts. The mean scores and standard deviations for student post time of initial posts are presented in Table 4.2. The results of 2 × 2 ANOVA showed no significant main effect of discussion protocol, $F(1, 346) = 4.306$, $p = .139$, no significant main effect of modeling example, $F(1, 346) = 1.198$, $p = .274$, and no significant interaction effect, $F(1, 346) = 1.155$, $p = .283$.

Table 4.2 Mean and SD for Post Time of Initial Posts

		Protocol		Total
		Yes	No	
Example	Yes	N = 73 M = 6.92 SD = 2.607	N = 96 M = 7.22 SD = 3.125	N = 169 M = 7.09 SD = 2.927
	No	N = 83 M = 6.27 SD = 2.604	N = 94 M = 7.21 SD = 2.651	N = 177 M = 6.77 SD = 2.664
Total		N = 156 M = 6.57 SD = 2.618	N = 190 M = 7.22 SD = 2.910	N = 346 M = 6.92 SD = 2.797

Length of Initial Posts

Were there significant main effect and interaction effect of discussion protocol and modeling example on students' length of initial posts? The length of each initial post was counted by the number of words. Mean scores and standard deviations of the length of initial posts were shown in Table 4.3. A 2 × 2 ANOVA was conducted to examine the differences of the length of initial posts among four combination groups. The results showed significant main effect of discussion protocol, $F(1, 346) = 11.847$, $p < .005$, no significant main effect of modeling example, $F(1, 346) = .238$, $p = .626$, and significant interaction between discussion protocol and modeling example, $F(1, 346) = 12.768$, $p < .005$.

Table 4.3 Mean and SD for Length of Initial Posts

		Protocol		Total
		Yes	No	
Example	Yes	N = 73 M = 250.66 SD = 101.524	N = 96 M = 181.61 SD = 88.998	N = 169 M = 211.44 SD = 100.364
	No	N = 83 M = 210.69 SD = 89.866	N = 94 M = 211.98 SD = 85.160	N = 177 M =211.37 SD = 87.150
Total		N = 156 M = 229.39 SD = 97.265	N = 190 M = 196.64 SD = 88.213	N = 346 M = 211.40 SD = 93.700

Because the interaction between discussion protocol and modeling example was significant, we chose to ignore the discussion protocol main effect and instead examined the discussion protocol simple main effects - that is, the differences of discussion protocol for using or not using modeling example separately. To control for Type I error across the two simple main effects, we set alpha for each at .025. The results show that there were no significant differences between using and not using discussion protocol when modeling example was not included, $F(1, 346) = .009$, $p = .925$, but there were significant differences when modeling example were used, $F(1, 346) = 23.878$, $p < .005$. When modeling example was included, using discussion protocol (M = 250.66, SD = 101.524) led to longer length of initial posts than not using it (M = 181.61, SD = 88.998).

Propositions of Initial Posts

Were there significant main effect and interaction effect of discussion protocol and modeling example on students' propositions of initial posts? The propositions of initial posts were counted by the number of statements of asserting or denying something. The mean scores and standard deviations of propositions of initial posts were presented in Table 4.4. A 2 × 2 ANOVA was conducted to examine the effect of discussion protocol and modeling example on the propositions of initial posts. The results showed significant main effect of discussion protocol, $F(1, 346) = 12.408$, $p < .005$, significant main effect of modeling example, $F(1, 346) = 21.926$, $p < .005$, and significant interaction between discussion protocol and modeling example, $F(1, 346) = 13.823$, $p < .005$.

Table 4.4 Mean and SD for Propositions of Initial Posts

		Protocol		Total
		Yes	No	
Example	Yes	N = 73 M = 2.60 SD = .571	N = 96 M = 2.05 SD = .716	N = 169 M = 2.29 SD = .710
	No	N = 83 M = 1.96 SD = .740	N = 94 M = 1.98 SD = .747	N = 177 M =1.97 SD = .742
Total		N = 156 M = 2.26 SD = .737	N = 190 M = 2.02 SD = .731	N = 346 M = 2.13 SD = .743

Because the interaction effect between discussion protocol and modeling example was significant on students' propositions of initial posts, we chose to ignore the two main

effects and instead first examined the modeling example simple main effects, that is, the differences between using or not using modeling example for each of two levels of discussion protocol. To control for Type I error rate across the two simple effects, we set the alpha level for each at .025. The results show that there were no significant differences between using and not using modeling example when discussion protocol was not included, $F(1, 346) = .517$, $p = .473$, but there were significant differences when discussion protocol was used, $F(1, 346) = 32.069$, $p < .005$, using modeling example (M = 2.60, SD = .571) led to more propositions of initial posts than not using it (M = 1.96, SD = .740).

Additionally, we examined the discussion protocol simple main effects, that is, the differences between using and not using discussion protocol for each two levels of modeling example. To control Type I error across the two simple main effects, we set the alpha level for each at 0.025. There were no significant differences between using and not using discussion protocol when modeling example was not included, $F(1, 346) = .020$, $p = .888$, but there were significant differences when modeling example was used, $F(1, 346) = 25.435$, $p < .005$, using discussion protocol (M = 2.60, SD = .571) led to more propositions of initial posts than not using it (M = 2.05, SD =.716).

Analysis of Second Research Question

Did discussion protocol and modeling examples have significant effects on student quality of initial posts in online discussion? To analyze the quality of initial posts, IAM was used to code each post's quality which was identified by level of knowledge construction. A 2 × 2 ANOVA was carried out to examine the main effects and interaction effect of discussion protocol and modeling example on the quality of students'

initial posts. Table 4.5 indicates the mean scores and standard deviations of quality of initial posts among four different combination groups. The results of 2 × 2 ANOVA indicated significant main effect of discussion protocol, $F(1, 346) = 14.645$, $p < .005$, significant main effect of modeling example, $F(1, 346) = 19.137$, $p < .005$, and significant interaction effect, $F(1, 346) = 17.374$, $p < .005$.

Table 4.5 Mean and SD for Quality of Initial Posts

		Protocol		Total
		Yes	No	
Example	Yes	N = 73 M = 3.77 SD = 1.161	N = 96 M = 2.68 SD = 1.252	N = 169 M = 3.15 SD = 1.326
	No	N = 83 M = 2.60 SD = 1.343	N = 94 M = 2.65 SD = 1.268	N = 177 M =2.63 SD = 1.300
Total		N = 156 M = 3.15 SD = 1.386	N = 190 M = 2.66 SD = 1.257	N = 346 M = 2.88 SD = 1.336

Because the interaction effect between discussion protocol and modeling example was significant on students' quality of initial posts, we chose to ignore the two main effects and instead first examined the modeling example simple main effects, that is, the differences between using and not using modeling example for each of the two levels of discussion protocol. To control the Type I error rate across the two simple effects, we set the alpha level for each at .025. The results show that there were no significant differences between using and not using modeling example when discussion protocol was

not included, $F(1, 346) = .024$, $p = .878$, but there were significant differences when discussion protocol was used, $F(1, 346) = 33.165$, $p < .005$, using modeling example (M = 3.77, SD = 1.161) led to higher quality of initial posts than not using it (M = 2.60, SD = 1.343).

Additionally, we examined the discussion protocol simple main effects, that is, the differences between using and not using discussion protocol for each of two levels of modeling example. To control for Type I error across the two simple main effects, we set the alpha level for each at .025. There were no significant differences between using and not using discussion protocol when modeling example was not included, $F(1, 346) = .060$, $p = .807$, but there were significant differences when modeling example was used, $F(1, 346) = 31.014$, $p < .005$, using discussion protocol (M = 3.77, SD = 1.161) led to higher quality of initial posts than not using it (M = 2.68, SD = 1.252).

Analysis of Third Research Question

Did discussion protocol and modeling examples have a significant effect on student perceptions about online discussion? To answer the third research question, both descriptive and inferential statistics were conducted to show student perceptions of online discussions on four domains: (a) preparedness, (b) motivation, (c) confidence, and (d) satisfaction. The following sections answer sub research questions regarding these four perception domains.

Preparedness

Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of preparedness for students? A total of 174 students attended two online discussions. Out of these 174 students, 170 students

completed the online perception instrument about online discussions. Likert scale was used to ask students to respond to all the items by indicating whether they strongly agreed, agreed, were undecided, disagreed, or strongly disagreed. There were total of 34 items in this perception survey. Seven out of 34 items were designed to test students' feeling of preparedness. Two of seven items were reversed before calculating the mean scores for preparedness domain. The mean scores and standard deviations of preparedness among four combination groups were shown in Table 4.6. A 2 × 2 ANOVA was conducted to evaluate the effects of discussion protocol and modeling example on student preparedness perception. The results of the 2 × 2 ANOVA showed no significant main effect of discussion protocol, $F(1, 346) = .000$, $p = .989$, no significant main effect of modeling example, $F(1, 346) = 3.350$, $p = .069$ and non-significant interaction effect, $F(1, 346) = .006$, $p = .938$.

Table 4.6 Mean and SD for Preparedness Domain

		Protocol		Total
		Yes	No	
Example	Yes	N = 39 M = 3.94 SD = .548	N = 48 M = 3.95 SD = .610	N = 87 M = 3.94 SD = .580
	No	N = 39 M = 3.77 SD = .618	N = 44 M = 3.77 SD = .664	N = 83 M = 3.77 SD = .639
Total		N = 78 M = 3.86 SD = .586	N = 92 M = 3.86 SD = .640	N = 170 M = 3.86 SD = .614

Motivation

Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of motivation for students? In the perception instrument, ten items were designed to examine students' motivation. Table 4.7 shows the mean scores and standard deviation for motivation domain. A 2 × 2 ANOVA was carried out to examine the effect of discussion protocol and modeling example on student perceptions of motivation. The results showed no significant main effect of discussion protocol, $F(1, 346) = .032$, $p = .858$, and no significant main effect of modeling example, $F(1, 346) = .284$, $p = .595$. The interaction effect was non-significant either, $F(1, 346) = .036$, $p = .850$.

Table 4.7 Mean and SD for Motivation Domain

		Protocol		Total
		Yes	No	
Example	Yes	N = 39 M = 3.41 SD = .804	N = 48 M = 3.41 SD = .741	N = 87 M = 3.41 SD = .765
	No	N = 39 M = 3.33 SD = .794	N = 44 M = 3.37 SD = .690	N = 83 M = 3.35 SD = .736
Total		N = 78 M = 3.37 SD = .795	N = 92 M = 3.39 SD = .713	N = 170 M = 3.38 SD = .750

Confidence

Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of confidence for students? There were eight items to test students' confidence in this perception instrument. One item was reversed before calculating the mean scores of confidence. Table 4.8 shows the mean scores and standard deviation for confidence domain. A 2 × 2 ANOVA was conducted to examine the differences of student perception of confidence among four combination groups. The results showed no significant main effect of discussion protocol, $F(1, 346) = .137$, $p = .712$, and no significant main effect of modeling example, $F(1, 346) = .413$, $p = .521$. The interaction effect was non-significant either, $F(1, 346) = .001$, $p = .973$.

Table 4.8 Mean and SD for Confidence Domain

		Protocol		Total
		Yes	No	
Example	Yes	N = 39 M = 3.84 SD = .529	N = 48 M = 3.80 SD = .596	N = 87 M = 3.82 SD = .564
	No	N = 39 M = 3.78 SD = .512	N = 44 M = 3.75 SD = .642	N = 83 M = 3.76 SD = .581
Total		N = 78 M = 3.81 SD = .518	N = 92 M = 3.78 SD = .616	N = 170 M = 3.79 SD = .572

Satisfaction

Were there significant main effect and interaction effect of discussion protocol and modeling example on perceived level of satisfaction for students? Nine items were designed to test students' feelings of satisfaction. One item was reversed before calculating the mean scores of satisfaction. The mean scores and standard deviations for satisfaction domain were shown in Table 4.9.

Table 4.9 Mean and SD for Satisfaction Domain

		Protocol		Total
		Yes	No	
Example	Yes	N = 39 M = 3.62 SD = .679	N = 48 M = 3.61 SD = .609	N = 87 M = 3.62 SD = .638
	No	N = 39 M = 3.59 SD = .709	N = 44 M = 3.57 SD = .607	N = 83 M = 3.58 SD = .653
Total		N = 78 M = 3.61 SD = .690	N = 92 M = 3.59 SD = .605	N = 170 M = 3.60 SD = .643

A 2 × 2 ANOVA was carried out to examine the effect of discussion protocol and modeling example on student perceptions of satisfaction. The results showed no significant main effect of discussion protocol, $F(1, 346) = .028$, $p = .868$, and no significant main effect of modeling example, $F(1, 346) = .108$, $p = .743$. The interaction effect was non-significant either, $F(1, 346) = .000$, $p = .988$.

Overall, preparedness, motivation, confidence, and satisfaction were four indicators in this study to examine student perceptions of online discussion. The results of multiple 2 × 2 ANOVAs showed that there were no significant main effect of discussion protocol, no significant main effect of modeling example, and no significant interaction effect on these four perception domains.

CHAPTER V

DISCUSSION AND CONCLUSION

This chapter reviews and summarizes the present study of the effects of discussion protocol and modeling examples on students' active participation, quality of posts and student perceptions of online discussions. The key findings are discussed and the implications and recommendations of this study are stated. This chapter consists of five major areas: (a) a summary of the procedures employed and key findings, (b) a discussion of the key findings, (c) the implications for showing teachers' expectations by using both discussion protocol and modeling examples, (d) recommendations for future research, and (e) conclusion.

Summary

The research methodology conducted in this study is summarized and the key findings are reported in this section.

Procedures

In this study, students were randomly assigned into four combination groups in each class section. Across three sections, all course contents, requirements, activities, and learning materials were exactly the same. Students in group one were given basic discussion guidelines about the requirements of participation in online discussions; students in group two were shown both basic discussion guidelines and an abstract discussion protocol, students in group three were offered concrete modeling examples in addition to the basic discussion guidelines, and group four was provided not only basic discussion guidelines but also discussion protocol and modeling examples. There were two online discussions designed for this online course and each discussion lasted two

weeks. Students were asked to make initial posts during the first week, and finish responding by the end of second week.

The data were collected from two main resources. First, students' discussion behaviors were analyzed by students' active participation, as were the quality of posts in online discussions. Two approaches were used for analysis. The first approach was to count the number of posts, length of initial posts, post time for initial posts, and propositions of initial posts as indicators of students' active participation. The second approach was to perform content analysis to code the quality of each student's initial posts. Another research resource was a discussion perception instrument measuring the areas of preparedness, motivation, confidence, and satisfaction of online discussion.

Key Findings

Some key findings were found by this study about students' active participation, quality of posts and perceptions of online discussion.

1. There were no significant differences of students' number of replying posts and post time of initial posts among four combination groups.
2. Dependent upon using or not using modeling example, discussion protocol was a main effect on the length of students' initial posts. When discussion protocol was used with modeling example, it led to longer length of students' initial posts.
3. There was a significant interaction effect between discussion protocol and modeling example on propositions of students' initial posts. When using both discussion protocol and modeling example, it led to more propositions on initial posts than other conditions.

4. There was a significant interaction effect between discussion protocol and modeling example on quality of students' initial posts. When using both discussion protocol and modeling example, it led to higher quality of initial posts than other conditions.
5. There were no significant differences among four combination groups for student perceptions of online discussions on preparedness, motivation, confidence, and satisfaction domains.

Discussion

This study was grounded in the theory of scaffolding which asserts that higher cognitive skills can be achieved when learning begins with concrete, external, and visible models and ends with abstract, internal and hidden thoughts. It is also supported by Dewey's experiential learning theory, which emphasizes practical inquiry from concrete to abstract learning process. Based on existing literature, discussion protocol and modeling examples were taken into account as the means to improve students' active participation, cognitive construction, and perceptions of online discussion. The following sections discuss the major findings of this study.

Active Participation

The present study explores the impact of discussion protocol and modeling examples on students' active participation. Active participation was examined as one important student behavior exhibited in the process of online discussions. The number of posts, the length of initial posts, the post time for initial posts, and the propositions of initial posts were coded as four indicators to evaluation students' active participation in this study.

Number of Posts

The findings of a chi-square test revealed that the number of initial posts among four combination groups were similar. On average, each student posted two initial posts for two discussion topics. Furthermore, a 2 × 2 ANOVA was conducted to examine differences in the number of replying posts among four combination groups. The result found that there were no significant differences. Students in each discussion group posted an average of two replying messages.

For this study, the quantitative requirements for online discussion were to post one initial post and respond to at least two other posts. The results show that students still tried to meet the minimum quantitative requirements. One possible reason is that by meeting the minimum requirements they can get full credit without doing extra work. Another reason is that students might feel they already understood discussion guidelines and achieved teachers' expectations of the number of posts. Therefore, even when students were exposed to discussion protocol and modeling examples, their quantitative behaviors had no differences. This finding is similar to the prior studies that students tend to only post the minimum number of messages required, particularly if participation is voluntary (e.g., Fung, 2004; Hara, Bonk, & Angeli, 2000). These similar findings indicate that students are highly driven by discussion quantitative requirements provided by teachers. Therefore, clearly showing teachers' expectations and providing detailed discussion guidelines is very important.

Post Time for Initial Posts

The results of a 2 × 2 ANOVA indicated that the post time for initial posts among four combination groups had no significant differences. The average post time for initial

posts in four combination discussion groups was all around six or seven. It means that no matter what kind of discussion guidelines were provided, students tended to wait till the last day to post. The quantitative and qualitative requirements of online discussion had no influence on students' motivation to post earlier. One possible reason is posting in the last day still can meet the requirement and get full credit. Moreover, students often take multiple courses in one semester; they tend to manage and allocate their time according to the deadlines for all the courses they are taking. The third possible reason is that some students are not sure whether their posts meet the requirements. So, they would like to read others' posts then create their own. Reading others' posts can also inspire them and reduce the cognitive load. This finding shows that setting up two or more post deadlines is very important. If there is only one deadline, students will wait until the last couple of days to post their initial posts. Thus, the interactions among students cannot be successfully achieved.

Length of Initial Posts

The results of a 2 × 2 ANOVA indicated discussion protocol can lead to longer students' initial posts when worked with modeling examples. However, there was no main effect of modeling example. One possible explanation is that learners would like to emulate behaviors modeled through modeling examples (e.g. Atkinson et al., 2000; Perdersen & Liu, 2002; Rummel et al., 2009). However, the lengths of all five modeling examples in this study were designed to be similar. Another possible explanation is that beyond emulating, the modeling example is able to reduce students' extraneous cognitive load of thinking what a good post should look like and inspire new ideas. However, students were not able to understand why it was a good example and how to construct

their own posts. The discussion protocol assisted students in better understanding the modeling examples and internalizing the debate procedures into their long-term memory. Students in other combination groups, however, had no opportunity to experience this learning process from concrete and external learning to abstract and internal understanding. Therefore, only when discussion protocol worked with modeling example, the interaction led to longer length of initial posts.

This finding might be an explanation for previous studies that did not find any significant differences of the length of posts. For example, Tollison (2009) indicated that students being exposed to worked example made no significant differences in the length of posts than those students in the control group. Exposing students to both discussion protocol and modeling examples may be a way to help students better understand teachers' expectations and internalize debate discussion procedures. The benefits provided by using both discussion protocol and modeling examples assisted students in contributing longer length of posts.

Propositions of Initial Posts

A 2 × 2 ANOVA results showed that there were significant interaction effect between discussion protocol and modeling example on propositions of students' initial posts. Using both discussion protocol and modeling example led to more propositions of initial posts than other combination conditions. One proposition is defended as a statement of asserting or denying something. In this study, debate discussion topic was designed and expected students to state their own opinions, identify the disagreement, negotiate meaning, and show new knowledge construction. If students can go through the five phases in IAM, their posts should have more propositions because they fully

discuss the debate topics and include more statements. Students can emulate the good modeling examples, but they cannot understand the inherent debate procedures in the example posts. Meanwhile, discussion protocol is too abstract for students to understand. Therefore, using both modeling example and discussion protocol sets up a good model, helps students better understand the debate procedures, and results in more propositions in their posts through fully discussing the debate topics.

Over all, learning through concrete modeling examples as well as abstract discussion protocol helped students better understand the process of cognitive construction when debating and achieve higher qualitative participation, but quantitative participation was not improved correspondingly.

Quality of Posts

Quality of posts is another important dependent variable to be examined in this study. 346 posts contributed by 147 students were coded by using IAM discussion protocol. IAM identifies the process of knowledge construction into five phases. The results of a 2 × 2 ANOVA indicated that students exposed to both discussion protocol and modeling examples achieved higher quality of posts than students in other combination groups. Previous studies found that the majority of the students' level of knowledge construction tended to be low and fall into level one or two of IAM (e.g., Cheung & Hew, 2005; Newman et al., 1995). In this study, when students were exposed to both modeling example and discussion protocol, the quality of their initial posts achieved 3.77.

One function of using both discussion protocol and modeling examples is to help students precisely understand teachers' expectations and format of instruction. Through

discussion protocol and modeling examples, students understand that instructors not only require the quantity, but also the quality of posts. Normally, students are only asked to post certain number of posts, and in such cases tend to simply meet the minimum quantitative requirements without regard to the quality of posts. In this study, both the modeling examples and discussion protocol exhibited teachers' expectations of qualitative requirements and provided students specific instructions on how to construct knowledge and achieve high quality of posts.

Another function of using both discussion protocol and modeling example is to reduce students' extraneous cognitive load. Students' cognitive load can be reduced when teachers have them learn the format of the instruction (Sweller et al., 1998). Li (2005) found that discussion worked examples could reduce students' mental effort to learn the format of instruction and increase the cognitive construction. The concrete modeling examples provide students with direct information of what a high quality post should look like and inspire new ideas as well. Discussion protocol is a theoretical explanation for those modeling examples; it helps students build up the concept of debate procedures and the process of knowledge construction in their long-term memory. These two scaffolding strategies assist students in moving from externally getting concrete information in short-term memory to internalizing the concept of knowledge construction in long-term memory effectively. This learning process is supported by the theory of scaffolding and Dewey's experiential learning theory. These theories emphasize on the collaborative constructivism and practical inquiry from concrete to abstract learning process. When students experience this learning process, their cognitive load is reduced and high cognitive skills are achieved.

Student Perceptions

Student perceptions of online discussion regarding to preparedness, motivation, confidence, and satisfaction is another important dependent variable in this study. The results showed no significant differences in student perceptions when they were exposed to more scaffolding discussion guidelines. The mean scores for four domains (preparedness, motivation, confidence, and satisfaction) across four combination groups are all around 3.5. That means students all have positive feelings about their experiences of online discussion in this online course. For example, below are comments expressed by four students in four different combination groups.

"The discussions engaged thinking about technology as a whole and what consequences can come from it (good and bad). Over all it was a positive experience".

– Group One

"I thought it was effective to take the time to think about technology and how it's a part of who we are and the major role it plays in our lives".

– Group Two

"I thoroughly enjoyed the online discussions because they made me think about tools and programs that are normally a part of my everyday life in a much different way."

-- Group Three

"I think the discussions are a great way to communicate and express thoughts about modern day technology. It really gives the student a chance to enhance their ability to think about situations with other students".

– Group Four

They have very similar opinions about online discussions stating that online discussion provided a good opportunity for them to communicate with each other and facilitated their thinking about the discussion topics when interacting with others. Their comments show that students like online discussion because it is the only opportunity in this online course to exchange ideas. They all felt they had enough discussion guidelines and were prepared to achieve the quantitative and qualitative discussion requirements. Their discussion behaviors however were not consistent with their perceptions. Only

students exposed to both discussion protocol and modeling examples posted longer, more propositions and higher quality of initial posts. Students in other combination groups did not receive enough scaffolding guidelines to help them effectively construct knowledge and create higher quality of posts, although they all felt they were prepared to discuss and satisfied with their discussion experiences.

There were many instances of prior research examining the student perceptions of online discussion. The results of these studies are complex. Some studies theoretically argued that providing students with more discussion scaffolding would lead to more positive student perceptions of online discussion (e.g., Palloff & Partt, 2003; Sorenson & Baylen, 2004). These studies were based on analyzing the theoretical merits of preparing students well to improve their perceptions with no empirical foundation. Some other studies, however, had opposite findings that there were no significant differences of student perceptions when actual scaffolding strategies such as structured discussion, worked examples or discussion protocol were provided. Rummel et al. (2009) found no significant differences in student perceptions when students were exposed to a discussion model. Tollison (2009) had similar findings that student perceptions were no different when students were provided a discussion worked example. Moore and Marra (2005) also found that exposure to discussion protocol did not promote student perceptions of online discussion. All these experimental studies applied actual scaffolding strategies had similar findings about student perceptions.

Over all, using both discussion protocol and modeling example could not improve student perceptions of online discussion and quantitative behaviors, but, students' qualitative behaviors have been significant changed.

Implication

Based on the evidence of prior studies, this study provides a starting point to explore the effectiveness of using two scaffolding strategies: discussion protocol and modeling examples on students' discussion behaviors and perceptions. The findings of this study have important educational implications.

Online discussion is a very common way in online courses to provide students with opportunities to communicate with each other and exchange ideas. It has been asserted by many theories as an effective way to improve students' communication, cognitive construction and perceptions of learning. These assertions however need more empirical evidence to prove. Many prior empirical studies have put efforts into examining the effectiveness of different scaffolding strategies in online discussion. Most of these studies attempted to test one intervention or scaffolding strategy; they have either examined students' discussion performances, or tested students' perceptions. Online discussion is a complex and systematic process and determined by many factors. This study broke new ground and provided empirical evidence of combining two scaffolding strategies for discussion design and implementation.

Some of the findings in this study are consistent with the arguments of previous research. In this study, students tended to post the minimum number of messages required and waited until the last day to complete discussions in four combination groups. These findings indicate that students are highly driven by the discussion quantitative requirements; therefore, proving more sufficient quantitative guidelines to students is very important. If teachers want students to contribute to more replying posts or post earlier instead waiting till last couple days, the discussion guidelines should specifically

ask students to respond more to others' posts and set up multiple deadlines to drive the discussion progress.

Although using discussion protocol and modeling examples had no effect on students' quantitative participation, the interaction of these two scaffolding strategies positively influenced the length of students' initial posts and propositions of initial posts. The findings show that providing students more qualitative guidelines is critical to improve students' qualitative participation. Moreover, applying scaffolding strategies in qualitative guidelines is valuable to better express teachers' expectations, guide students' knowledge construct, and finally facilitate students' achievement of high qualitative participation. This combination may be a good solution for past research which did not find any significant differences of students' participations in online discussions.

The findings about students' cognitive behavior support the argument that providing students more discussion guidelines can improve students' cognitive skills. Exposure to both discussion protocol and discussion example facilitates students' learning from receiving external concrete information of modeling examples to internally understanding the debate procedures presented in discussion protocol. In this study, providing students modeling examples or discussion protocol separately did not lead to any significant differences in students' quality of posts. Therefore, the combination of more scaffolding strategies is worth being applied to better facilitate students' learning process and to achieve successful cognitive behaviors.

For student perceptions of online discussion, the findings of this study refute the claims made by previous theoretical assertions that providing students with more discussion scaffolding would lead to more positive student perceptions of online

discussion. These findings are consistent with prior empirical evidence which show no significant differences in student perceptions when scaffolding strategies were applied (e.g., Rummel et al., 2009; Tollison, 2009; Moore & Marra, 2005). Some studies have argued that interaction in online courses has received too much recognition without sufficient empirical foundation (e.g., Gosrky & Caspi, 2005; Kreijns et al., 2002). The gaps between (1) students' cognitive behaviors and their perceptions of learning and (2) the theoretical assertions and actual empirical evidence need to be filled in future research.

Although the implications of this study cannot generalize to other educational settings, the findings that support or refute assertions made by others support the fact that more empirical studies should be pursued and conducted.

Recommendations for Future Research

This study was conducted in an online course related to computer skills and concepts and students were all undergraduate students. A replication of this study can be performed in other situations with different student populations or different subject courses.

Regarding previous studies, this study examined students' active participation by analyzing the number of students' posts, the length of initial posts, the post time of initial posts and the propositions of initial posts. It is hard to make a specific conclusion that students actively participated in the online discussions or not because the evidence shows that students' number of posts and post time were not significantly different, however, the length and the propositions of initial posts were positively changed. This finding suggests that active participation should be clearly defined and more indicators can be

examined in future research to better measure students' active participation in online discussions.

The findings present that students' active participation is highly driven by the discussion guidelines. Therefore, future research can attempt to examine different ways of designing guidelines such as setting up multiple deadlines to drive students' discussion progress or asking students to respond more to others' posts. The relationship between students' quantitative participation and qualitative participation also need to be investigated in future research.

Using both discussion protocol and modeling examples has been examined by this study to be an effective way to help students improve knowledge construction and cognitive behaviors. In a similar vein, research into different applications of combining scaffolding strategies can continue to be examined. For example, modeling examples can be shown in different ways and different types of discussion protocols may be used. Additionally, other scaffolding strategies can be integrated and tested as a new combination to facilitate students' online discussions.

IAM was used as the discussion protocol to guide students' knowledge construction and also used as the coding instrument to code every post's quality in the present study. There are some other models or coding instruments to measure similar cognitive behavior. Further studies can choose a different instrument for discussion protocol and coding instruments to see whether the same results can be achieved. Some other measurable behaviors such as students' social behaviors or metacognition (e.g., Hara et al., 2000; Henri, 1992) can also be examined by using different coding instruments.

This study did not find any significant differences in student perceptions of online discussion. Although this finding is similar to empirical evidence from prior studies, it is not consistent with the theoretical assertions that more scaffolding can improve student perceptions. The definition of student perceptions of online discussion should be more clear and specific. Future research can investigate additional perception variables such as learner control and self-direction to better define and measure student perceptions. Moreover, the perception instrument should be also further improved and tested under different educational settings in future empirical studies to better understand students' feelings of their learning experiences.

Online discussion is a complex and systematic teaching and learning process. Many factors may interact with each other to influence students' participation, knowledge construction and learning perceptions. Future research might focus on more details of discussion design related to quantitative and qualitative requirements and more scaffolding strategies. All these findings will shed light on future discussion design for instructors and instructional designers.

Conclusion

This study was intended to extend prior studies and further the understanding of better preparing students for high quantity and quality participation in online courses. It provided a starting point of combining two scaffolding strategies (discussion protocol and modeling examples) to guide students' online discussions. It expected providing students more scaffolding strategies would help them better understand teachers' expectations, encourage their active participation and cognitive behaviors, and improve their perceptions of online discussions.

The results of this study indicated that preparing students by using both discussion protocol and modeling examples did improve students' qualitative participation and cognitive behaviors, however, the quantitative participation and student perceptions of online discussion had no significant changes. Additional future research is needed to not only substantiate the effects of using both discussion protocol and modeling examples in other educational settings, but also to explore other scaffolding strategies to better prepare students to have more effective discussion experiences. The findings of these studies related to preparing students will provide empirical evidence and shed light on actual online course design and teaching.

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APPENDIX A

BASIC DISCUSSION GUIDELINES

EDIT2318 Discussion Guidelines

Discussions are an important part of this course. The purpose of online discussion is to deepen your understanding of the lecture topics, express your own ideas, interact with others, and take into account others' ideas.

Your higher quality of participation may lead to more and higher quality of responses and interactions from other students. Therefore, please read below discussion guidelines and criteria and try to create as higher quality of postings as you can.

Both the quantity and the quality of your postings will be considered when grading your online discussion performances.

Posting Requirements: Posting Quantity

- You are to contribute to #1 discussion by posting 1 initial message no later than Jan. 27th and 2 responses no later than Feb. 3rd.
- Additional postings are encouraged to be made in order to generate meaningful discussions

Posting Requirements: Posting Quality

- The length can be flexible; however, your postings should demonstrate thoughtfulness.
- Your postings should not be simple repeats of postings previously posted by others.
- Please be courteous and respectful of various viewpoints expressed in the discussions.
- Check the forum site often to make sure you follow and stay engaged in your group's discussions.

Discussion Criteria (40 points)

	Unacceptable (0 points)	Acceptable (1 points)	Good (5 points)	Excellent (10 points)
Frequency	Participates not at all	Participates 1 time in the discussion week	Participates 2 time in the discussion week	Participates 3 or more times in the discussion week
Adherence to guidelines	Not follows the discussion guidelines	Somewhat follows the discussion guidelines	Almost follows the discussion guidelines	Follows the discussion guidelines very well
Initial Posting	Posts no initial posting	Articulates his or her position less than adequately	Articulates his or her position adequately	Articulates his or her position very well
Follow-Up Postings	Posts no follow-up responses to others	Posts shallow contribution to discussion (e.g., agrees or disagrees); does not enrich discussion	Elaborates on an existing posting with further comment or observation	Demonstrates analysis of others' posts; extends meaningful discussion by building on previous posts

APPENDIX B

DISCUSSION PROTOCOL

How to improve the quality of your postings?

Interaction Analysis Model (IAM) is a content analysis model based on a constructivist paradigm designed to detect evidence of knowledge construction in a collaborative online discussion environment. It posits five phases that learners may move through (not necessarily sequentially) as knowledge is being constructed. Higher phase in IAM means the higher quality of the post and the higher level of knowledge construction.

	Knowledge Construction	Phase Description
Low	Phase I. Sharing/comparing of information	Statement of observation or opinion; agreement between participants.
↕	Phase II. Discovery/exploration of dissonance/inconsistency amongst participants	Identifying areas of disagreement; asking and answering questions to clarify disagreement.
↕	Phase III. Negotiation of meaning/knowledge co-construction	Negotiating meaning of terms and negotiation of the relative weight to be used for various arguments.
↕	Phase IV. Testing/modification	Testing the proposed new knowledge against existing cognitive schema, personal experience or other sources.
High	Phase V. Phrasing of agreement and applications of newly constructed meaning	Summarizing agreement and metacognitive statements that show new knowledge construction.

APPENDIX C

Modeling Example

How to improve the quality of your postings?

Here shows some examples which represent different levels of knowledge construction and different levels of quality of postings.

Knowledge Construction		Posting Examples
Low	1	Technology helps make the world feel much smaller through cell phones, social networks, and Skype by allowing people to connect instantly with friends/family, no matter how far away they may be. I think that society's attitude toward technological advancements is that they make things easier, better, or more efficient.
	2	I believe that professor should not allow any kind of technology in the classroom besides what the university provides. Although there are students who don't abuse their professor's rules of allowing technology in the class, the majority of students visit social networking sites. It is the professor's duty to make it known what their personal rules on this matter are and enforce them.
	3	Technology in education can be a good thing and a bad thing. Computers are a good source to use to look up stuff on the Internet and take notes in class, but at the same time students get distracted and get on Facebook or twitter or any other site to communicate. Students just need to know the appropriate times when they should or shouldn't use their technology.
	4	I believe that technology is both a means for a better quality of life, as well as a status symbol. The iPhone can be used as one example. People who already have one want the latest one... A different form of technology is the Facebook, we brag about how many friends we have... In this way we are no longer using the networking site as a form of communication. Not that what we are doing is wrong, it is just proof of how comfortable we feel with technology. So the science-fiction novels and movies about computers dominating humankind are no longer as frightening.
High	5	With continuing advances in technology and social networking, it is wise that we do our best to learn what we can. We have never been such connected to one another as a whole population as we are now... we would be wise while we are still in school to learn as much as we can … because you will use in the real world. However, that also brings up a negative. Because it is so easy to get information or … people take shortcuts and exploit these tools without actually learning the material… For example, doing math homework when you can find a program online to basically do it for you. As a society, we need to learn self-control when it comes to technology and social networking. It is a powerful tool and if we abuse it, we end up learning nothing at all and become more of a robot than the computer itself.

APPENDIX D

Student Perception Instrument

EDIT2318 Student Perceptions of Online Discussions

Thank you for participating in this survey regarding your perceptions of online discussions in this online course.

The survey was designed to understand learning experiences by means of the online course. Results of the survey will be confidential and used to improve the quality of online courses for college-level students. Your participation is completely voluntary but would be greatly appreciated. Your identity will not be revealed to anyone other than the researcher in this project.

There are two parts in the survey: (1) Demography information. (2) Student perceptions of online discussion in this course. This will take approximately 20-30 minutes.

Please click on the ">>" button below to begin the survey. You may quit at any time by closing the browser window. You will notice a progress bar at the bottom of each page which indicates where you are in the survey.

Part I: Background Information

Instruction: Select the option next to each statement that reflects your opinion.

Please enter your research ID number

Please enter your section number. E.g., 1, 2, or 3

1. What is your gender?

Male

Female

2. What is your Age?

3. What is your major?

4. School Year:

Freshman

Sophomore

Junior

Senior

5. Ethnic background:

Asian / Asian American

Black / African American

Hispanic

Native American

White / Causian

Other

6. How many hours, on average, do you usually use the Internet every day? E.g., 6 hours, 10 hours

7. How many online courses have you previously taken?

0

1

2

3

4

5 or more

8. Rate your knowledge of computers and technology by checking one of the responses provided:

Extreme knowledgeable

Moderate knowledgeable

Slight knowledgeable

Neutral

Slight ignorant

Moderate ignorant

Extreme ignorant

9. Your English is:

elementary proficiency

limited studying proficiency

professional studying proficiency

full professional proficiency

native or bilingual proficiency

Part II: Student Perceptions of Online Discussion

Discussions are an important part of this course. The discussion guidelines were designed to help you understand the requirements and the teachers' expectations of the online discussion assignments. The purpose of this survey is to help us to better understand your experiences and perceptions of the online discussions in this course and improve our future course design.

Did you read all of the discussion guidelines and policies before participating in the online discussions?

Yes

No

Please indicate how strongly you agree or disagree with the following statements. * means the reverse items.

Preparedness:

1. The discussion guidelines clearly stated what was expected of me in regards to the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

2. I felt adequately prepared to participate in the online debate after reviewing the discussion guidelines.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

3. I felt adequately prepared to create high quality postings after reviewing the discussion guidelines.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

4. The discussion guidelines helped me clearly understand how to construct knowledge during online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

5. I felt I was provided enough information to be successful in online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

6. * I felt unprepared to debate with my group members during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

7. * I was confused about how to successfully achieve the requirements of the online discussions after reviewing the discussion guidelines.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

Motivation:

1. I was eager to participate in the online discussion activities after reviewing the discussion guidelines.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

2. I was eager to contribute high quality postings after reviewing the discussion guidelines.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

3. The discussion guidelines motivated me to actively construct new knowledge during online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

4. I was motivated to put a lot of thought into my comments.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

5. I was eager to express my own opinions during online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

6. I was motivated to read more group members' postings during online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

7. I was eager to get more responses from others during online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

8. The discussion guidelines motivated me to think about the quality of postings in my discussion group.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

9. Participating in the online discussions motivated me to make quality posts.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

10. I have a strong interest in participating in future online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

Confidence:

1. The discussion guidelines made me feel confident to achieve the requirements of online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

2. I felt confident that I could successfully participate in the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

3. I felt confident that I could create high quality messages during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

4. The discussion guidelines made me feel confident to construct knowledge during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

5. The discussion guidelines made me feel confident to state my own opinions during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

6. I felt confident in my ability to challenge others' opinions during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

7. * I lacked confidence in my ability to debate others during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

8. After participating in the online discussions, I feel more confident to be successful in future online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

Satisfaction:

1. I felt the discussion guidelines were very useful to guide my online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

2. The discussion guidelines helped me to post high quality postings about given topics.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

3. The discussion guidelines helped me to successfully debate during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

4. * My online discussion experiences were undermined because I did not possess adequate knowledge about how to create high quality postings.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

5. The discussion guidelines helped me to construct new knowledge during the online discussions.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

6. My interaction with other students helped me to enjoy this course.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

7. I was satisfied with my online discussion experiences in this course.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

8. I felt the online discussions enhanced my learning in this online course.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

9. Overall, in terms of interaction and collaboration, I would rate the online discussions as “effective”.

Strongly Disagree

Disagree

Neither Agree nor Disagree

Agree

Strongly Agree

If you have any other opinions or feelings about the online discussions in this course, please briefly express here:

Thank you for your participation! Click "Next" button to submit this survey.