THE INFLUENCE OF DIRECT INSTRUCTION
ON ASYNCHRONOUS EDUCATIONAL DISCUSSIONS

A Dissertation presented to the
Faculty of the Graduate School
University of Missouri-Columbia

In Partial Fulfillment
Of the Requirements for the Degree

Doctor of Philosophy

by

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December 2011
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THE INFLUENCE OF DIRECT INSTRUCTION
ON ASYNCHRONOUS EDUCATIONAL DISCUSSIONS

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Acknowledgements

Many people have helped me along this path to my doctorate. Of course, my dissertation supervisor, Dr. Joi Moore, deserves a special thank you for being patient yet firm with me as my dissertation study grew from an idea to a reality. Drs. Joseph Donaldson, James Laffey, Rose Marra, and John Wedman also deserve thanks for being on my dissertation committee and helping me hone my research study into a valuable contribution to the field.

I would also like to recognize and thank James Lockard, L. Jean Owen, and John Sherk, who encouraged me to start working on my doctorate in the first place, when I had many doubts. Many other people have helped me with my dissertation study and deserve recognition: Mike Bleich, Marge Bott, Helen Connors, Matt Fuoco, Brian Gajewski, Stephanie Gerald, Gigi Grover, Adam Keener, Lou Loescher-Junge, Ryan McDowell, Nellie Modaress, Tony Paolo, Chris Richards, Kathy Tally, Cindy Teel, Dan Voss, Karen Wambach, Jameson Watkins, Julie Wilhauk, and Phil Wilhauk.

I would also like to thank my parents, Hugo and Esther Antonacci, for valuing education and encouraging our family to excel. To my children, Mike, Beth, and Dominic Antonacci, a special thank you for doing without your dad sometimes because of my school work. Your hard work and dedication to your education also inspired me to continue working hard when my school work was tough. And finally, this milestone in my life would not have been possible without the love and support of my wife, Paula Antonacci.
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THE INFLUENCE OF DIRECT INSTRUCTION ON ASYNCHRONOUS EDUCATIONAL DISCUSSIONS

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Abstract

Online learning is an important and rapidly growing area, and asynchronous discussions are a vital component of online courses. This doctoral study examined the influence of discussion moderator messages, specifically messages with direct instruction content, had on those discussions. This study obtained data from content analysis of course discussions. The subjects for this study were the instructor and all 15 students enrolled in a fully-online graduate course at a large, public university medical center. The study found that the direct instruction content of an instructor message influenced students replying to that instructor message as well as students reading other student replies to that instructor message. The current study found that the direct instruction content of the instructor message may also influence students reading an instructor message and students responding to other replies to that instructor message. Instructors can use these findings to more effectively moderate their online discussions.
Chapter 1: Introduction

Background

Computer-mediated communication in higher education

The growth of online courses in higher education continues to increase dramatically. According to Allen & Seaman (2009), almost 4.6 million students took at least one online course in Fall 2008, an enrollment increase of 17% from the previous year and more than 14 times the growth of total higher-education enrollments in the same time period. Additionally, a majority of institutions (60%) believe online education is critical to their long-term strategy, which has been a consistent finding over the last five years.

However, Allen & Seaman (2009) also report a relatively stable minority (31%) of chief academic officers believe their faculty accept the “value and legitimacy of online education” (p. 12). A longstanding criticism of online courses is that online students do not receive the frequent and rich interaction with the instructor and with other students, which occurs in a traditional classroom setting (Badu-Nyarko, 2006; Baglione & Nastanski, 2007; Schmieder, 2008; Sher, 2009).

To provide interaction in an online course, computer-mediated communication (CMC) is often included (Rovai, 2007; Thompson & Savenye, 2007; Ulmer, Watson, & Derby, 2007). In its broadest sense, CMC involves computer systems which receive information from people and ultimately return information to people. In a narrower sense, CMC enables direct person to person communication (Luppicini, 2007; Rovai, 2007). This consists of three primary forms: electronic mail, group conferencing systems, and
interactive messaging systems (Hrastinski & Keller, 2007; Repman, Zinskie, & Carlson, 2005).

Of the various CMC tools, asynchronous discussion boards have become the primary communication technology for online courses (Baglione & Nastanski, 2007; Hrastinski & Keller, 2007; Maurino, Federman, & Greenwald, 2008; Schmieder, 2008). And, these asynchronous online discussions are considered an important part of online courses (Lynch, Kearsley, & Thompson, 2011; Marra, 2006; Thompson & Savenye, 2007).

Computer-mediated discussions

Although asynchronous online discussions share some similarities with face-to-face discussions, online discussions have important differences, and discussion participants must adapt their discussion techniques to these differences and also develop new techniques unique to the online discussion environment (Conrad, 2004; Easton, 2003; Mason, 1991a; Murphy & Coleman, 2004). Rizopoulos & McCarthy (2009) highlighted the advantages and limitations of online discussions, and they provided strategies and techniques—for both instructors and students—to benefit from the advantages and manage the limitations.

One difference between online and face-to-face discussions is that online discussions are mediated with communication technology, and participants must learn to use the technology itself (Collins & Berge, 1996; Gunawardena, 1992; McElhinney & Nasseh, 1998-1999; Thurmond & Wambach, 2004). Another important difference is that online asynchronous discussions are text-based and lack paralinguistic and nonverbal
information which is available in face-to-face discussions (Bollinger, 2009; Connolly, Jones, & Jones, 2007; Conrad, 2004; Feenberg, 1989). Additionally, the text-based nature of asynchronous online discussions creates a written record of the discussion. While this record can be a valuable learning resource, it can grow large over time, and participants have reported being overwhelmed or overloaded by the amount and length of messages (Hesse, Werner, & Altman, 1988; Johnson, 2006; Tu & Corry, 2003; Vonderwell & Zachariah, 2005).

Compared to face-to-face discussions, asynchronous online discussion may unfold over days or even weeks, instead of minutes or hours. Additionally, several discussion threads may be occurring simultaneously. Early works by Hesse et al. (1988) and Davie (1989) identified this major difficulty with online discussions. The disrupted sequencing of messages can make it difficult to connect related messages and follow the discussion conversation or thread. This problem of following the thread continues to be a challenge for both online students and instructors (Heckman & Annabi, 2005; Murphy & Coleman, 2004; Potter, 2008; Xin & Feenberg, 2006). However, Herring (1999) suggested these differences may create advantages as well. For example, simultaneously participating in multiple conversations may provide interaction intensity not possible in face-to-face interactions.

**Moderating online discussions**

Moderating face-to-face and online discussions also share some similarities, but moderating asynchronous educational discussions requires special knowledge and skills as well (Badu-Nyarko, 2006; Connolly et al., 2007; Marra, 2006; Murphy & Coleman,
First-time online instructors, even those with extensive classroom teaching experience, have reported difficulty moderating online discussions (Connolly et al., 2007; de Leng, Dolmans, Jobsis, Muijtjens, & van der Vleuten, 2009; Maurino et al., 2008; Morris, Xu, & Finnegan, 2005). Without faculty development or online teaching experience, online instructors often attempt to moderate online discussions as they have moderated classroom discussions, and this approach may not be successful (Connolly et al., 2007; Hammond, 2005; Heckman & Annabi, 2005; Maurino et al., 2008).

Kanuka (2002) went further on the issue of transferring traditional classroom practices to the online environment. She argued this approach will not extend learning to take advantage of the unique opportunities an online environment may present. Scagnoli, Buki, & Johnson (2009) went still further, and they described how experienced classroom instructors changed their classroom teaching practices because of their online teaching experiences.

As previously mentioned, online discussion moderators, like all discussion participants, must adapt to this communication medium. For example, online moderators need to moderate multiple conversation threads occurring simultaneously, and they must interpret student meaning, understanding, and intention without nonverbal information. However, instructors moderating online educational discussions face several additional challenges.

Heckman & Annabi (2005), Hillman (1999), Levin, Kim, & Riel (1990), and Poole (2000) analyzed online educational discussions and found important differences with face-to-face discussions. All four studies found the typical classroom recitation sequence of instructor initiation, student reply, and instructor evaluation was missing in
most online threads. Instead, these studies found the online discussions had more complex interactions, resembling discussion, with both instructors and students exhibiting a wider range of discussion behaviors. Poole concluded online discussions may require more diverse instructor roles, and Heckman & Annabi determined traditional classroom discussion techniques which rely on teacher-centered linear interaction, such as Socratic questioning, may not work in an online discussion.

In an online discussion, the instructor also has reduced authority, where students can ignore and challenge the instructor (Coppola, Hiltz, & Rotter, 2002; McGrath, 1998; Smith & Ferguson, 2002; Vonderwell & Zachariah, 2005). Ahren & El-Hindi (2000) reported a somewhat extreme example:

Participants within the conference demonstrated a kind of peer-oriented discourse that was not teacher directed…. These topics, created by the participants, generated richer interaction than did the global topics initiated by the instructor…. This discourse pattern is supported by network data that illustrates that the presence of the instructor's voice within the discourse was virtually ignored. (pp. 392-393)

**Online moderator importance**

Research has identified skillful moderation as a critical factor in successful online discussions (Feenberg, 1989; Gorsky & Blau, 2009; Kim & Bonk, 2006; Schmieder, 2008).

Trained and prepared moderators are not only important to the success of a computer conference but more importantly are crucial to the success of distance education courses. Without the direction and resulting interaction between moderator and learner and learner and learner, a distance education course often reduces to nothing more than a correspondence course. (Winograd, 2003, p. 69)

Without effective moderation, online discussions can lose focus and wander off topic. Eisley (1992) stated, “Entropy abounds in on-line discussion. It takes the constant
addition of energy to the system on the part of the instructor to keep the discussion on course” (p. 9). Beaudin (1999) also noted that since the moderator of an asynchronous discussion is not immediately available, the discussion can digress and lose focus for long periods of time. Similarly, Lee (1999) found surveyed students thought student-moderated discussions were not focused or productive, and students felt the discussions were not finished. Tu & Corry (2003) also warned that without effective moderation, online discussions tend to become unfocused and shallow.

Effective moderation is also important to an educationally valuable discussion. Early in the literature, Mason (1991b) observed students did not naturally synthesize disparate ideas into a more organized form, just because students were participating in online discussions. She considered that synthesis to be a higher cognitive skill needing an instructor to help develop. Likewise, Newman, Johnson, Webb, & Cochrane (1997), Gustafson & Gibbs (2000), Thomas (2002), and Christopher, Thomas, & Tallent-Runnels (2004) all examined online discussions having limited moderator participation. All four studies reported students exchanging information, but those exchanges did not necessarily result in deep learning or critical thinking. Additionally, these four studies concluded an active and skilled moderator was necessary to encourage and support the interactive dialog needed for higher levels of thinking.

Finally, some important discussion roles appear to be assumed only by the instructor acting as moderator. Tagg (1994) reported an online course where students moderated discussions. Although students performed many roles, only the instructor engaged in recognition, which involved evaluating and correcting student contributions, and only the instructor provided meta-commenting, which involved guiding the
discussion by making comments about the discussion direction. Murphy, Mahoney, Chen, Mendoza-Diaz, & Yang (2005) also found only the instructor engaged in mentoring, which they described as a guiding relationship between an expert and novice.

**Statement of the Problem**

Despite two decades of research on moderating educational online discussions, faculty—including experienced-classroom and experienced-online instructors—continue to report difficulty moderating these discussions (Choi & Park, 2006; Connolly et al., 2007; Conrad, 2004; Liu, Bonk, Magjuka, Lee, & Su, 2005; Maurino et al, 2008).

Much research has been conducted on computer-mediated communication in general, and on moderating online discussions specifically (Hammond, 2005; Luppicini, 2007; Spataria, Quinn, & Hartley, 2007; Wallace, 2003). One branch of that research has examined the effect moderator activity has on the discussion itself.

Regarding quantitative aspects of moderator discussion activity, such as number, length, and frequency of instructor messages, several studies have reached similar conclusions. “The most favorable [instructor] presence seemed to be one that lets students know that their messages were being read without taking over the discussion” (Dennen, 2005, p. 142). Likewise, Rovai (2007) concluded, “A challenge for the online instructor in establishing and maintaining social presence is to show that student postings are read without the instructor becoming the center of all discussions” (p. 82).

At the same time, quantitative factors alone do not fully explain successful online discussions. The content or quality of instructor postings is also an important factor. However, unlike quantitative aspects of moderator activity (e.g., how much the
moderator should post), this literature is not clear about what the moderator should post or say in an online discussion. For example, posting a discussion summary has been recommended as a worthwhile moderator activity (Anderson, 2004; Berge, 1995; Rovai, 2007; Winograd, 2002). Yet, no empirical data exists about the effect such summary postings have on the discussion. Do summaries end the discussion thread or revitalize the discussion by better organizing it for further examination? Without knowing this effect, moderators could unintentionally undermine their own goals by summarizing a discussion thread with the intent to stimulate more discussion, when summarizing may actually tend to reduce discussion, or vice versa.

Given the vital role of the moderator in effective educational discussions and the reported difficulties instructors have moderating effective online discussions, understanding what moderators should post is an important question. More research is needed to answer this question and provide guidance to instructors about what they should post to effectively moderate their online discussions.

**Purpose of the Study**

Garrison, Anderson, & Archer (2000) provide a framework for organizing what instructors should say in online discussions. In their community of inquiry (CoI) model, successful higher educational experiences occur through the interaction of three core elements: cognitive presence, social presence, and teaching presence.

Though all three elements are crucial, Garrison et al. (2000) recognized teaching presence as the “binding” (p. 96) element for educational purposes. Anderson, Rourke, Garrison, & Archer (2001) defined teaching presence as “the design, facilitation, and
direction of cognitive and social processes for the purpose of realizing personally meaningful and educational worthwhile learning outcomes” (p. 5). Within the teaching presence element, they identified three characteristics: (a) designing, organizing, and administering the course; (b) facilitating an environment conducive to learning; and (c) providing direct instruction. Of the three characteristics, Anderson et al. (2001) found direct instruction was the dominant characteristic and was found in 77%-88% of instructor discussion postings that included teaching presence.

Direct instruction was the focus of the current study. In their discussion coding scheme of direct instruction, Anderson et al. (2001) included six indicators:

- Present content/questions
- Focus the discussion on specific issues
- Summarize the discussion
- Confirm understanding through assessment and explanatory feedback
- Diagnose misconceptions
- Inject knowledge from diverse sources

They also included an indicator for responding to technical concerns, but this indicator was not included in the current study because it is not directly related to learning course content. Additionally, the technical indicator may have reduced importance as technology becomes more widespread and technical support is provided by the hosting educational organization (Anderson et al., 2001; Conrad, 2004; Morris et al., 2005; Shea, Fredericksen, Pickett, & Pelz, 2003).

While the CoI model identifies six indicators of direct instruction within online discussions, this model does not describe how these types of instructor messages may
affect the discussion. The current study focused on that gap in our understanding of moderating online discussion.

Thread development, which examines how online discussion threads grow, provides one approach to examining how specific messages, such as those with direct-instruction content, influence the discussion at a message level. Because students respond differently to instructor messages based on the content of those messages (Pocente & Fahy, 2003; Walker, 2004), the current study focused on how students responded differently to instructor messages based on the direct-instruction content of the instructor message. The current study examined direct student replies to the instructor message as well as student replies to subsequent student messages (Hrastinski & Keller, 2007; Thurmond & Wambach, 2004; Wanstreet, 2006). Additionally, the current study examined how these instructor messages influenced vicarious interaction (Sutton, 2001; Dennen, 2008), which can occur in an online discussion when a student reads a message but does not reply to the message.

**Research Questions**

The research question for this study was: To what extent, does the type of direct instruction message (present content/questions; focus the discussion on specific issues, summarize the discussion, confirm understanding through assessment and explanatory feedback; diagnose misconceptions, and inject knowledge from diverse sources) posted by an instructor influence thread development in an online asynchronous discussion? More specifically:
1. Among the instruction indicator types, are there differences in the number of students who view the instructor’s message?

2. Among the instruction indicator types, are there differences in the number of students who directly reply to the instructor’s message?

3. Among the instruction indicator types, are there differences in the number of students who view other student responses to the instructor’s message?

4. Among the instruction indicator types, are there differences in the number of students who reply to other student responses to the instructor’s message?

**Significance of the Study**

Considering the continued growth of online learning and the critical role of online discussions in those courses, educators need a better understanding of how to design and moderate effective online discussions. Furthermore, online instructors spend considerable time—and consequently expense—moderating their discussions (Lazarus, 2003; Mandernach, Dailey-Herbert, & Donnelli-Sallee, 2007; Smith & Ferguson, 2002), and more research in this area would also help improve moderator productivity by focusing their efforts on the most effective interventions (Anderson, 2003; Dixson, Kuhlhorst, & Reiff, 2006).

The current study contributed to that understanding by examining the influence direct instruction messages have on online discussions. With that knowledge, online moderators can make more effective decisions about what to post to move a discussion in the desired direction. Additionally, this study contributed to the existing research
literature and expanded our understanding of the CoI model, teaching presence, and direct instruction.

Limitations and Delimitations of the Study

Like all studies, this study has its limitations and delimitations as well. This study used a convenience sample. Therefore, its findings may not generalize to other groups and settings.

This study examined six asynchronous online discussions in one course, and these six discussions focused on discussing course content. This course also included discussion areas for student introductions and for asking administrative questions, but these two discussion areas were not included in this study because these discussions were not about course content. Additionally, some courses may include synchronous chat discussions, but this study only examined asynchronous discussions.

This study analyzed data from archived online discussion transcripts. It made no manipulation of these discussions or discussion participants. It was not a true experimental design and cannot establish causality.

This study also used the CoI model, teaching presence, and direct instruction as a framework for understanding online learning and classifying instructor discussion messages. Other theoretical perspectives and classification schemes exist, and those frameworks might lead to alternative research questions, procedures, and results.

Finally, part of this study used content analysis to classify instructor messages. This research method requires researchers to make subjective inferences from text.
Additionally, human coding is prone to error and open to interpretation, especially when examining latent content.

**Assumptions**

The researcher was aware of the following assumptions regarding the current study:

- The direct instruction indicators make useful distinctions among instructor messages.
- Students react differently to instructor messages based on the message content.
- Students react differently to instructor messages based on the direct instruction content of the message.

**Definition of Terms**

Direct Instruction: A course instructor’s message coded with one of the direct instruction indicators in Appendix A.

Discussion Moderator: A course instructor posting messages in an online discussion forum.

Learner-Instructor Interaction: A student reply message to an instructor’s discussion message.

Learner-Instructor Vicarious Interaction: A student viewing an instructor’s discussion message, as recorded by the discussion tracking system.
Learner-Learner Interaction: A student reply message to another student’s discussion message.

Learner-Learner Vicarious Interaction: A student viewing another student’s discussion message, as recorded by the discussion tracking system.

Online Discussion: Messages posted and read using the Discussion Forum tool in the ANGEL Learning Management Suite 7.4 software.

Thread Development: Continuation of a discussion thread when a discussion participant replies to another participant’s discussion message.

Chapter Summary

Online learning is an important and rapidly growing area, and asynchronous discussions are a vital component of online courses. This study examined the influence of moderator messages, specifically messages with direct instruction content, had on those discussions. With that information, online instructors will have a better understanding of how to effectively moderate online discussions in their courses.
Chapter 2: Literature Review

This literature review focuses on four related areas that inform this research study. It begins with an examination of interaction, including definitions of interaction, types of interaction, vicarious interaction, and factors affecting online discussion. The next section examines the CoI model and major CoI research issues. The third section covers moderating asynchronous educational discussions; it defines and describes the discussion moderator, identifies challenges of moderating online discussions, and examines moderator discussion participation. This chapter closes with a section on discussion thread development.

Interaction

This section reviews the literature on interaction. Definitions of interaction are examined first. The various types of interaction are presented next, with an emphasis on three important aspects of interaction for the current study: learner-instructor, learner-learner, and vicarious interaction. This section concludes by reviewing factors affecting online discussion.

Definitions of interaction

No consensual definition of interaction exists (Anderson, 2003; Bannan-Ritland, 2002; Thurmond & Wambach, 2004). According to Bretz (1983), interaction occurs when two or more agents respond to each other, and interaction minimally requires three actions:
1. A message from Agent A to Agent B
2. A response from Agent B to Agent A
3. A response from Agent A to Agent B

Bretz also described “quasi” (p. 137) interaction as only requiring these first two actions, not all three actions. Similarly, Vrasidas & McIsaac (1999) defined interaction as “the process consisting of the reciprocal actions of two or more actors within a given context” (p. 25).

Wagner (1994) also defined interaction as “reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another” (p. 8). She further distinguished and defined instructional interaction as “an event that takes place between a learner and the learner's environment. Its purpose is to respond to the learner in a way intended to change his or her behavior toward an educational goal” (p. 8). Gilbert & Moore (1998) also made a distinction between instructional and social interaction.

Though sometimes used synonymously with interactivity, Wagner (1994) reserved the term interaction for human-to-human relationships, and she used the term interactivity to refer to technology characteristics. For Wagner, interaction involved human-to-human exchanges, which were the outcomes of using communication technologies. Muirhead (1999, 2001) also defined interaction so as to emphasize the human and instructional aspects of it. Interaction “involves participation by the learner in on-line communication between learners and with their class tutors” (Muirhead, 2001, p. 1).
Bannan-Ritland (2002) reviewed definitions of interaction in the research literature and found 21 articles with an operational definition of interaction. She organized those definitions into five groups: learner participation or involvement, patterns and amounts of communication, instructor activities, social or collaborative exchanges, and instructional activities and technologies. The majority of studies focused on learner-human interaction, and the most common operational definition (11 of 21 studies) defined interaction as a communication pattern among learners, among learners and instructors, or both.

**Interaction as learner-learner and learner-instructor exchanges**

However, in a more recent review of the interaction literature, Wanstreet (2006) concluded, “Despite scholars who bemoan multiple definitions of interaction, this review of the literature has shown that there is a great deal of agreement on the conceptual definitions of the term” (p. 405). She found the majority of articles conceptualized interaction as learner-learner (23 of 39 articles) or learner-instructor (20 of 39 articles) exchanges. She also found agreement on the operational definition of interaction as well, with message frequency counts as the most emphasized.

**Types of interaction**

Interaction also has many dimensions (Bannan-Ritland, 2002; Moore, 1989; Thurmond & Wambach, 2004). Moore (1989) suggested interaction consists of at least three different interaction types: learner-content, learner-instructor, and learner-learner. Learner-content interaction occurs when the learner interacts with course content, such as
reading a textbook or watching an instructional video. Learner-instructor interaction is between the learner and the instructor, who is able to motivate and encourage the learner, evaluate coursework, provide feedback, and individualize instruction. Moore also recognized that new communication technologies—new for the time—were beginning to be used for distance education, and these technologies allowed learners to directly interact with other learners, which Moore called learner-learner interaction. Furthermore, he emphasized the importance of providing all three interaction types in distance education, and he criticized distance education courses at the time as frequently lacking opportunities for learner-instructor and learner-learner interaction.

Building on Moore’s interaction types, Anderson & Garrison (1998) completed these combinations by adding teacher-teacher, teacher-content, and content-content interaction. Hillman, Willis, & Gunawardena (1994) proposed learner-interface interaction because online learners interact with a communication tool to interact with content, instructors, or other learners. However, Sutton (2001) argued content and interface are inanimate and cannot directly interact with people.

Hirumi (2002) added learner-other human interactions, such as interactions with guest speakers or librarians. Hirumi also added learner-environment interactions, which occur when learners manipulate tools, equipment, or other objects or when learners travel to other locations or attend events to achieve specific learning objectives.

Similarly, Bonk & Dennen (2003) identified five research frameworks for studying online education. One of their frameworks, called participant interaction, focused on who interacted with whom. In addition to students and instructors as
participants, Bonk & Dennen included practitioners because computer technology can enhance communication with practitioners at a distance and widen learning opportunities.

Other dimensions of interaction

Although these interaction types focus on who or what is interacting, other authors make important distinctions along different dimensions. Kearsley (1995) made a distinction involving the timing of the interaction, with synchronous interaction occurring immediately and asynchronous interaction being delayed. Muirhead (2001) emphasized that the nature of the interaction varies with the medium, with some possibilities as written, audio, video, and tactile interactions. Parker (1999) also recognized that different communication tools support different interactions, but she maintained the course design and instructor determine the interaction experience itself.

Berge (1999) developed a model locating various communication technologies in four quadrants with continuums of content and interpersonal interaction on the horizontal axis and with synchronous and asynchronous communication on the vertical axis. For example, interactive multimedia was placed in the quadrant of content interaction using asynchronous communication because students using interactive multimedia primarily interact asynchronously with content not other people, and teleconferencing was in the quadrant of interpersonal interaction using synchronous communication because students using teleconferencing interact with other people in real time. He placed online discussions in the quadrant of interpersonal communication using asynchronous communication.
Expanding on her idea of instructional interaction (Wagner, 1994), Wagner (1997) proposed interaction types based on their effect on learners. She identified twelve such interaction types: increase participation, develop communication, receive feedback, enhance elaboration and retention, support learner control/self-regulation, increase motivation, negotiation of understanding, team building, discovery, exploration, clarification of understanding, and closure.

Mabrito (2004) distinguished between public and private interactions. For example, email between an instructor and student would be private learner-instructor interaction, whereas a student replying to an instructor’s question in an online discussion would be public learner-instructor interaction.

Beuchot & Bullen (2005) made a distinction among three different types of interaction: active, reactive, and interactive. Active interaction referred to messages which did not reference any other message. Reactive messages were reply messages implicitly or explicitly referring to the message which prompted the reply. Interactive messages referred to multiple discussion messages.

**Learner-learner and learner instructor interaction**

However, of these various dimensions of interaction, learner-learner and learner-instructor interaction are the most researched aspects of interaction (Bannan-Ritland, 2002; Thurmond & Wambach, 2004; Wanstreet, 2006). In their literature review of CMC research, Hrastinski & Keller (2007) reported 85% of studies examined learner-learner interaction, 68% examined learner-instructor interaction, and 59% examined both of these interaction types.


**Vicarious interaction**

Henri (1989) first distinguished between participation and interaction. When he compared interactive messages (explicitly or implicitly referring to another message or person) to independent messages (not connected to another message or person), he found almost twice as many student messages were independent monologues than interactive messages. Furthermore, most interactive messages were simple two-message exchanges, either a student responding to an instructor message or an instructor responding to a student message. That is, almost all interactions were learner-instructor with little learner-learner interactions. Despite this lack of interaction, interviewed students reported learning a great deal by reading the postings of their classmates. Henri concluded learning from online discussion is not dependent on direct message exchanges, but it is an internal process where discussion content provides an opportunity for learners to compare and validate their knowledge.

After analyzing an online discussion, Mowrer (1996) also concluded, “We cannot assume that students who do not post on the forum are not processing information. Some students profit from ‘private thinking’ rather than ‘public thinking’ and have different styles of learning” (p. 237).

Berge (1999) made a similar distinction between interpersonal interaction, which included learner-learner and learner-instructor interaction, and intrapersonal interaction, such as reflection. He considered both interaction types important for learning. Northrup (2001) recognized the importance of intrapersonal interaction as well, and she included it in her framework of strategies and tactics to facilitate interaction in online courses.
Northrup referred to intrapersonal interaction as learner-self interaction, connecting it to Moore’s (1989) interaction types.

Hirumi (2002) provided additional insights about learning from learner-self interaction. In his proposed interaction framework, all other interactions, such as learner-content and learner-instructor, are designed and sequenced to bring about learner-self interactions. “Learner-self interactions occur within each individual learner. They include both the cognitive operations that constitute learning as well as metacognitive processes that help individuals monitor and regulate their learning” (p. 144).

Also acknowledging learning occurs even when students do not directly interact, Sutton (2001) used the term *vicarious interaction* to describe this process in online discussions. “Vicarious interaction takes place when a student actively observes and processes both sides of a direct interaction between two other students or between another student and the instructor” (p. 227). She recommended instructors recognize and pursue vicarious interaction in their online courses.

*Research on vicarious interaction*

Vicarious interaction in an online course is not completely invisible because computer servers keep user access logs, which can be analyzed (Hillman, 1999). Taylor (2002) examined discussion participation in his online course, both in terms of posting and also accessing or viewing postings, sometimes called *hits*. He identified three major groups of discussion participants: workers, lurkers, and shirkers. The workers (14 students) were the most active group, with an average of 38 message postings, 193 message hits, and 636 coursesite hits per student. The lurkers (17 students) were much
less active regarding posting, with an average of 13 message postings, but this group was
still actively accessing the discussion messages and coursesite, with an average of 129
message hits and 519 coursesite hits. The shirkers (12 students) were minimally active in
the course, with an average of 4 message postings, 36 messages hits, and 220 coursesite
hits. However, both the workers and lurkers had almost identical course grade averages:
5.43 and 5.41 respectively. On the other hand, seven of the shirkers failed to complete all
required assignments, and the remaining five shirkers had an average course grade of 4.3.
Taylor concluded the lurkers, though not as actively posting to the discussions as the
workers, were still participating in and benefiting from course discussions, materials, and
other activities.

To further understand vicarious interaction in online discussions, Beaudion (2002)
surveyed students about why they chose not to participate in online discussions and how
they learned from online discussions. The most common reason for not participating,
given by three-fourths of students, was that they preferred to read what others wrote.
Only 25% of students were not comfortable writing online, and only 4 of 20 students
indicated time constraints limited their online contributions. Furthermore, all but 1 of the
24 survey respondents indicated they were learning from course discussions even when
not visibly posting, and about three-fourths felt they learned as much if not more reading
other students comments than writing their own comments. Given that discussion posting
in this course also did not correlate with course grades, Beaudion concluded frequent
discussion posting did not necessarily improve student performance on graded
assignments, and students who were overactive in these discussions may be doing so at
the expense of engaging in other important learning activities and processes. However,
Beaudion thought lurking students might be considered somewhat parasitic because they benefited from but did not contribute to discussions.

**Ambiguity of silence**

Lurking presents an additional problem. Although replies to discussion messages provide posters with explicit feedback about their ideas, “silence online is often a puzzle for the presenter” (Xin & Feenberg, 2006, pp. 10-11). Online silence could mean a message was accepted, ignored, unread, or possibly not even received.

To further understand the ambiguity of online silence, Zembylas & Vrasidas (2007) interviewed instructors and students about their experiences of silence in two online courses. They defined *silence* in an online course as not making written comments when expected to do so, such as not posting to an online discussion. From these interviews, four themes emerged about the meaning of online silence: non-participation, confusion, marginalization, and thoughtful reflection. Knowing online silence can mean something other than non-participation, the authors challenged online instructors to support silence when it added to student learning, but to confront the factors behind silence which detracted from learning.

Dennen (2008) also surveyed students about their behavior reading and posting in online discussions. She concluded that reading and reflecting on others’ messages were part of regular discussion participation. Students read messages to learn more about a topic, find a message to which they would like to respond, and avoid posting a redundant reply. However, the most popular reason for posting (91%) was because posting was required. Students reported learning more by reading messages, from both the instructors
and other students, than they learned by writing their own messages. Furthermore, Dennen found some students posted but did not read other discussion messages, and those students did not perceive the discussions as meaningful learning activities. Dennen was also critical of research studies neglecting to examine vicarious interaction and only focusing on more directly observable message posting.

**Vicarious interaction as a research variable**

A number of recent studies have recognized the potential importance of vicarious interaction and included messages views/hits as a research variable. Palmer, Holt, & Bray (2008) examined the relationship between final course grade and assorted variables, including number of discussion postings read/viewed, new discussion postings, and reply discussion postings. They found students only posted the minimum requirement, with 17% making no new postings and 12% making no replies, but they reported a large number of students who read every discussion posting. Even so, in their final regression model, only the number of new discussion postings and prior academic performance were found to be good predictors of final course grade. Reading discussion postings was not significantly correlated with final course grade.

Gorsky & Blau (2009) also included lurking, which they defined as logging into the discussion forum but not posting a message, as an independent variable in their study. Their study compared the online discussions moderated by two different instructors teaching the same course. One instructor received very high student ratings on her course evaluation, while the other instructor received very low student ratings. Not only did the high-rated instructor have more instructor postings, student postings, and threads than the
low-rated instructor, but she also had almost twice as much lurking as the low-rated instructor, 1389 instances compared to 775 instances.

De Leng et al. (2009) counted both messages read and messages posted as part of their evaluation process of a new online learning activity for medical students in residency. These small-group discussion activities involved resolving practice-based issues experienced by students during their residency. The authors reported no lurking students, with all students posting from 13 to 26 messages during the three weeks of discussion. They also reported all students reading all student postings in one group, and all students reading almost all student messages (64 of 67 messages) in the other group.

Finally, Ransdell (2010) developed a model predicting final course grades in a health science statistics course. Her final regression model included online activity, age, and reasoning skill and disposition. Online activity consisted of the number of coursesite hits, discussion messages read/hit, and discussion postings, and these components yielded partial correlations of .18, .20, and .18 with final course grade, respectively.

**Factors affecting online discussions**

Many studies have examined factors affecting online discussions. For example, Thompson & Savenye (2007) investigated the relationship between student discussion participation, which was defined as message counts, and three other factors: experience with previous online courses, the course itself, and the instructor. They analyzed discussion postings from 149 business students enrolled in five courses, with each course having three sections. They found a positive correlation between discussion participation and prior online course experience ($r = .43$, $p < .01$). Similarly, discussion participation
varied by course, with students in the Accounting and Statistics courses posting an average of about 8 messages per course, and students in the Management and Logistics courses posting an average of about 50 and 60 messages per course, respectively. Course participation differences were still significant ($p < .01$) when controlling for prior online course experience using ANCOVA. However, when examining discussion participation in the three courses which were taught by different instructors, they only found a significant difference in the Logistics course ($p < .05$), also controlled for course and previous online course experience factors.

Table 1 summarizes student and course characteristics influencing online discussions, as well as studies that examined those characteristics. Listed studies are limited to the ten most recent studies found.
### Table 1

*Studies on Characteristics Influencing Online Discussions*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic degree/program</td>
<td>Arbaugh (2008)</td>
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<tr>
<td></td>
<td>Artino &amp; Stephens (2009)</td>
</tr>
<tr>
<td></td>
<td>Chapman (1998)</td>
</tr>
<tr>
<td></td>
<td>Palmer et al. (2008)</td>
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<tr>
<td></td>
<td>Sher (2009)</td>
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<tr>
<td>Age</td>
<td>Arbaugh (2008)</td>
</tr>
<tr>
<td></td>
<td>Chyung (2007)</td>
</tr>
<tr>
<td></td>
<td>Marks, Sibley, &amp; Arbaugh (2005)</td>
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<tr>
<td></td>
<td>Meyer (2008)</td>
</tr>
<tr>
<td></td>
<td>Palmer et al. (2008)</td>
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<td></td>
<td>Ransdell (2010)</td>
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<tr>
<td></td>
<td>Shea &amp; Bidjerano (2009a)</td>
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<tr>
<td></td>
<td>Sher (2009)</td>
</tr>
<tr>
<td></td>
<td>Swan (2004)</td>
</tr>
<tr>
<td>Class size</td>
<td>Arbaugh (2008)</td>
</tr>
<tr>
<td></td>
<td>Arbaugh &amp; Benbunan-Fich (2005)</td>
</tr>
<tr>
<td></td>
<td>Bliss &amp; Lawrence (2009a)</td>
</tr>
<tr>
<td></td>
<td>Vrasidas &amp; McIsaac (1999)</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Studies</td>
</tr>
<tr>
<td>----------------</td>
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<tr>
<td>Discussion task</td>
<td>Bradley, Thom, Hayes, &amp; Hay (2008)</td>
</tr>
<tr>
<td></td>
<td>Darabi, Arrastia, Nelson, Cornille, &amp; Liang (2011)</td>
</tr>
<tr>
<td></td>
<td>De Wever, Van Keer, Schellens, &amp; Valcke (2009)</td>
</tr>
<tr>
<td></td>
<td>Jorczak &amp; Bart (2009)</td>
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<tr>
<td></td>
<td>Luppicini (2007)</td>
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<tr>
<td></td>
<td>McLoughlin &amp; Mynard (2009)</td>
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<tr>
<td></td>
<td>Moore &amp; Marra, 2005</td>
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<tr>
<td></td>
<td>Pisutova-Gerber &amp; Malovicova (2009)</td>
</tr>
<tr>
<td></td>
<td>Richardson &amp; Ice (2010)</td>
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<td></td>
<td>Song &amp; McNary (2011)</td>
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<tr>
<td></td>
<td>Spartariu et al. (2007)</td>
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<tr>
<td>Gender</td>
<td>Arbaugh (2008)</td>
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<tr>
<td></td>
<td>Chyung (2007)</td>
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<td></td>
<td>Li (2006)</td>
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<td></td>
<td>Lin &amp; Overbaugh (2009)</td>
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<td></td>
<td>Luppicini (2007)</td>
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<td></td>
<td>Marks et al. (2005)</td>
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<td></td>
<td>Palmer et al. (2008)</td>
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<td></td>
<td>Sher (2009)</td>
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<td></td>
<td>Williams &amp; Humphrey (2007)</td>
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<td></td>
<td>Wu &amp; Hiltz (2004)</td>
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<tr>
<td>Characteristic</td>
<td>Studies</td>
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<td>--------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Graded discussion participation</td>
<td>Bliss &amp; Lawrence (2009b)</td>
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<tr>
<td></td>
<td>Chapman (1998)</td>
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<td></td>
<td>De Wever et al. (2009)</td>
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<td></td>
<td>Griffith (2009)</td>
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<td></td>
<td>Klisc, McGill, &amp; Hobbs (2009)</td>
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<td></td>
<td>Palmer et al. (2008)</td>
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<td></td>
<td>Rovai (2003)</td>
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<tr>
<td></td>
<td>Vrasidas &amp; McIsaac (1999)</td>
</tr>
<tr>
<td>Online or Hybrid/Blended Format</td>
<td>Akyol &amp; Garrison (2010)</td>
</tr>
<tr>
<td></td>
<td>Akyol, Garrison, &amp; Ozden, 2009</td>
</tr>
<tr>
<td></td>
<td>Arbaugh, Bangert, &amp; Cleveland-Innes (2010)</td>
</tr>
<tr>
<td></td>
<td>Vaughan &amp; Garrison (2005)</td>
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<tr>
<td></td>
<td>Vaughan &amp; Garrison (2006)</td>
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<td></td>
<td>Vess (2005)</td>
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</tbody>
</table>
Benbunan-Fich, Hiltz, & Harasim (2005) developed an input-process-output model of input factors affecting the interaction process in online courses and ultimately course outcomes, such as learning and satisfaction. As shown in Table 2, they organized these input factors into four variables: Technology, Course, Instructor, and Student.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior online course experience</td>
<td>Arbaugh (2004)</td>
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<tr>
<td></td>
<td>Arbaugh (2008)</td>
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<tr>
<td></td>
<td>Archibald (2010)</td>
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<tr>
<td></td>
<td>Artino &amp; Stephens (2009)</td>
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<td></td>
<td>Marks et al. (2005)</td>
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<td>Sher (2009)</td>
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<td></td>
<td>Sherry (2000)</td>
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<tr>
<td></td>
<td>Thompson &amp; Savenye (2007)</td>
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<tr>
<td></td>
<td>Vonderwell &amp; Zachariah (2005)</td>
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<tr>
<td></td>
<td>Wu &amp; Hiltz (2004)</td>
</tr>
</tbody>
</table>
Table 2

*Input Factors for Online Learning Interaction (Benbunan-Fich et al., 2005, p. 24)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Mode (Media Mix)</td>
</tr>
<tr>
<td></td>
<td>Time Dispersion</td>
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<td></td>
<td>Geographic Dispersion</td>
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<td></td>
<td>Software Functionality</td>
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<td></td>
<td>Software Interface (Usability)</td>
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<tr>
<td></td>
<td>Reliability</td>
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<tr>
<td></td>
<td>Media Bandwidth</td>
</tr>
<tr>
<td>Course</td>
<td>Course Type</td>
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<tr>
<td></td>
<td>Class Size</td>
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<tr>
<td></td>
<td>Type of Subject</td>
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<tr>
<td></td>
<td>Institutional Context</td>
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<tr>
<td>Instructor</td>
<td>Skills</td>
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<tr>
<td></td>
<td>Effort</td>
</tr>
<tr>
<td></td>
<td>Pedagogical Model</td>
</tr>
<tr>
<td>Student</td>
<td>Motivation</td>
</tr>
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<td></td>
<td>Ability (GPA)</td>
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<td></td>
<td>Skills/Knowledge</td>
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<td></td>
<td>Attributes (e.g., age, sex)</td>
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<tr>
<td></td>
<td>Learning Styles</td>
</tr>
</tbody>
</table>
Summary

In terms of interaction, the current study examined the public interactions which occurred asynchronously in online educational discussions. The research questions for the current study included both learner-learner and learner-instructor exchanges because these important distinctions are highly emphasized in the interaction literature but missing from the literature on discussion thread development. Additionally, the research questions included both observable message replies as well as less-observable messages views—presumably read messages—because vicarious interaction, though important, has been ignored by much of the online discussion research. By incorporating these three aspects of interaction into the research questions, the current study expanded our understanding of discussion thread development along these new dimensions.

Community of Inquiry

Of the theoretical perspectives for online learning, the community of inquiry (CoI) model has attracted the most attention (Arbaugh, 2008; Arbaugh et al., 2010; Arnold & Ducant, 2006), and the CoI model was also the theoretical framework for the current study. This section is a review of the literature on the CoI model (Garrison et al., 2000). It begins with an explanation of the CoI model. This section then focuses on several major issues and research lines regarding the model itself.

The CoI model

Garrison et al. (2000) developed the CoI model as a conceptual framework for understanding higher educational experiences. The CoI model was developed as a
Cognitive presence is the most basic element for success, and it is defined as “the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication” (Garrison et al., 2000, p. 89). Social presence is defined as “the ability of participants in the Community of Inquiry to project their personal characteristics into the community, thereby presenting themselves to the other participants as real people” (Garrison et al., 2000, p. 89). It functions as a support for cognitive presence. Social presence is possible in CMC but not automatic. Teaching presence is considered the binding element because it is a support for developing both cognitive presence and social presence. It is defined as “the
responsibility to design and integrate the cognitive and social elements for educational purposes” (Garrison et al., 2000, p. 92). Teaching presence consists of two primary functions: the design and facilitation of the learning experiences.

Garrison et al., 2000 also introduced a set of indicators for each element, based on the CoI model, for analyzing computer conference transcripts. These indicators were further refined and tested in three subsequent publications. These works form the research framework for studies which use the CoI model to examine other educational research questions, described later in this section.

**Cognitive presence**

Expanding on these general indicators for cognitive presence, Garrison, Anderson, & Archer (2001) developed a tool for assessing cognitive presence in CMC. Cognitive presence progresses through four phases beginning with a Triggering Event, and each phase can be identified with the indicators shown in Table 3.
Table 3

*Cognitive Presence Phases and Indicators (Garrison et al., 2001, pp. 15-16)*

<table>
<thead>
<tr>
<th>Phase</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triggering Event</td>
<td>Recognizing the problem</td>
</tr>
<tr>
<td></td>
<td>Sense of puzzlement</td>
</tr>
<tr>
<td>Exploration</td>
<td>Divergence within the online community</td>
</tr>
<tr>
<td></td>
<td>Divergence within a single message</td>
</tr>
<tr>
<td></td>
<td>Information exchange</td>
</tr>
<tr>
<td></td>
<td>Suggestions for consideration</td>
</tr>
<tr>
<td></td>
<td>Brainstorming</td>
</tr>
<tr>
<td></td>
<td>Leaps to conclusions</td>
</tr>
<tr>
<td>Integration</td>
<td>Convergence among group members</td>
</tr>
<tr>
<td></td>
<td>Convergence within a single message</td>
</tr>
<tr>
<td></td>
<td>Connecting ideas, synthesis</td>
</tr>
<tr>
<td></td>
<td>Creating solutions</td>
</tr>
<tr>
<td>Resolution</td>
<td>Vicarious application to real world</td>
</tr>
<tr>
<td></td>
<td>Testing solutions</td>
</tr>
<tr>
<td></td>
<td>Defending solutions</td>
</tr>
</tbody>
</table>

Garrison et al. (2001) then used this tool to assess cognitive presence in three one-week online discussion transcripts: one transcript from a course on workplace learning and two transcripts from a health promotion course. The content analysis was conducted at the message level, and if a message had multiple phases present, it was coded-up to the
higher phase level. Results revealed 8% of messages were coded as triggering events, 42% exploration, 13% integration, and 4% resolution. Park (2009) replicated the Garrison et al. (2001) study with discussion data from a similar course, and she found similar message distributions among the cognitive presence phases. Garrison et al. (2001) offered several possible explanations for the low levels of resolution including discussion topics not requiring resolution, ineffective discussion facilitation, inability of CMC to support resolution, and inadequacy of their tool. They also reported interrater reliability for coding each transcript using two methods. Kappa (Cohen, 1960) was .35, .49, and .74 for the three discussion transcripts, and the coefficient of reliability (Holsti, 1969) was .45, .65, and .84 for the transcripts.

**Social presence**

Likewise, Rourke, Anderson, Garrison, & Archer (2001) expanded on the general social presence indicators introduced by Garrison et al. (2000) and also developed a tool for assessing social presence in online discussions. As detailed in Table 4, social presence includes three types of responses: affective, interactive, and cohesive.
Table 4

*Social Presence Responses and Indicators (Rourke et al., 2001, pp. 11-12)*

<table>
<thead>
<tr>
<th>Response</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective</td>
<td>Expression of emotions</td>
</tr>
<tr>
<td></td>
<td>Use of humor</td>
</tr>
<tr>
<td></td>
<td>Self-disclosure</td>
</tr>
<tr>
<td>Interactive</td>
<td>Continuing a thread</td>
</tr>
<tr>
<td></td>
<td>Quoting from others’ messages</td>
</tr>
<tr>
<td></td>
<td>Referring explicitly to others’ messages</td>
</tr>
<tr>
<td></td>
<td>Asking questions</td>
</tr>
<tr>
<td></td>
<td>Complimenting, expressing appreciation</td>
</tr>
<tr>
<td></td>
<td>Expressing agreement</td>
</tr>
<tr>
<td>Cohesive</td>
<td>Vocatives (referring by name)</td>
</tr>
<tr>
<td></td>
<td>Addresses or refers to the group using inclusive pronouns</td>
</tr>
<tr>
<td></td>
<td>Phatics, salutations</td>
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</table>

To pilot test this tool, Rourke et al. (2001) analyzed discussion transcripts from two graduate-level courses. The discussion from Course A contained 2.5 times as many instances of social presence as Course B, but Course A also had twice as many messages and four times as many words. To compare these two discussions, they calculated the incidents of social presence per 1000 words, called social presence density. Course B actually had higher social presence density for all indicators except:
complimenting/expressing appreciation, phatics/salutations, and quoting from others’ messages. The authors also reported aggregate interrater reliability using the coefficient of reliability (Holsti, 1969): .95 for Course A and .91 for Course B. However, reliability varied considerably among indicators. Explicit indicators, like vocatives, had reliability almost at 1.0. For more subjective indicators, like humor, which required interpretation of the latent message, reliability was very low, only .25 for humor.

**Teaching presence**

Using the general indicator descriptions provided by Garrison et al. (2000), Anderson et al. (2001) further developed a tool for assessing teaching presence by delineating specific indicators for each teaching presence category. See Table 5.
Table 5

*Teaching Presence Categories and Indicators (Anderson et al., 2001, pp. 4-8)*

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicators</th>
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<tbody>
<tr>
<td>Instructional Design and Organization</td>
<td>Setting curriculum</td>
</tr>
<tr>
<td></td>
<td>Designing methods</td>
</tr>
<tr>
<td></td>
<td>Establishing time parameters</td>
</tr>
<tr>
<td></td>
<td>Utilizing medium effectively</td>
</tr>
<tr>
<td></td>
<td>Establishing netiquette</td>
</tr>
<tr>
<td>Facilitating Discourse</td>
<td>Identifying areas of agreement/disagreement</td>
</tr>
<tr>
<td></td>
<td>Seeking to reach consensus/understanding</td>
</tr>
<tr>
<td></td>
<td>Encouraging, acknowledging, or reinforcing student contributions</td>
</tr>
<tr>
<td></td>
<td>Setting climate for learning</td>
</tr>
<tr>
<td></td>
<td>Drawing in participants, prompting discussion</td>
</tr>
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<td></td>
<td>Access the efficacy of the process</td>
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</table>
Anderson et al. (2001) then tested this tool for content analysis of instructor discussion postings in two online courses: one course in education and the other in health. Coding at the message level and allowing each message to be coded in multiple categories, they found the majority of instructor messages were in the direct instruction category (77%-88%). Instructor messages in the facilitating discourse category ranged from 43%-75%. And, the fewest messages were in the instructional design and organization category (22%-38%). In addition to finding a different pattern of teaching presence for these two experienced online instructors, they found the education instructor had more than twice as many messages coded in two or more categories than the health instructor (78% to 35%). They also reported interrater reliability using Cohen’s (1960) kappa: $k = .77$ for the education discussion and $k = .84$ for the health discussion.
**Intersection of elements**

Redmond & Lock (2006) provide additional insights into the CoI model by describing the intersections of the three elements. The intersection of social presence and teaching presence involves creating and sustaining a learning community. Where social and cognitive presence intersect is where students move beyond simple information exchange and into more in-depth learning. The intersection of teaching and cognitive presence includes developing and facilitating learning activities which foster deep learning. Finally, resolution—the highest phase of cognitive presence—occurs where all three elements intersect.

Garrison (2006) used the CoI framework to identify six principles for online collaboration. For each of the three teaching presence components, he presented two principles: one for social presence and one for cognitive presence. These principles, organized in this way, also elaborated on the relationships among cognitive, social, and teaching presence, especially the connecting role of teaching presence. The principles are listed in Table 6.
Table 6

_CoI Online Collaboration Principles (Garrison, 2006)_

<table>
<thead>
<tr>
<th>Instructional Design and Organization:</th>
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<tbody>
<tr>
<td>• Social Presence: “Design a climate that will create a community of inquiry” (p. 27).</td>
</tr>
<tr>
<td>• Cognitive Presence: “Establish critical reflection and discourse that will support systematic inquiry” (p. 28).</td>
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</table>

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<tr>
<th>Facilitating Discourse:</th>
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<tbody>
<tr>
<td>• Social Presence: “Sustain community through expression of group cohesion” (p. 29).</td>
</tr>
<tr>
<td>• Cognitive Presence: “Encourage and support the progression of inquiry through to resolution” (p. 30).</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Direct Instruction:</th>
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<tbody>
<tr>
<td>• Social Presence: “Evolve collaborative relationships where students are supported in assuming increasing responsibility for their learning” (p. 31).</td>
</tr>
<tr>
<td>• Cognitive Presence: “Ensure that there is resolution and metacognitive development” (p. 31).</td>
</tr>
</tbody>
</table>

**Role of social and teaching presence**

One important issue in the CoI literature involves the role of social and teaching presence. At the beginning of an online course, social presence is critical for developing the foundation necessary for open and effective communication, but as a course progresses, less social reinforcement is needed as online discussions evolve to focus more
on educationally purposeful goals and relationships (Garrison, 2007; Garrison & Arbaugh, 2007; Garrison, Cleveland-Innes, & Fung, 2010). A number of studies support this complimentary role social and teaching presence have with supporting cognitive presence.

Social presence alone

Wise, Chang, Duffy, & del Valle (2004) studied the affect of social presence on student learning, engagement, and satisfaction. Students in 45 self-paced courses were randomly assigned instructors who engaged in either high or low social presence dialogues with each student. Instructors in the low social presence condition provided feedback and encouragement, but they avoided using CoI social presence indicators in their messages, while instructors in the high social presence condition provided feedback and encouragement as well as using CoI social presence indicators in their messages. From post-course survey data, students in the two groups perceived the difference in social presence. Also, compared to the low social presence group, the high social presence group posted longer messages, and their messages had a higher number of social presence indicators. However, this study found no significant differences between these two groups on graded project score or on perceived learning, engagement, and satisfaction.

Swan & Shih (2005) investigated the relationship between perceived social presence (measured using student survey data) and actual projected presence (measured using content analysis of online discussions with CoI social presence indicators). They found students who reported high social presence in the survey also had a higher social
presence density measure (social presence indicators per 1000 words) than students reporting low social presence: 42.3 indictors per 1000 words compared to 28.6. This difference was consistent across all three social presence categories: affective (26.3 for the high group compared to 17.5 for the low group), interactive (10.0 compared to 6.7), and cohesive (6.0 to 4.4). Within the categories, most of the differences between groups were with specific indicators: self disclosure in the affective category, acknowledgement in the interactive category, and group references in the cohesive category. Combining these findings with student interview data, the researchers concluded the high social presence group valued social construction of knowledge and community building, but the low social presence group had low options of their classmates’ ideas and preferred to learn from the instructor.

Social and teaching presence

Vaughan & Garrison (2006) examined changes in social and teaching presence over time between the online and face-to-face discussions of a hybrid college faculty development course. For the first and last discussion, face-to-face discussions were recorded and transcribed, and this transcript along with the online discussion postings were coded for social and teaching presence. In the online discussions, the number of messages coded affective and open communication decreased considerably from the first to last discussions, with affective messages decreasing from 53% to 19% and open communication messages going from 35% down to 5%. Also, group cohesion messages increased from just 3% in the first online discussion to 71% in the last discussion. The distribution of face-to-face discussion messages remained stable between the first and last
discussions. Regarding teaching presence, the online and face-to-face discussions both had similar changes between the first and last discussions, with a decrease in facilitating discourse messages (84% to 52% for online discussions and 43% to 26% for face-to-face discussions), accompanied by an increase in participant direct instruction messages (13% to 43% for online and 8% to 40% for face-to-face). Based on participant interviews, the researchers believed this change occurred because participants became more comfortable with each other and the course content. As a result, students needed less facilitating discourse to guide discussion and were able to provide direct instruction to each other, which requires some subject expertise.

Haavind (2007) used social and teaching presence as a framework for analyzing three courses having highly collaborative online discussions. All three courses included activities specifically designed to promote social presence: introductory ice-breaker discussions in the first week and discussion forums for non-course topics. Regarding teaching presence, all three instructors presented rubrics or expectations for discussion postings, and these instructors explicitly taught students about engaging in collaborative dialogue. Additionally, discussion topics required dialog. However, she found no pattern for discussion moderator strategies.

Gorsky & Blau (2009) also used the CoI elements to compare the online discussions of two instructors teaching different sections of the same course. One instructor received very high student ratings on his course evaluations, and he had consistently high levels of social, teaching, and cognitive presence in his online course discussions. The other instructor received very low student rating on her course evaluations, and she had little social and teaching presence in her online discussions.
Although the low-rated instructor initially posted triggering messages to generate cognitive presence, her discussions lacked social presence, and she did not engage in teaching presence to guide the discussions. About halfway through the course, she essentially stopped posting in the discussions.

**Cognitive presence related to social and teaching presence**

A number of studies support the complimentary role of social and teaching presence in supporting cognitive presence. Shea & Bidjerano (2009a) surveyed more than 5,000 students in a multi-institutional online learning network using the CoI instrument (Arbaugh et al., 2008). Students were clustered into high, medium, and low social presence groups based on their reported social presence from the survey, and students were also clustered into high, medium, and low teaching presence groups based on their reported teaching presence. A three-way analysis of covariance was used to determine the extent to which social presence, teaching presence, and course type (fully online or hybrid) predicted cognitive presence, controlling for age. Social presence and teaching presence were both significant ($p < .001$) predictors of cognitive presence, with the students who reported the highest levels of social and teaching presence also reporting the highest levels of cognitive presence.

Shea & Bidjerano (2009b) randomly selected approximately 2,100 students and surveyed them using the CoI instrument (Arbaugh et al., 2008) to further understand the relationships among the three CoI elements. Structured equation modeling indicated teaching presence directly predicted cognitive presence, and social presence was mediated between teaching presence and cognitive presence. Additionally, responses on
three survey items were identified as making the most significant breaks with cognitive presence:

1. I felt comfortable participating in the course discussions.
2. The instructor helped focus discussions on relevant issues that helped me to learn.
3. Getting to know other course participants gave me a sense of belonging in the course.

Students rating any of these three items high were also likely to score cognitive presence high as well.

To further investigate the causal relationship among the three CoI elements, Garrison, Cleveland-Innes et al. (2010) administered the CoI instrument (Arbaugh et al., 2008) to 205 students in 14 different courses across two different programs. Factor analysis showed all items loaded onto the expected three CoI elements. Structural equation model also confirmed social presence as a mediating variable between teaching presence and cognitive presence. Teaching presence had a significant direct effect on both social presence and cognitive presence, and social presence had an indirect effect on cognitive presence. Additionally, this study found no differences by gender, but significant differences across programs, with the social sciences program having a stronger association with cognitive presence than the education program.

Archibald (2010) also surveyed 189 students in 10 different research methods courses using the CoI instrument (Arbaugh et al., 2008). Controlling for self-directed learning readiness, prior online learning experience, and prior collaborative learning.
experiences, social and teaching presence explained 69% of the variance in cognitive presence reported by these students.

Shea et al. (2010) further examined the relationship between cognitive, social, and teaching presence in two online courses that differed in the amount of instructor social and teaching presence. Course A had almost perfect correlation between instructor teaching presence and student social presence \((r = .97)\), and Course A also had almost perfect correlation between instructor social presence and student social presence \((r = .98)\). On the other hand, the instructor in Course B stopped posting to the online discussions after the second discussion of five discussions. Student social presence also declined, and the correlations with instructor social presence and teaching presence were not as strong \((r = .38\) for both) as found in Course A. However, cognitive presence in Course B equaled or exceeded cognitive presence in Course A in the last three discussions, the discussions where the instructor in Course B did not post. After further examination of instructor messages, Shea and colleagues suggested these two instructors posted different types of messages, which affected the discussions. The instructor in Course A posted messages that were encouraging, acknowledging, reinforcing, or introduced outside material, but the instructor in Course B posted messages that explained to students how they should participate in the discussions, such as critiquing the readings or integrating understanding with the real world.

**Developing cognitive presence**

Another important issue in the CoI literature is the difficulty moving online discussions to the higher phases of cognitive presence: integration and resolution. A
number of independent studies involving cognitive presence consistently identified two important factors increasing integration and resolution. Discussion activities requiring integration and resolution as an outcome generate more of these types of messages, and discussions with an active instructor moderator also have more integration and resolution messages (Garrison, 2007; Garrison & Arbaugh, 2007). These two factors reflect the two primary functions of teaching presence: the design and facilitation of the learning experiences.

To examine online discussion interaction and identify effective moderator discussion strategies, Pawan, Paulus, Yalcin, & Chang (2003) coded speech segments using the CoI cognitive presence indicators. The online discussions from three language teacher education courses centered on exploration (66%), with little integration (11%) and no resolution. One course had considerably more integration (25%) than the other two (2% and 8%). This course differed from the other two courses in three ways: (a) it clearly outlined discussion participation requirements; (b) the discussion activities required students to respond to each other, though these activities did not emphasis resolution as a goal; and (c) the instructor’s messages included triggering events, exploration, and integration, while the other instructors’ messages were almost exclusively triggering events.

Similarly, Del Valle et al. (2004) used the CoI cognitive presence indicators to study how online cognitive facilitation strategies are related to critical thinking. One group’s discussions were moderated with high cognitive facilitation strategies (Collison, Elbaum, Haavind, & Tinker, 2000), while social and motivational approaches were used to moderate discussions in another group. The group moderated with high-cognitive
facilitation strategies had a considerably higher percentage of sentence units coded with higher cognitive presence indicators (integration and resolution) than the other group.

Kanuka & Garrison (2004) used the CoI model to identify constructs and strategies for moving online discussions beyond sharing information. Based on the cognitive presence element, they first identified six constructs for facilitating higher learning in online discussions: discourse, collaboration, management, reflection, monitoring, and knowledge. Then, using a focus group of experienced online instructors, they reached agreement that these six constructs were necessary for facilitating higher learning in online discussions. Additionally, the focus group identified various strategies for each construct, though all members did not completely agree on all strategies.

Celani & Collins (2005) used the CoI cognitive presence indicators to analyze the depth of critical thinking occurring in a hybrid course for English teachers. They found very few instances of integration and no resolution. They did identify several opportunities where online discussions could have progressed to resolution, but teacher moderation was irregular and missing at those opportunities.

Garrison & Cleveland-Innes (2005) also concluded cognitive presence requires both a challenging learning task and strong teaching presence. Their study examined the importance of instructor involvement, overall interaction, and reflective assignments on deep versus surface learning. They purposely selected four courses because of differing levels of these three variables in each course. They surveyed these students, at the beginning and end of each course, to determine changes in students’ approach to learning (deep or surface). The greatest increase from initial surface learning to final deep learning
occurred in the course with high instructor involvement and requiring highly reflective assignments, even though this course had the lowest overall interaction.

Vaughan & Garrison (2005) investigated differences in cognitive presence between the online and face-to-face discussions of a hybrid college faculty development course. Face-to-face discussions were recorded and transcribed, and this transcript along with the online discussion postings were coded for cognitive presence. In both discussion forms, the majority of messages were coded as exploration, 61% for online and 60% for face-to-face. The face-to-face discussion had more triggering events than the online discussions, 13% and 8% respectively, but the online discussions had more integration messages than the face-to-face discussions, 16% and 2% respectively. Almost no resolution messages were found in the online or face-to-face discussions, 1% and 0% respectively. Additionally, 14% of online messages and 25% of face-to-face messages were not coded to any cognitive presence phase. Participant interviews indicated each discussion form supported a different aspect of cognitive presence. New discussion topics often began in the face-to-face discussions, but the online discussions allowed these topics to be further discussed beyond the limited class time. The lack of resolution was attributed to discussion activities that did not require collaborative resolution, as well as to the discussion coordinator not using direct instruction strategies to move the discussions to resolution.

Varnhagen, Wilson, Krupa, Kasprzak, & Hunting (2005) compared student experiences in three different online courses. Their data came from focused discussions with students, and emerging themes were interpreted with the CoI model. They found students valued peer relationships (social presence), especially in their first online course.
The students also described their online discussions as in-depth and valuable for increased understanding (cognitive presence). However, students had difficulties with and were frustrated in one of the three courses. This course had inadequate teaching presence, both in terms of instructional design (e.g., unclear expectations and poor visual examples) and course facilitation (e.g., lack of feedback and ineffective discussion facilitation).

Arnold & Ducate (2006) selected the CoI framework for their study of foreign language teaching methodology because this framework: (a) was specifically designed for analyzing online discussion, (b) was widely used for examining asynchronous CMC, and (c) included coding categories for social presence and cognitive presence. They coded the transcripts of five unmoderated online discussions using the CoI indicators for social and cognitive presence. In all five discussions, more social messages were found (58% – 67%) than cognitive messages (33% – 42%). Within the cognitive messages, exploration messages were the most common (53%), followed by integration (36%) and triggering events (10%). Very few resolution messages were found (1%), and the majority of those messages were in the fifth discussion (10 of 14 total resolution messages). They concluded students could reach advanced phases of cognitive presence without instructor moderation. Additionally, they noted the topic for the fifth discussion, which required student-developed solutions, may explain the larger number of resolution messages in this discussion compared to the other four discussions.

Gibbs (2006) examined three discussions using the CoI cognitive presence indicators. In the first two discussions, a guest speaker posted a position paper, and students posted their reactions to each paper. In the first discussion, most messages were
coded as triggering events (70%) or exploration (20%), with no messages coded as resolution. Messages in the second discussion centered on exploration (31%) and integration (33%), again with no resolution messages. However, the third discussion required students to take and defend a position on a controversial media topic. This discussion had some resolution messages (5%), mostly exploration (45%) and integration (30%) messages, and no messages coded as other which was a category used for messages with no cognitive presence content.

Kanuka, Rourke, & Laflamme (2007) examined how the instructional activity influences online discussion quality. They selected the CoI cognitive presence indicators to measure discussion quality because the CoI model was specifically developed for computer-mediated communication and the model includes defined coding indicators. They found students engaged in WebQuest and debate activities posted a higher proportion of discussion messages coded as integration, than students engaged in invited expert, nominal group, and reflective deliberation activities.

Using design-based research, Wang & Chen (2008) developed and evaluated an online discussion activity specifically for promoting high cognitive presence. Their design characteristics included a complex discussion task requiring peer expertise and scaffolding an important student presentation assignment. Additionally, they had a list of discussion rules to promote cognitive, social, and teaching presence, such as support your arguments with evidence and encourage others. They operationalized cognitive presence with the CoI indicators, except they did not include resolution because they believed this phase was achieved in the student presentation itself, not the discussion. Cognitive presence distribution was 22% triggering events, 41% exploration, and 31% integration.
Richardson & Ice (2010) compared critical thinking in the same class, which included three online discussions, each using a different instructional strategy: case-based, debate, and open-ended/topical discussions. To measure critical thinking in these discussions, they coded approximately 2,500 discussion messages with the cognitive presence indicators. Although 47% of these students reported a preference for the open-ended discussions because it allowed them more freedom, regression analysis indicated students performed similarly in all three strategies. Additionally, Richardson & Ice found high levels of integration with all three strategies: 78% case-based, 77% debate, and 60% open-ended. However, some differences existed within the cognitive presence indicators. Discussions for all three strategies included high but different percentages of convergence messages: 37% case-based, 54% debate, and 46% open-ended. Furthermore, the case-based strategy had a considerable number of messages coded as creating solution, 23% of all cognitive presence messages (114 of 507 messages), whereas this indicator was essentially non-existent in the other two discussions to 1% (5 of 493 messages) in the debate and 0% (0 of 596 messages) in the open-ended discussions.

However, Rourke & Kanuka (2009) conducted a literature review of learning in communities of inquiry, and their review indicated deep learning may not occur in communities of inquiry. Additionally, of the 57 articles they found that had CoI as the primary focus, only five articles measured learning, and four of those five articles measured learning using a single, closed-form survey question. They recommended more substantive studies of learning in communities of inquiry. In response, Akyol, Arbaugh et al. (2009) criticized the Rourke & Kanuka review because it omitted several studies which did indicate deep learning can occur in communities of inquiry and which
provided explanations about why deep learning may not occur in some communities of learning.

Subsequently, Akyol & Garrison (2010) evaluated learning in communities of learning. This study included two groups of students taking the same course, but one section was a hybrid course and the other section was a fully online course. Their content analysis showed the majority of student messages (52%), in both the hybrid and online sections, were coded as integration, one of the higher cognitive presence categories. The course instructor credited these high levels to a discussion activity which required integration and resolution, the selection of a theoretical perspective for student projects. A small, but not statistically significant, difference was found between the online and hybrid sections. The hybrid section had more integration messages and less triggering events and exploration, than the online section, which Akyol & Garrison attributed to weekly discussions in the hybrid course beginning with a face-to-face discussion not captured in the online discussion transcript. Student survey and interview data also confirmed high levels of perceived learning and satisfaction, and the course instructor expressed high satisfaction with the quality of the discussions and final student projects. Additionally, because course content included the CoI model itself, students described high levels of cognitive, social, and teaching presence in their interviews.

**Teaching presence categories**

A third major issue concerning the CoI model is whether teaching presence has two or three distinct categories. Garrison et al. (2000) conceptualized teaching presence as having three categories: instructional design and organization, facilitating discourse,
and direct instruction. However, Shea (2006) found support for just two categories, with facilitating discourse and direct instruction combined into a single category. Conversely, Arbaugh & Hwang (2006) found support for three categories. Garrison (2007) and Garrison & Arbaugh (2007) maintain teaching presence has three categories, emphasizing that facilitating discourse and direct instruction differ in that direct instruction requires subject expertise. To reconcile the differences between Shea (2006) and Arbaugh & Hwang (2006), Garrison (2007) and Garrison & Arbaugh (2007) suggested teaching presence categories are highly correlated with each other and that the undergraduate student subjects in the Shea (2006) study may not be sophisticated enough learners to distinguish between facilitating discourse and direct instruction.

**Two categories and directed faciliation**

Shea, Swan, Li, & Pickett (2005) and Shea (2006) both reported a study to validate a survey tool for teaching presence developed by Shea, Fredericksen et al. (2003). The survey was presented to a randomly selected group of approximately 20% of all students enrolled in SUNY Learning Network courses in the Summer 2004 semester. They obtained a 93% response rate, from 2,036 of 2,181 students. However, their initial factor analysis did not confirm the expected three-factor solution for the three teaching presence categories. Instead, a two-factor solution was indicated, with instructional design and organization as one factor and both discourse facilitation and directed instruction combined, which they termed *directed facilitation*, as the other factor. This study also investigated the relationship between learning community and teaching presence, as well as other selected demographic variables. Multiple regression analysis
indicated that 62% of the variance of student sense of learning community could be accounted for by instructional design and organization, directed facilitation, and gender, with coefficients of .14, .67, and -.03 respectively.

Shea, Li, & Pickett (2006) performed the same study with data from 1,067 students enrolled in the Fall 2004 semester, and they obtained similar results. Factor analysis again indicated two factors: instructional design/organization and directed facilitation. Multiple regression analysis indicated that 64% of the variance of student sense of learning community could be accounted for by instructional design and organization, directed facilitation, and full-time employment status, with coefficients of .09, .71, and -.05 respectively.

**Three categories**

However, Arbaugh & Hwang (2006) surveyed 190 graduate business students using the same teaching presence survey tool developed by Shea, Fredericksen et al. (2003), and they validated the three categories of teaching presence: instructional design and organization, facilitating discourse, and direct instruction. Factor analysis of their initial model did not fit well. However, after removing three items which loaded on more than one factor and one item which did not significantly load on its intended factor, they obtained a good fit. (These removed items involved identifying areas of agreement/disagreement, keeping participants on task, and providing useful information.) The authors noted that although these three components of teaching presence were distinct, they were also highly correlated with each other.
Furthermore, using data from 30 online courses at six different colleges and universities, LaPointe & Gunawardena (2004) tested a model of influences on self-reported peer interaction and perceived learning. Factors included student-perceived teaching presence (measured using an author-developed survey based on the CoI teaching presence indicators), self-construal, task design, course requirement, and prior CMC experience. Factor analysis of the author-developed teaching presence survey produced the expected three teaching presence categories: instructional design and organization, discourse facilitation, and direct instruction. Additionally, their final adjusted regression model included only two significant predictors: perceived teaching presence and prior CMC experience. Teaching presence had a .23 direct effect on peer interaction, .24 direct effect on perceived learning, and a total .39 effect on perceived learning.

**CoI instrument**

A series of studies focused on developing, refining, and validating a survey tool for measuring social, teaching, and cognitive presence. The resulting CoI instrument provides a valid and reliable measure for the CoI model (Arbaugh, 2008).

**Shea and colleagues survey**

Shea, Fredericksen et al. (2003) created an initial survey by writing questions around on the teaching presence indicators developed by Anderson et al. (2001). They piloted this questionnaire to all students enrolled in SUNY Learning Network courses in the Summer 2002 semester. Although they received 1,150 survey responses, this was only a 15% response rate, so they considered their findings preliminary and not
generalizable to all SUNY Learning Network students. Each category of teaching presence was positively correlated with student satisfaction and reported learning:

- **Instructional Design and Organization:** $r = .635$ for satisfaction and $r = .588$ for reported learning
- **Facilitating Discourse:** $r = .64$ for satisfaction and $r = .58$ for reported learning
- **Direct Instruction:** $r = .64$ for satisfaction and $r = .61$ for reported learning

Shea, Pickett, & Pelz (2003) administered this survey again to all students enrolled in SUNY Learning Network courses in the Spring 2003 semester. This time they had a 31% response rate, receiving 6,088 responses, which was a much better response rate than their pilot study, but they considered this rate only high enough to offer suggestive, not conclusive, results. Like the pilot study, each category of teaching presence was positively correlated with student satisfaction and reported learning, and their results were remarkably similar to the pilot results:

- **Instructional Design and Organization:** $r = .64$ for satisfaction and $r = .60$ for reported learning
- **Facilitating Discourse:** $r = .61$ for satisfaction and $r = .58$ for reported learning
- **Direct Instruction:** $r = .63$ for satisfaction and $r = .61$ for reported learning

Shea, Pickett, & Pelz, (2004) modified this survey tool to collect faculty perceptions of their own teaching presence. They administered this survey to all instructors teaching a SUNY Learning Network course in the Spring 2003 semester, receiving a 60% response rate with 366 responses. Faculty rated themselves high in all
three teaching presence categories: 93% percent faculty agreeing or strongly agreeing they had provided good instructional design and organization, 82% for facilitating discourse, and 89% for direct instruction. However, when comparing faculty to student ratings, students rated these same faculty lower in all three teaching presence categories: 85% for instructional design and organization, 75% for facilitating discourse, and 78% for direct instruction. Additionally, this study compared ratings of faculty who had attended a workshop on teaching presence to faculty who had not attended this workshop. Faculty who had attended the workshop were rated higher by their students in all three teaching presence elements, as well as rated higher on student satisfaction and reported learning. The authors were encouraged that their workshop improved teaching presence, satisfaction, and reported learning, and they planned to modify this workshop to help faculty become more aware of their behaviors regarding student expectations.

**Garrison and colleagues survey**

In addition to the work by Shea and his colleagues, Garrison, Cleveland-Innes, & Fung (2004) studied anticipated role adjustments of first-time online students from two perspectives: compared to their face-to-face experiences and compared to their perception of experienced online students. To do so, they constructed a survey instrument from the indicators for all three CoI elements, and they administered two forms of that survey to 65 students in six different online courses. When comparing anticipated role adjustments to their face-to-face experiences, students were focused on social and teaching presence, whereas students were focused on cognitive presence when comparing to experienced online students. The authors interpreted this finding as a student perception that online
learning requires more personal student responsibility and has a greater emphasis on deep learning than face-to-face learning. Regarding validating the questionnaire, the resulting factor structures corresponded well to the CoI model, with most items loading in the anticipated CoI elements. A revised instrument was constructed using the top loading items as well as revised wording for several items identified as ambiguous.

**Combined survey**

In Arbaugh et al. (2008), the authors and researchers of two instruments for measuring CoI presence (Shea, Fredericksen, et al., 2003 and Garrison et al., 2004), combined items from both questionnaires and developed new items to fully capture each CoI presence. For validation, this 34-item survey was administered to students taking online courses at several institutions and in a variety of disciplines, with 287 students responding for a 43% response rate. Factor analysis supported the instrument design, with items loading on the expected factor for each presence.

A number of additional studies have further validated this tool, called the CoI instrument (e.g., Akyol, Ice, Garrison, & Mitchell, 2010; Arbaugh et al., 2010; Bangert, 2009; Boston et al., 2009; Diaz, Swan, Ice, & Kupczynski, 2010; Garrison, Cleveland-Innes et al., 2010; Shea & Bidjerano, 2009b). With this tool, researchers have a valid and reliable measure for the CoI model.

**Summary**

The CoI model is a powerful framework for understanding online discussions. It is conceptually grounded in the research literature, was specifically developed for courses
using asynchronous online discussions, and has been verified through qualitative and quantitative measures (Garrison et al, 2010). The CoI model also has been widely adopted and adapted as a research framework (Swan & Ice, 2010). However, no research in the area of discussion thread development has been conducted using the CoI model as its research framework.

In addition to being a well-established framework for online discussion research, the CoI framework offers several other advantages and opportunities for the current study. In terms of methodology, this model already has a developed, tested, and reliable set of indicators for content analysis of online discussions, particularly the direct instruction indicators. For moderating online discussion, CoI teaching presence is a vital component for developing social presence and cognitive presence. As such, the teaching presence indicators both describe and prescribe moderator activities for effective online discussions. Regarding the CoI model itself, teaching presence is the least researched CoI element (Arbaugh, 2007; Arbaugh & Hwang, 2006), and the current study added to our understanding of teaching presence by examining how the direct instruction indicators influence student replies to the instructor and other students as well as student viewing of these messages.

**Moderator Literature**

This section reviews the literature on moderating asynchronous online educational discussions, the central focus of the current study. It includes studies which focus on the discussion moderator, typically the course instructor. It does not include studies on moderating synchronous discussions or chats, unmoderated or student moderated.
discussions (except when comparing instructor moderated discussions), or non-educational discussions.

This section is organized into three major sections. In the first section, moderator is defined and described, and the challenges of successfully moderating educational discussions are reviewed. In the next section, quantitative aspects of moderating are examined, such as the frequency or number of moderator postings. Finally, the qualitative side of moderating is reviewed, such as the types of messages moderators post and the influence these messages have on the discussion.

**Moderator challenges**

Like classroom discussions, online educational discussions frequently have at least one identified person, called a *moderator*, who is responsible for guiding the discussion toward worthwhile educational outcomes. Winograd (2002) described a discussion moderator as a person, often the course instructor, “who is sensitive to the individuals and dynamics that make up the conference and through this sensitivity can decide when a conference is doing well or poorly and deciding on actions to take if a conference is going awry” (p. 53). And, Collison et al. (2000) defined an online discussion moderator as “a person charged with fostering the culture and the learning in an online dialogue or in a netcourse discussion area” (p. xiii).

However, Xin & Feenberg (2006) cautioned, “But managing online discussion is rather more difficult and time-consuming than might be expected on the basis of the loose analogy with the classroom. Online discussion is paradoxical. It consists in a flow of
relatively disorganized improvisational exchanges that somehow achieve highly goal-directed, rational course agendas” (p. 2).

For both novice and experienced online instructors, the moderator literature clearly recognizes faculty concerns and difficulties regarding effectively moderating online educational discussions. Conrad (2004), Choi & Park (2006), and Connolly et al. (2007) examined the experiences of online instructors teaching their first online course. In all three studies, faculty reported difficulty moderating successful online discussions, despite receiving prior technical and pedagogical training. Additionally, faculty eventually reverted to traditional classroom discussion techniques, using teacher-centered approaches focused on delivering content.

Winograd (2000) also examined the effect of moderator training but coupled with ongoing support. In the two forums without an identified moderator, student participation was minimal and eventually disappeared completely. One student posted,

DO NOT WASTE YOUR TIME READING THIS! I am just sending an e-mail to fulfill the three-a-week requirement. Unfortunately, I have nothing to say or ask so I am just writing about my writing about nothing. (p. 129)

On the other hand, with even a low degree of moderating, a third forum, which had the trained faculty moderator and ongoing support, formed into a learning community with significantly more participation and satisfaction, and eventually allowed the instructor to participate more as a member than an authority.

*Improvement with moderator experience*

Even many experienced online faculty have difficulty moderating their online discussions, though improvement comes with experience. Liu et al. (2005) interviewed
28 experienced online instructors about their concerns teaching online. Among those concerns, faculty expressed concerns about not knowing discussion moderation strategies to promote peer interaction, build social relationships with students, and move discussions from sharing information to knowledge construction. About 20% of the students in these courses did not think their instructors facilitated class discussion so as to foster learning, and students also rated social connections, both with their instructors and with other students, low.

Maurino et al. (2008) also interviewed 30 experienced online instructors about their online discussion goals. Only 47% of these instructors considered their discussions successful. Almost all interviewed faculty said they were trying to use online discussions to reproduce classroom discussions. Some faculty also mentioned the difficult they had transitioning from classroom lecturer to discussion facilitator, and some instructors stated they did not know how to moderate online discussions.

However, Beaudin (1999) surveyed moderators, both experienced (taught five or more online courses) and less experienced, about techniques recommended and used to keep discussions focused. The top four techniques were: (a) carefully designing good questions, (b) providing guidelines for learners to use when preparing their responses, (c) rewording the question when discussions go off topic, and (d) providing discussion summaries. With 10 of 13 techniques, statistically significant differences ($p < .05$) were found between experienced moderators and less experienced moderators. In all differences, experienced moderators rated the techniques less important than their less experienced counterparts. Beaudin concluded that as moderators gain experience, they
change their moderating techniques and that online moderating is a skill which is developed.

Furthermore, Morris et al. (2005) compared the roles novice and experienced online instructors took in discussions. They found experienced online instructors posted more than ten times the number of messages as novice online instructors (193 messages per course compared to 19 messages per course). Additionally, the experienced instructors tended to focus on intellectual tasks, but the novice instructors focused on managerial tasks.

De Latt, Lally, Lipponen, & Simons (2007) also compared a first-time online instructor to an experienced instructor when both instructors were moderating the same discussion forums but with different students. The experienced instructor’s discussions had high participation from all members, and all participants, including the instructor, acted as both learner and teacher. When interviewed about his teaching style, this instructor expressed the need to balance being present to guide learning and allowing students to explore on their own. Whereas with the first-time online instructor, discussion participation declined over time. Several students eventually dominated the discussions, and in the last discussion, the instructor did not participate at all. In the follow-up interview, this instructor said she was overwhelmed and uncertain about guiding the discussions, especially about handling one very dominant student.

**Student perspective of moderators**

Students have reported problems with their instructors moderating online discussions as well. Youngblood, Trede, & Di Corpo (2001) surveyed graduate students
about their online courses. Four items relating to online discussions were rated as important by the students: use questions for discussion (80%), monitor participation (80%), build on others' comments (78%), and move discussion forward (77%). However, when students rated their instructors’ performance of these tasks, only about half or fewer rated instructor performance as done well: use questions for discussion (44%) and monitor participation (53%). Specific values for the other items were not reported but were less than 40%. Students in this study also identified limited instructor participation as one factor hindering their participation and learning.

Similarly, Lim & Cheah (2003) examined the discussions of experienced online instructors. Analyzing survey, focus group, and discussion data, they found students considered the instructor’s role to be more important than they actually experienced. The largest difference was with the instructor’s roles during the discussion, as opposed to before or after the discussion. On a four-point scale, where 1 is low/never and 4 is high/always, these roles were considered moderately important by the students (3.1) but close to seldom observed (2.32). Even for the item about responding to queries, which Lim & Cheah considered a basic and necessary instructor role, students only reported observing this instructor behavior between seldom and frequently (2.66), indicating the instructors either ignored or may not have even read student queries. All other during-discussion items scored still lower, closer to seldom observed. The authors recommended providing instructors with more specific guidelines and recommendations, including more active discussion participation.

Dennen (2007) compared faculty and student rankings of 19 instructor actions which online teaching experts considered relevant to online learning. Although both
groups considered all 19 actions important, students ranked posting to the discussion board as the second most important instructor action, whereas faculty only ranked that action as twelfth most important. Additionally, students ranked providing timely feedback more important than faculty ranked this action, fourth for students and ninth for faculty. However, faculty ranked providing extensive feedback most important (first), but students only ranked it ninth in importance.

**Moderator performance**

Finally, several studies directly examined faculty discussion participation and moderation and also found shortcomings. Bliss & Lawrence (2009b) reported an extreme example. Reviewing online discussions in 33 course sections, they found a range of instructor presence, but they also reported one course where the instructor only posted one discussion message during the entire course.

Blignaut & Trollip (2003a) examined both quantity and quality of instructor postings. In all categories, faculty postings were extremely low when compared to the expectations expressed by experienced faculty. For example, for the entire semester, studied faculty asked only 0.7 questions requiring student reflection per student, where the expectation was six questions per student. Similarly, faculty posted only 0.8 corrective messages, where the expectation was five postings. The researchers offered several explanations for this situation, including the need for faculty development to help faculty understand the importance of their responsiveness.

Angeli, Valanides, & Bonk (2003) investigated the extent to which online discussions could support critical thinking about difficult cases encountered by
undergraduate student teachers in their early field experiences. In addition to the technical training received by everyone in the course, mentors (six instructors, two conference moderators, and the early-field director) received additional training about online moderating, which distinguished between low-level mentoring (social acknowledgments, general advice, feedback, direct instruction, questioning, and modeling) and high-level mentoring (cognitive task structuring, pushing to explore, cognitive elaboration, fostering reflection, and encouraging articulation). Despite this training, mentors posted less than one message per student case (117 mentor messages for 124 student cases), and only 1% of mentor postings incorporated high-level mentoring, all of which were cognitive task structuring. Almost half of student postings (49%) were unsupported advice and personal opinions, and 35% were social acknowledgements. Only 9% of student postings were requests for clarification or attempts to further dialog, and 7% were justified opinions and claims. These authors also speculated that better moderator training and accountability may have improved student thinking because undergraduate students are usually not disposed to thinking critically about an issue and may need effective scaffolding to do so.

**Quantitative aspects of moderator activity**

To understand and improve online discussion moderation, one research line examines quantitative aspects of moderator participation, such as the number or frequency of moderator discussion postings. This research converges on several common findings. Instructor participation at either extreme, either too much or too little, affects learner-learner interaction and discussion quality. When the instructor posts too often or
responds too quickly to student messages, the discussion tends to become a two-person exchange between the instructor and student, often resembling classroom recitation. At the other extreme, too little instructor involvement is similar to an unmoderated discussion, with students posting simply to meet grade requirements and not moving the discussion toward productive educational outcomes.

Vandergrift (2002) succinctly described moderator participation as balancing restraint and presence, which she called “restrained presence” (p. 83). As she further explained, the moderator may want to respond immediately to an insightful, confused, or incorrect student message, but these actions will not promote student ownership of the discussion. However, instructor involvement is needed at other times, such as to provide information or guide the discussion. She added that it is not always clear when to exercise restraint and when to intervene. Winograd (2002) also described a balance between posting too soon and waiting too long until the students have lost interest. Additionally, he recommended higher moderator participation as a discussion begins, but as the discussion progresses, the moderator should reduce participation to avoid stifling student participation.

Tagg & Dickinson (1994) studied the effect of facilitator messaging on student participation. They found the relationship was more complex than simply posting more messages, responding promptly, or encouraging students. Although they found no single, simple combination for facilitating an online discussion that encouraged student participation, the most successful discussions shared factors which created the impression the instructor was paying constant attention to student contributions. These factors included: instructor messages equal to about one-third of total messages, reasonably
prompt initial responses, rapid subsequent responses, and dispersed responses throughout the discussion.

Bullen (1998) investigated critical thinking in online discussions. He found that all students made postings at some level of critical thought, but no students were consistently posting messages at the highest levels. Both instructor and students in this study reported their discussions lacked interaction, with students not responding to other student messages. The researcher provided several explanations for this lack of interaction: context, design, and facilitation. In terms of facilitation, the instructor did not participate consistently. The instructor tended to post sporadically, posting many messages at once rather than a few messages each day or two. Students reported that they did not think the instructor was present in the discussion, and more leadership from him was needed.

An, Shin, & Lim (2009) also investigated the effect of instructor postings on student interaction. In two sections of the same online course, the instructors responded to each student's initial message, and those discussions were teacher-centered with students responding to the instructor's messages, not to the student messages. However, in another section of the same course, the instructor did not respond to the initial student messages, and those discussions had more evenly distributed participation as well as more students responding to other student messages. Similarly, Daley (2002) found if the instructor entered the online discussion too early, before students had the opportunity to discuss among themselves, the students responded to the instructor as an authority figure, rather than a group member.
**Extent of moderator participation**

Several studies examined and categorized the extent to which moderators participated in online discussions and the effect of these levels of participation on the discussion. Mazzolini & Maddison (2003) conducted a study on the effect of instructor postings on student participation. They found instructors who posted frequently, referred to as sages, had fewer student discussion postings than instructors who posted moderately (called guides) or who posted infrequently (called ghosts). However, students reported the least satisfaction with the online discussions where the instructor posted infrequently, the ghosts.

Morris et al. (2005) also examined instructor participation in online discussions, and they identified three types of instructors based on the number of instructor posting made in a course. The lowest posters, called online monitors, posted less than 75 messages per course. At the other extreme, the online teachers posted more than 450 messages per course, sometimes responding to almost every student posting. The online facilitators were in the middle, posting between 125 – 275 messages each course. Additionally, the online facilitator group had more student postings in their discussions than either of the other two types.

Using a comparative case study method, Dennen (2005) found active involvement of the instructor in the online discussion was related to a higher occurrence of dialogue, as measured by referencing past messages in a posting. Instructor presence ranged from absence to domination, and she concluded that a moderate presence was best because problems arose when the instructor was too absent or dominant. When too absent,
students did not expect that their instructors would read their postings, but when too
dominant, students wrote primarily to their instructors, not to other students.

Subsequent work by Dennen (2007) furthered explored these relationships. One
instructor who posted frequently (51.3% of all discussion messages and often replying to
student postings within a few hours) had many discussion threads which were two-person
dialogues between the instructor and one student, with the instructor usually ending the
dialogue. On the other hand, another instructor only posted six messages during the entire
course. Students in this instructor’s course did not meet minimum posting requirements,
were posting to meet the stated requirements, and were not discussing the same topics at
the same time.

Correlation between instructor and student participation

Although extreme instructor discussion participation can negatively affect online
discussions, overall instructor participation is positively correlated with student
discussion participation. Analyzing online discussions involving 14 instructors and 249
students, Kirkiakidis & Parker (2008) found a significant correlation between the number
of instructor and student messages \( r = .763, p < .01 \). They concluded students
participate more in discussions when the instructors actively participate also.

Similarly, Bliss & Lawrence (2009b) examined 33 courses and almost 12,000
discussion messages, and they also found instructor presence in online discussion was
positively correlated with the percent of students who participated in the discussions, the
quantity of student messages, and the discussion thread depth. However, instructor
presence was not correlated with the quality of student messages.
Qualitative aspects of moderator activity

Although the number or frequency of moderator postings is an important factor affecting an online discussion, another research line focuses on the content or types of messages moderators post and the influence those message types have on the discussion. Many authors have published advice, guidelines, and recommendations for moderating online educational discussions. Based on a review of this literature, Winograd (2000, 2003) found much similarity among articles describing the activities of a successful online discussion moderator. These activities included: encourage participation, end topics, focus off-topic threads, mention students by name, model appropriate behavior, praise, present new content, provoke controversy, reinforce good behavior, summarize discussions, and weave. For additional published articles on this topic, see Davie (1989); Eastmond (1992); Eisley (1992); Berge (1995); Paulsen (1995); Berge & Muilenburg (2000); Knowlton, Knowlton, & Davis (2000); Goodyear, Salmon, Spector, Steeples, & Tickner (2001); O'Grady (2001); Youngblood et al. (2001); Winograd (2002); Tu & Corry (2003); Murphy et al. (2005); and Rovai (2007).

Categorizing instructor messages

Several studies went beyond describing effective moderating activities. These studies developed coding schemes for categorizing instructor message content, and then used those schemes to measure the extent to which instructors were posting different types of messages.

Anderson et al. (2001) examined instructor discussion postings in two online courses: one in health and the other in education. Using the CoI teaching presence
categories, they found most messages included direct instruction: 77% in the health
course and 88% in the education course. The fewest were instructor messages containing
instructional design and organization: 22% for health and 38% for education. And, 43%
of the instructor messages in the health course and 75% in the education course included
some facilitating discourse. (A message could be coded into more than one category.)

Blignaut & Trollip (2003b) also developed a coding scheme for classifying
instructor messages in online discussions, and they then tested this scheme by coding
2,746 instructor postings from 18 different instructors teaching business and education
courses. They reported the following message distribution: administrative (22.1%),
affective (14.3%), corrective (4.9%), informative (23.0%), Socratic (10.3%), and other
(25.3%). From student interviews, students believed all these message types were
important and valuable, but some students were intimidated by the Socratic questions and
would not reply to those messages.

Dixson et al. (2006) analyzed how different instructor interventions affected the
quality of the final discussion product, which was a student-group answer. They
organized instructor messages into twelve different categories (e.g., shows solidarity,
agrees, gives opinion, asks for information). No difference was found between the type of
instructor postings and the final product quality. However, Dixson and colleagues
speculated instructor postings had an indirect effect of guiding student thought because
most instructor postings were offering information about the assignment, procedure, or
discussion direction.
Disagreements

Handling disagreement is an important moderator skill if discussions are to move from information sharing to knowledge construction. Kanuka & Anderson (1998) found most student messages were simply an exchange of information which increased students’ knowledge base but did not change or alter student views. Occasionally however, student disagreements lead to further discussion which did alter student views. However, most disagreements were ignored and not pursued, losing the opportunity to change views. Additionally, no instructor moderator was available to help identify disagreements, focus attention on those disagreements, and facilitate the discussion around disagreements, so students continued participating at a comfortable level, which did not challenge their existing views. Similarly, Daley (2002) found a critical moment occurred in online discussions when a student disagreed with or challenged another student’s thinking. After that juncture, the class moved to a higher learning level, where they made conclusions and decisions.

Xin & Feenberg (2006) developed a three-phase model describing online educational discussions and emphasizing the pivotal change which can occur when disagreements arise. According to their model, discussions begin with establishing shared or accepted knowledge. At this phase, moderators frequently use recognition to both encourage and accept student contributions. As the discussion progresses, disagreements emerge and are negotiated. Moderators often use prompting at this phase to identify these disagreements and direct learners toward resolution. At the end of the discussion process, students have expanded their accepted knowledge to include these negotiated agreements. Summarizing and weaving are common moderator activities during this phase.
Although students surveyed by Hewitt (2005) indicated they might not participate in discussion threads which had become too confrontational, several studies support an active discussion moderator presenting opposing viewpoints and challenging students. Gerber, Scott, Clements, & Sarama (2005) studied the effect of a challenging instructor stance on referencing and reasoning in student postings. In forums where the instructor took on a challenging stance, students were more likely to post messages referencing readings or research, than in forums where the instructor took on a non-challenging stance but provided support and encouragement. However, the relationship between stance and reasoning was more complex. In forums with lower-order cognitive (Bloom & Krathwohl, 1956) outcomes, such as defining a concept, a challenging instructor stance elicited more student messages which included a reasoned argument or statement, than in the non-challenging forums. Instructor stance had no effect on student reasoning in higher-order forums.

Topper (2005) was not satisfied with the discussions in his online courses. He described these discussions as narrow (short thread depth) and primarily students replying to his initial discussion question with little learner-learner interaction. In subsequent courses, he expanded his moderator messages to present opposing viewpoints and ask focusing questions, as well as providing students with his discussion expectations and guidelines. Having made these changes, he found his discussions threads were deeper and more complex, with students frequently replying to other student messages.

Lowes, Lin, & Wang (2007) compared online discussions from four sessions of the same course, and they found very different interaction patterns. From social network analysis, one session (Sess4) had broad student participation, but another session (Sess1)
was dominated by just a few participants, even though the instructors in both sessions were active in the discussions. Content analysis indicated Sess1 participants, both instructor and students, tended to post praise and encouragement messages. However, the Sess4 instructor questioned and challenged, and students tended to post new information. Further analysis indicated praise/encouragement messages had a very low likelihood of getting a response (21%), and those responses tended to be more praise and encouragement (60%). Questioning/challenging messages, however, were much more likely to get a response (51%), and those responses were most likely to be new information (56%). Additionally, students in Sess4 reported higher satisfaction with both the course and discussions, than students in Sess 1.

Authority

A number of studies examined the extent to which instructors exercised their authority while moderating online discussions as well as the effect of this moderator behavior on their discussions. In discussions where the instructor took on an expert leader role, discussions were teacher centered, mostly with learner-instructor interaction and little learner-learner interaction. However, when the instructor participated more as a student peer than an authority, discussions were more student centered with many learner-learner interactions.

McGrath (1998) presented the teacher’s role in an educational asynchronous discussion as simply “one voice among many” (p. 293). She suggested that the teacher may start a discussion with an initial question, but the students determine its direction. Students were free to respond when and how they choose, even ignoring teacher
comments and questions. Students started and developed multiple conversations, “beyond the teacher’s control” (p. 293). She also suggested that the teacher too may choose not to take part in the conversation.

Although some instructors may moderate their online discussions to promote this level of freedom, the research indicates the instructor moderator has considerably more authority and influence than McGrath (1998) described. For example, Gruber (1995) reported that after a heated discussion around gender differences, the instructor, who had been absent during the discussion, posted her impressions of the discussion. Students interpreted that message as disapproving and adjusted future discussion postings to be less vigorous and critical. Likewise, in a study by Dykes & Schwier (2003), students reported a similar situation where they interpreted instructor comments as implying they had violated a discussion rule. These students became less assertive and more cautious about challenging other students’ ideas. At the time, the instructor was not aware of this change. Additionally, students surveyed by Hewitt (2005) indicated they might not participate in discussion threads where an instructor posted a message the student considered a final answer.

Howell-Richardson & Mellar (1996) compared two online discussion groups: one primarily student led with limited instructor moderation and the other with the instructor as expert and leader. The student moderator made frequent but short messages, whereas the instructor in the expert/leader discussion made less frequent but much longer messages. A larger percentage of students participated in the student-moderated discussion than in the expert/leader discussion. The message maps differed as well. The student-moderated discussion had a complex map with considerable learner-learner
interaction, but the expert-leader discussion was linear with most threads started by and ending with an instructor posting.

Schrire (2006) also found teacher-centered discussion threads resembled more traditional classroom discussion where the instructor initiated, student responded, and instructor provided follow-up evaluation and feedback. In contrast, synergistic threads, where all messages connected to each other, had a more even distribution of initiate, response, and evaluation moves among instructors and students.

In a somewhat related study, Vonderwell & Zachariah, (2005) described online discussions where a student had content expertise and assumed an expert role in the discussion. In these situations, the discussion became an exchange between the student expert and other students, similar to exchanges where the instructor assumed an expert role.

Dennen (2007) studied instructor positioning by analyzing instructor postings and student replies to these postings. She found students readily accepted the instructor’s positioning. One instructor presented himself as the content expert, and student replies to this instructor were either questions for the instructor to answer or ideas for instructor feedback. However, a different instructor positioned himself more as a peer learner. Although students generally responded to this instructor as a more experienced peer, some conversations, such as administrative details, required this instructor to switch to a more authoritative position.

Kian-Sam & Lee (2008) examined the online discussions of Malaysian students. They found most students answered the instructor’s questions, and only a few students responded to other students. Additionally, 60% of student messages were coded in the
lowest levels of knowledge construction: give opinion, ask for opinion, and knowledge
telling. The authors noted the Malaysian educational system has a very didactic approach,
and they attributed these discussion outcomes to student and instructor experiences in that
didactic system.

On the other hand, Ahren, Peck, & Laycock (1992) studied the effect of three
instructor discourse styles (questions, statements, and conversational) on the quality of
student participation, defining quality as the extent to which student messages referenced
other student messages and were supported by external evidence. In the questions
condition, the instructor formally posed questions to the group as a whole. Similarly, the
instructor formally posted statements to the group in the statements condition. However,
in the conversational condition, the instructor used a more informal conversational style
with spontaneous responses directly to individual students or individual comments. They
found the conversational condition produced the highest percentage of both referenced
messages and supported messages. Furthermore, the questions condition produced the
lowest percentages in both referenced and supported messages. However, Williams &
Humphrey (2007) found messages with a broad intended audience were more likely to
receive a response than messages directed at an individual.

To better study the role of expertise in online discussions, Lui et al. (2007)
developed the idea of “expertise presence” which they defined as “a persistent
contribution of knowledge relevant to the purposes of the computer conferences” (p.
1024). Their indicators for expertise presence included: answering questions, providing
feedback, sharing knowledge, and identifying misconceptions. They also examined
expertise presence over time in three online courses, and they found it varied among the
discussions in these courses. One course had a fairly consistent and stable expertise presence in its discussions, primarily because of consistent instructor contributions. In the other two courses, instructor contributions were inconsistent. Although student contributed expertise presence in the first half of one course, expert presence in the rest of this course and in the other course was volatile and sometimes almost nonexistent.

**Summary**

Effective moderators are critical for online educational discussions, but online instructors continue to report difficulties moderating their online discussions. The moderator literature has identified an active, but not dominating, moderator, as one important characteristic of effective online discussions. This literature has also identified some moderator behaviors, such as handling disagreement and exercise of authority, affecting online discussions. The current study added to our understanding of moderator behaviors influencing online discussions by examining how the CoI direct instruction content of instructor messages influenced online discussion thread development.

**Thread Development**

Online discussions are created as each participant reads and replies to other participants’ messages, and each discussion message can affect future messages (Chen & Chiu, 2008). A discussion thread is “a hierarchical arrangement of linked notes in which each successive contribution is written as a response to an earlier note in the discussion” (Hewitt & Teplovs, 1999, p. 1). Thread development is one line of CMC research that examines “growth patterns of computer conferencing threads” (Hewitt & Teplovs, 1999,
A discussion thread grows when someone responds to a message in the thread, continuing and extending the discussion thread, but threads die or terminate when replies stop (Hewitt & Teplovs, 1999). Understanding how discussions evolve, message by message, may improve discussion quality (Chen & Chiu, 2008).

A message fulfills two goals; it communicates information and evokes a response (Xin & Feenberg, 2006). In an early work using message maps to analyze online discussions, Levin et al. (1990) noted, “It becomes apparent that some messages trigger off a large set of other messages” (p. 199). At the other extreme, Hewitt (2005) used the term “clunkers” (p. 573) to describe messages that stop discussions, such as superficial comments and pontification.

Thread length

Though long discussion threads do not necessarily signify quality discussions, short threads indicate limited discussion interaction. Guzdial (1997) and Hewitt & Teplovs (1999) both examined thread length in online educational discussions. Both studies found very short threads. Guzdial reported the average discussion thread length was 2.8 messages, and Hewitt & Teplovs reported a similar average length of 2.69 messages. That is, the average discussion thread is not much more than one message and a single reply. Guzdial expressed concern that with such short exchanges “in-depth analysis and discussion may not be taking place” (p. 83).

MacLean & Asher (2009) were also concerned about short threads and noted some student will simply post independent messages to meet minimum posting requirements. They used regression analysis to identify factors that might affect average
thread length. The relationship was more complicated than the instructor simply posting more messages or asking more questions. The placement of instructor messages within a thread was a significant factor. A level-1 instructor message—that is, an instructor replying to a student message which started a thread—had a positive effect on thread length. Instructor messages placed deeper in the discussion thread increased thread depth as well, though this factor would be difficult for the instructor to control if students were not responding already. Overall, if an instructor consistently participated in a discussion thread, the thread continued to grow. To test these findings, the researchers intentionally increased instructor participation in certain discussion threads in another set of courses. With this strategy, they were able to increase average thread length in these discussions by one additional message, from 3.1 in the original courses to 4.1 in the manipulated courses.

De Leng et al. (2009) reported thread length as part of their evaluation of a new online learning activity for medical residence. These researchers considered five messages or more to be long threads, indicating substantial exchanges among students. In these online discussions, they found 40% of discussion threads were five or more messages long in one discussion group, and 75% of discussion threads were five or messages long in a different group.

**Unread-notes practice**

To investigate why many online educational discussions had short threads containing only a few messages, Hewitt (2003) examined the effect of online discussion habits on thread development. He found students tended to read and reply to unread
messages. This practice favored elongated threads, where one topic is discussed in depth but at the expense of discussing other, possibly more important, topics. It also led to unintentional thread abandonment, when a discussion thread was not finished but ignored if it had no recent posting activity. To prevent these unintended outcomes, he recommended a skilled moderator to direct student attention toward neglected topics and maintain focus on existing threads until fully discussed.

Hewitt (2005) continued his research on the unread-notes practice. In addition to confirming the majority of students (9 of 14 students) used an unread-notes approach to online discussions, he ran a computer simulation mimicking this student response behavior, and the simulated thread patterns matched those of an actual course. In his simulation, 95% of threads ended simply because of the unread-notes practice. The 5% remaining threads were started just before the simulation ended, and he extrapolated that those remaining threads also would have ended had the simulation run longer. He concluded that the unread-notes practice may appear a logical approach to online discussion participation, but it allows participation without the larger responsibility of directing the discussion toward educational goals. Although effective discussion moderating can reduce these effects, he emphasized developing a culture where all discussion participants focus on productive discussion outcomes.

**Message content and student replies**

To better understand how the content of a discussion message might affect thread length, researchers have examined the relationship between message content and replies
to those messages. These studies found certain types of discussion messages demand, obligate, or necessitate a reply by other discussion participants.

Poscente & Fahy (2003) investigated the relationship between message type and number of responses. Instructor and student messages were coded using the Transcript Analysis Tool (Fahy et al., 2000) as question (vertical or horizontal), statement (non-referential or referential), reflection, scaffolding, or quotation/citation. Of the coded message types, only horizontal or open-ended questions were triggers, defined as receiving four or more responses, and none of the message types were duds, defined as receiving no responses.

Although Walker (2004) investigated synchronous chats, not asynchronous discussions, her study is included here because it is similar to the current study in that she coded instructor chat messages using the DISCOUNT system (Pilkington, 1999) and examined student responses to those messages types. Of the messages types used more than a few times, students responded to 76% (22/29) of probes (elicit more information) and 73% (19/26) of challenges (elicit a defense). However, students only replied to 19% (3/16) of encouragements (give encouragement) and 29% (10/35) of metastatements (comment about task rather than topic). Walker emphasized that student overt responses were not the only indicator of successful instructor moderation. For example, students may not have directly responded to instructor encouragements, but having received encouragements, students may have been more motivated to participate in the chat overall.

Schrire (2006) noted instructor messages which had a demand function—that is, expected student response, extended the discussion thread. Furthermore, some instructor
messages, which both commented on a previous message and initiated a new discussion direction, were also effective at continuing a discussion thread.

Chan, Hew, & Cheung (2009) also analyzed response rates to different types of student moderator messages. Messages were coded as pointing, questioning, resolving, and summarizing. They found questioning messages received a 100% response rate (16 of 16 messages), followed by summarizing messages with a 70% response rate (7 of 10 messages) and resolving messages with a 62% response rate (18 of 29 messages). Only one pointing message was posted, and it did not receive a reply. Though working with limited data, they also examined response rates for messages which used a combination of these four types. Messages with both resolving and questioning had a 64% response rate (9 of 14 messages), about the same rate as a resolving message. Messages with both summarizing and questioning had a 75% response rate (3 of 4 messages), about the same rate as a summarizing message. Chan and colleagues explicitly cautioned against generalizing these results to instructor moderators because student moderators are peers but a hierarchical relationship exists between student and instructor.

Jeong (2005a) described the process of using sequential analysis to examine how messages may affect each other in online discussions. Basically, this approach determines the probability that a given message type will elicit a certain message response. Jeong (2003) used sequential analysis to examine an online debate between 34 graduate students, and he found a number of significant relationships. For example, student replies to position statements were most likely supporting statements or opposing arguments, and argument statements generated additional argument statements as replies.
Jeong (2004) also used sequential analysis to determine the effect of response
time and message content on thread development in an online debate discussion. Overall,
response rates dropped as the response time increased. However, critique messages had a
significantly longer response time than elaborative messages. Jeong believed critique
messages required more time for constructing a rebuttal than other message types, and
rebutting critiques was important given the debate task.

Jeong (2005b) furthered his work with sequential analysis to examine the effects
of linguistic qualifiers and intensifiers on online debates, and he found messages with
qualifiers received fewer responses than messages with intensifiers or with neither
qualifiers nor intensifiers. Using sequential analysis, Jeong & Frazier (2008) also found
messages posted early in the discussion time period had a higher response rate than
messages posted later, and this effect was larger for some exchange types, like a
challenge followed by another challenger, than for other types, such as a challenge
followed by evidence or explanation.

Williams & Humphrey (2007) used regression analysis on selected variables to
identify factors related to a discussion message receiving a reply. These factors included:
native language of writer, gender of writer, course type (online/hybrid), course status
(required/elective), presence of face-threatening speech acts, presence of direct questions,
intended audience, message length, nature of message topic, indication of social
presence, and naming. Examining data from seven graduate-level online courses, they
found three significant variables related to increased replies: presence of a direct
question, broad intended audience, and longer messages.
Chen & Chiu (2008) used multilevel analysis to determine the effect of earlier messages on later messages. They examined 131 messages from 47 participants using five dimensions: evaluations, knowledge content, social cues, personal information, and elicitation. They found messages coded as disagreement, content contribution, and social cue affected subsequent messages. For example, a message coded as disagreement or contribution was most likely to receive a reply message coded as disagreement, and disagreements and contributions also tended to elicit responses with social cues.

Dringus & Ellis (2010) took another approach to examining thread development. They introduced a discussion wellness rating system to provide a composite view of discussion activity. This wellness rating included: density, intensity, latency, and response count. For example, the wellness rating would be high during an intense discussion period with frequent postings, but a slower discussion period would have a lower wellness rating because of fewer responses and longer delays between responses. They applied wellness ratings to the online discussions of five sections of the same course taught by the same instructor, which included 2,500 messages by 113 students. Their results showed discussion wellness varied throughout the semester. They further analyzed instances where the wellness rating changed significantly (z-score > ±2) from one day to the next. They were unable to identify any patterns related to these occurrences, except a wellness rating changed significantly when a student posted to an older, but still open, forum. (Although discussion forum were opened as the course proceeded, the course instructor did not close any forum once he had opened it.)
Summary

Thread development provides one approach for examining how discussion threads grow at a message-level, where each discussion message influences subsequent messages. Work in this field indicates that message content is related to the probability a message will receive a reply as well as the content of the reply message. This knowledge is important for discussion moderators because their messages may extend or stop a discussion thread depending on its content. The current study added to this body of knowledge by examining how the direct-instruction content of instructor messages may influence student replies to those messages and to subsequent student reply messages.

Chapter Summary

This literature review focused on four related areas that informed the current research study. The moderator literature indicates online instructors have difficulty moderating their discussions, particularly regarding qualitative aspects of moderating, such as what online instructors should say or post in their discussions. The CoI model, more specifically teaching presence and direct instruction, suggests six types of messages online instructors should include in their discussions. However, little is known about how each of these six direct-instruction types may influence the discussion.

Thread development provides one approach to examine how the direct-instruction content of instructor messages influences an online discussion at a message level. As found in the thread development literature, some messages types are more likely to receive a reply and continue the discussion thread, while other message types are less likely to receive a reply, terminating the discussion thread.
The current study examined differences in the number of students who directly reply to the instructor’s message based on the direct-instruction content of the instructor message (Research Question 2: Instructor-Learner Interaction). In addition to direct student replies, the current study included research questions examining these differences for subsequent student replies to each other (Research Question 4: Learner-Learner Interaction) as well as student viewing of both instructor and students messages in these threads (Research Question 1: Instructor-Learner Vicarious Interaction and Research Question 3: Learner-Learner Vicarious Interaction).
Chapter 3: Methodology

This study obtained data from content analysis of course discussions to examine the influence of direct-instruction instructor messages on thread development in asynchronous discussions. This chapter first reviews the study’s research questions and describes the study’s context and participants. It then focuses on the instrumentation, data collection, and data analysis for the content analysis.

Research Questions

The research question for this study was: To what extent, does the type of direct instruction message (present content/questions, focus the discussion on specific issues, summarize the discussion, confirm understanding through assessment and explanatory feedback, diagnose misconceptions, and inject knowledge from diverse sources) posted by an instructor influence thread development in an online asynchronous discussion? More specifically:

1. Among the instruction indicator types, are there differences in the number of students who view the instructor’s message?
2. Among the instruction indicator types, are there differences in the number of students who directly reply to the instructor’s message?
3. Among the instruction indicator types, are there differences in the number of students who view other student responses to the instructor’s message?
4. Among the instruction indicator types, are there differences in the number of students who reply to other student responses to the instructor’s message?
Research Hypotheses

Hypothesis 1: No differences exist among the six direct instruction indicator types and the number of students who view the instructor’s message. No literature was found regarding students’ reading instructor messages based on the content of the instructor message. However, the instructor is a subject expert, and the researcher expects students will read a high percentage of instructor messages because of the instructor’s position as a subject expert and the students’ interest in learning the course material.

Hypothesis 2: Differences exist among the six direct instruction indicator types and the number of students who directly reply to the instructor’s message. Poscente & Fahy (2003) and Walker (2004) both found students reply more to some instructor messages depending on the content of the instructor message. The researcher believes the CoI direct instruction indicators make important distinctions among instructor messages, and these differences will influence student replies to those instructor messages.

Hypothesis 3: Differences exist among the six direct instruction indicator types and the number of students who view other student responses to the instructor’s message. Although no literature was found regarding students’ reading discussion messages based on the content of those messages, Poscente & Fahy (2003) and Walker (2004) both found students reply more to some instructor messages depending on the content of the instructor message. The researcher expects instructor messages receiving student replies will also gain student attention and interest, and those student replies will be read by other students.

Hypothesis 4: Differences exist among the six direct instruction indicator types and the number of students who reply to other student responses to the instructor’s
message. As with Hypothesis 3, the researcher expects instructor messages receiving student replies will also gain student attention and interest, and students will reply to other student responses to those instructor messages.

**Institutional Context**

The setting of this study was a large, public university medical center located in the Midwestern United States. Their total enrollment is approximately 3,000 students. The university medical center is organized into three schools: nursing, medicine, and allied health.

Their school of nursing was founded more than 100 years ago, and it offers three degrees in nursing: baccalaureate, masters, and doctorate. Approximately 700 students are enrolled in this school of nursing, and more than 90% of these students are female. Approximately 300 students are working towards a Master’s of Science Degree in Nursing. Within their Master’s program, 94% of students are female, and 82% are caucasian/white. Their average age is 33 years old, with a range of 23 to 60.

This Master’s program is accredited by the Commission on Collegiate Nursing Education. For online students, this school of nursing has specified minimum hardware and connectivity standards, as well as browser and other software requirements.

**Subjects and Course Context**

The subjects for this study were the instructor and the 15 students enrolled in a fully online course at this university medical center. The course was delivered using the ANGEL Learning Management Suite 7.4 software, hosted on university medical center
servers. This course was a convenience sample, but it was specifically selected because its consistent course design and discussion activities—as described later in this section—controlled several important factors affecting online discussions (e.g., academic degree, discussion task, graded discussions) and, therefore, reduced experimental error.

The 16-week course was about research in health care. It was required for the Master’s of Science Degree in Nursing, and enrollment was restricted to students in this masters program or other students who had instructor consent. Students can take this course at anytime during their program of study.

The course instructor had been teaching for almost 20 years. She had been teaching online since 1995, and she had taught this course—both in online and on-campus formats—four times in the past.

**Course Discussion Activities**

The course was organized into six units around the research process:

- Unit 1: Purpose and Terminology
- Unit 2: Initial Stages of the Research Process
- Unit 3: Research Design
- Unit 4: Measurement and Data Collection
- Unit 5: Data Analysis and Interpretation of Results
- Unit 6: Integration of Research Evidence and Communication of Research Findings
Each unit included textbook and journal article readings, discussion, short written assignments, and a one-hour quiz. Throughout the semester, students also worked in small groups on a group project.

This study drew data from the online discussions which occurred in the six course units, a total of six discussions. For these unit discussions, the course instructor placed students into three small discussion groups of five students each. The instructor identified three goals for these discussions: (a) recognize the value of discussion on nursing research, (b) increase access to nursing colleagues, and (c) address each discussion topic.

Figure 2 shows an example of an ANGEL discussion forum—using fictitious names and information, not actual discussion participants and data from the current study. The instructor’s initial questions and instructions are shown in the Directions area. Posted messages are listed below the Directions area, and the post title, author, and date posted are automatically displayed for each message. Unread messages are bolded. ANGEL uses an expandable outline format to organize messages and message replies into a threaded format. For example, in the “Dave’s Introduction” thread in Figure 2, Mike Jones and Dominic Gucci have both directly replied to Dave Smith’s introduction message, as indicated by the dotted lines connecting those messages. However, Beth Chang has directly replied to Mike Jones’ message, titled “Where?”.
To view a message, a user clicks the Post Title, and the entire message is
displayed as shown in Figure 3. At this point, the user can click the Reply button reply to
the displayed message, click the Return to List button to select another message to view,
or click a Navigate button to view the next or previous message in this discussion forum.
For the first five unit discussions, the instructor posed several discussion questions related to that unit’s content. Within their small discussion groups, each student individually posted his or her answers to these questions. Then, other students posted comments to the students in their small discussion groups. The course instructor was also an active discussion moderator. This discussion strategy, sometimes called open or topical discussion, is a common type of online discussion task (Hammond, 2005; Richardson & Ice, 2010; Sherry, 2000; Weisskirch & Milburn, 2003). Additionally, Richardson & Ice (2010) compared critical thinking in a class, which included open-ended/topical discussions as well as two other instructional strategies: case-based and
debate. Their regression analysis indicated students performed similarly in all three strategies.

These five discussions each lasted one week. One student from each group was responsible for posting the first message for that discussion within one day of the discussion opening, and that student posted a discussion summary after the discussion forum closed. In some units, that student also divided the instructor’s discussion questions among group members. This responsibility rotated to a different student for each discussion. Figure 4 is an example discussion from this course, with student and instructor names removed to protect confidentiality.

Figure 4: Example Course Discussion

For the sixth unit discussion, the instructor simulated a poster presentation that might be made at an academic conference. For this discussion activity, students viewed
two posters about a research study conducted by the instructor, and they also viewed a narrated slide presentation about the research study. In the Unit 6 discussion forum, students were then required to pose two questions to the instructor about her research study, similar to questions they might ask a researcher at a conference poster session. No explicit requirements were made about reading discussion messages or replying to the instructor or other students in this discussion activity. The Unit 6 discussion also lasted one week.

The discussion task for Units 1-5 and Unit 6 are different. In Units 1-5, students answered questions posed by the instructor, and the instructor responded to those student answers. For Unit 6, students asked the instructor questions, and the instructor responded to those student questions. The instructor and students may have participated differently in the Unit 6 discussion because of its different discussion task. (Appendix B includes the instructor’s discussion prompts/questions for all six unit discussions.)

Unit discussions were graded and counted for 15% of the course grade. The instructor described discussion grading criteria in the course syllabus. These criteria included posting at least twice each week, answering the discussion questions, making substantive discussion contributions, and referencing course readings (Penny & Murphy, 2009). No credit was given for messages posted after the discussion forum had closed. At the end of each unit, the instructor posted discussion points in the online grade book. Additionally, the coursesite provided students with technical instructions for using the ANGEL Learning Management Suite 7.4 software, including instructions for using the online discussion tool.
In addition to the online discussion forums for each unit, the course used online discussions for several other purposes. At the beginning of the course, students introduced themselves in one forum, which helped develop social presence and provided an opportunity to learn how to use the discussion tool in case some students were unfamiliar with this tool. Another discussion forum was available for administrative questions, such as course assignments and requirements. Additionally, each group had its own discussion forum for working on its group project. The current study did not include data from these three discussion areas (introductions, administrative, and group projects) because these discussions did not involve discussing course content. Additionally, the instructor did not moderate the group project discussion forums.

Students were explicitly directed to email the instructor only about individual concerns, such as assignment grades. All other course questions were to be directed to the appropriate discussion forum. This requirement helped ensure all course content discussion occurred in the unit discussion forums and was captured in the discussion transcript.

**Instrumentation**

This study used content analysis of the instructor’s discussion messages its data source. Content analysis is a research method for making inferences from text (Weber, 1990; Krippendorff, 2004), and it is frequently used to study online discussions (Marra, 2006; Meyer, 2006; Rattleff, 2007). A central idea in content analysis is the classification of words, phrases, or other units of text into categories based on their meaning. Therefore, text units in the same category share a similar meaning.
For this study, the coding system developed for the community of inquiry model (Garrison et al., 2000) was used. This model has been significantly adopted by educational researchers and is considered to have good validity (Garrison, Cleveland-Innes, Koole, & Kappelman, 2006). The classification system for the teaching presence element of this model, which was the focus of the current study, has been tested (Anderson et al, 2001) and has been used in a number of other studies as well (e.g., Garrison et al., 2006; Rourke & Anderson, 2002; Vaughan & Garrison, 2006).

It was anticipated some instructor messages would not have any direct instruction content and were coded as such. It also was anticipated some instructor messages would have more than one direct instruction indicator type (Anderson et al, 2001; Chan et al, 2009). Those messages were coded as a combination type, but these combination codes also included all direct instruction types found in the message. See Appendix A for the complete coding scheme used in the current study, including indicators and examples.

Additionally, the researcher and another coder pilot tested this coding system using discussion data from another online course which they taught. This second coder has a master’s degree in educational technology, is a published author in the field, and has assisted with many research and evaluation projects. This coder is also an experienced online instructor and student, and this person has been involved in the instructional design, development, and support of online courses since 1996.

After discussing the indicators and coding a sample of messages, the researcher and second coder agreed upon some clarifications for some indicators. As recommended by Krippendorff (2004) and Park (2009), these clarifications are also noted in Appendix A to improve reliability. The researcher and second coder then coded an additional
sample of instructor messages from the same course, and they obtained interrater reliability of 88% agreement and Cohen’s (1960) $k = .86$, both values considered excellent levels of agreement (Banerjee, Capozzoli, McSweeney, & Sinha, 1990; De Wever, Schellens, Valcke, & Van Keer, 2006).

To determine interrater reliability in the current study, 20% of the instructor messages (33 of 163 messages) were randomly selected and coded by the second coder. The researcher and second coder agreed on 23 (70%) messages, disagreed on 2 (6%) messages, and partially agreed on 8 (24%) messages. Accounting for both chance agreement and partial agreement, Cohen’s (1968) weighted kappa for this data was .81. A percent agreement of 70% is consider very good, and a weighted kappa of .81 is considered excellent (Banerjee, Capozzoli, McSweeney, & Sinha, 1990; De Wever, Schellens, Valcke, & Van Keer, 2006).

**Data Collection Procedure**

After receiving approval from the Institutional Review Board of the University of Missouri and the institutional review board of the university medical center, data collection began. As each discussion forum closed, discussion board postings were examined and analyzed. The ANGEL 7.4 discussion tool automatically recorded discussion information, including the name of the person who posted a message, the date and time a message was posted, the message text, which messages were posted as replies to other messages, and how many times a person viewed a message.

As previously described, only the six unit discussions were included in this study. When a discussion forum closed, the researcher read each instructor message in that
forum and coded that message using the system described in Appendix A. The message unit was used as the unit of analysis for this study because of the nature of the research questions, examining the influence of the instructor’s message on discussion thread development (Garrison et al., 2006). Additionally, message units are physically demarcated by the message author rather than by the researcher or coder, which increases reliability (Garrison et al., 2001; Rourke et al., 2001).

All instructor messages were recorded as separate records in SPSS. Table 10 operationally defines the fields in each instructor message record. The researcher determined the values to enter in each field for each instructor message according to these definitions. Discussion activity, both reading and replying to messages, of all 15 students were included in the corresponding counts.
Table 7

*Fields and Operational Definitions for Content Analysis*

<table>
<thead>
<tr>
<th>Field</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODE</td>
<td>Direct Instruction code(s) from Appendix A</td>
</tr>
<tr>
<td>RD-I</td>
<td>Count of all unique students viewing of instructor message as recorded by discussion tool (i.e., same student viewing a message twice counts as one)</td>
</tr>
<tr>
<td>RP-I</td>
<td>Count of all direct student replies to instructor message</td>
</tr>
<tr>
<td>RD-S</td>
<td>Count of all unique students viewing of all direct student replies to instructor message as recorded by discussion tool (i.e., same student viewing a reply twice counts as one, but same student viewing two different replies counts two)</td>
</tr>
<tr>
<td>RP-S</td>
<td>Count of all direct student replies to other student responses to the instructor message</td>
</tr>
</tbody>
</table>

**Data Analysis**

Preliminary data analysis indicated the data sets were not normally distributed and also lacked homogeneity of variance. Because normality and homogeneity of variance are assumptions of ANOVA, research questions could not be tested by ANOVA. Instead, research questions were tested using Kruskal-Wallis (1952) variance analysis (Siegel & Castellan, 1988).
The Kruskal-Wallis (1952) test is a nonparametric test that uses ranks to determine if average ranks of sample groups differ more than expect from sampling variance. Unlike ANOVA, Kruskal-Wallis does not require normality nor homogeneity of variance. However, Kruskal-Wallis requires at least ordinal data. Because observed values are converted to ranks and therefore lose exact magnitude, Kruskal-Wallis is not as powerful as ANOVA.

To answer each research question, a separate Kruskal-Wallis (1952) test was performed for each of the four research questions to examine differences between the independent variable of direct instruction type and the corresponding dependent variable for that research question. A significance level of $p = .05$ was used for significance testing of the data. Table 8 identifies specifically which field was compared for each research question.

Table 8

*Research Questions and Corresponding Fields for Kruskal-Wallis Testing*

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Corresponding Field for Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: View Instructor Message</td>
<td>RD-I</td>
</tr>
<tr>
<td>2: Reply to Instructor Message</td>
<td>RP-I</td>
</tr>
<tr>
<td>3: View Student Message</td>
<td>RD-S</td>
</tr>
<tr>
<td>4: Reply to Student Message</td>
<td>RP-S</td>
</tr>
</tbody>
</table>
If the Kruskal-Wallis (1952) results indicated statistically significant difference were found, a Mann-Whitney (1947) test was used to test all pairwise comparisons to determine which direct instruction types were different.

Because the instructor posted predominately messages coded as containing Confirm, Focus, and Present direct instruction content, few instructor messages for the other direct instruction indicators (Diagnose, Inject, and Summarize) were available for analysis. Consequently, the Kruskal-Wallis (1952) tests were performed using only Confirm, Focus, and Present instructor messages. Additionally, the instructor posted enough Confirm-Focus combination messages that these Confirm-Focus combination messages were added to the previous data set, and another series of Kruskal-Wallis tests were performed on this second data set. Finally, because the Unit 6 discussion activity and data was different than Units 1-5, the Unit 6 data was removed from the second data set. Another series of Kruskal-Wallis tests were performed using only this discussion data from Units 1-5. Removal of the Unit 6 instructor messages left too few Present instructor messages for analysis, so this data set included only Confirm, Confirm-Focus, and Focus instructor messages.

Chapter Summary

This chapter describes the context, subjects, instrumentation, data collection, and data analysis that were used in this study. Data for this study was collected using content analysis of online discussion. Because this data violated ANOVA assumptions of normality and homogeneity of variance, hypotheses were tested using Kruskal-Wallis (1952) variance analysis.
Chapter 4: Results

This chapter presents the findings of the current study. It is organized into three sections. The distribution of discussion messages is summarized in first two sections. The content analysis results for the four research questions are presented in the last section.

Message Distributions for All Students and Instructor

Table 9 shows the distribution of messages in the six unit discussions posted by all 15 students and the instructor. Students posted 786 (82.8%) messages, and the instructor posted 163 (17.2%) messages. Students posted an average of 52.4 messages per student across all six unit discussions, and students posted an average of 8.7 messages per discussion forum.

In Unit 4, the instructor was out of town, and she did not post any messages in that forum. Despite the instructor’s absence in the Unit 4 discussion, the number of student messages in this forum (153 messages) was the highest among the six unit discussions. Conversely, the instructor posted the most messages in the Unit 6 discussion (63 messages), and that forum had the fewest student messages (78 messages) as well as the fewest total messages (141 messages) in it. The discussion task for Unit 6 was different than the other units. For the Unit 6 discussion, the students asked the instructor questions to simulate a poster session at a conference.
Table 9

_Distribution of All Student and Instructor Messages by Discussion Forum_

<table>
<thead>
<tr>
<th>Forum</th>
<th>Student Messages</th>
<th>Instructor Messages</th>
<th>Total Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of Forum</td>
<td>Percent of Forum</td>
<td>Percent of Total</td>
</tr>
<tr>
<td>Unit 1</td>
<td>147</td>
<td>23</td>
<td>170</td>
</tr>
<tr>
<td></td>
<td>86.5%</td>
<td>13.5%</td>
<td>17.9%</td>
</tr>
<tr>
<td>Unit 2</td>
<td>134</td>
<td>33</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td>80.2%</td>
<td>19.8%</td>
<td>17.6%</td>
</tr>
<tr>
<td>Unit 3</td>
<td>136</td>
<td>21</td>
<td>157</td>
</tr>
<tr>
<td></td>
<td>86.6%</td>
<td>13.4%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Unit 4</td>
<td>153</td>
<td>0</td>
<td>153</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td>0.0%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Unit 5</td>
<td>138</td>
<td>23</td>
<td>161</td>
</tr>
<tr>
<td></td>
<td>85.7%</td>
<td>14.3%</td>
<td>17.0%</td>
</tr>
<tr>
<td>Unit 6</td>
<td>78</td>
<td>63</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>55.3%</td>
<td>44.7%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Total</td>
<td>786</td>
<td>163</td>
<td>949</td>
</tr>
<tr>
<td></td>
<td>82.8%</td>
<td>17.2%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 10 shows the distribution of messages in the three discussion groups posted by all 15 students and the instructor. Each discussion group had five students in it. Group C had the most messages overall (376 messages), as well as the most messages posted by students (305 messages) and instructor (71 messages). Group A had the fewest student messages (190 messages), and Group B had the fewest instructor messages (45 messages). Although the instructor posted approximately the same number of messages to Group A (47 messages) and Group B (45 messages), students posted considerably more messages in Group B (291 messages) than Group A (190 messages). Furthermore, the instructor posted more messages to Group C (71 messages) than to Group B (45 messages), but students posted about the same number of messages in Group C (305 messages) and Group B (291 messages).
Table 10

*Distribution of All Student and Instructor Messages by Discussion Group*

<table>
<thead>
<tr>
<th>Group</th>
<th>Student Messages</th>
<th>Instructor Messages</th>
<th>Total Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Percent of Forum</td>
<td>n</td>
</tr>
<tr>
<td>Group A</td>
<td>190</td>
<td>80.2%</td>
<td>47</td>
</tr>
<tr>
<td>Group B</td>
<td>291</td>
<td>86.6%</td>
<td>45</td>
</tr>
<tr>
<td>Group C</td>
<td>305</td>
<td>81.1%</td>
<td>71</td>
</tr>
<tr>
<td>Total</td>
<td>786</td>
<td>82.8%</td>
<td>163</td>
</tr>
</tbody>
</table>

**Direct Instruction Distributions of Instructor Messages**

Table 11 displays the distribution of instructor messages coded for direct instruction by discussion forum. Approximately 84% (137 of 163 messages) of instructor messages were coded with at least one direct instruction indicator. The instructor showed a preference for three direct instruction types: Present, Confirm, and Focus. For Present (present content/question), 63 (39%) messages were coded as containing Present: 50 messages with only Present and an additional 13 messages with Present and other direct instruction. Furthermore, 83% of the Present messages were posted in the Unit 6 discussion forum. For Confirm (confirm understanding through assessment and explanatory feedback), 62 (38%) messages were coded as containing Confirm: 30 messages with only Confirm and an additional 32 messages with Confirm and other direct instruction. For Focus (focus the discussion on specific issues), 42 (26%) messages were coded as containing Focus: 17 messages with only Focus and an additional 25 messages with Focus and other direct instruction.
No Focus messages were posted in the Unit 6 discussion forum. Additionally, the instructor posted no messages coded with Summarize (summarize the discussion) in any unit discussion.

Table 11

*Distribution of Direct-Instruction Messages by Discussion Forum*

<table>
<thead>
<tr>
<th>Direct Instruction Code(s)</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 5</th>
<th>Unit 6</th>
<th>Count of Code</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>46</td>
<td>50</td>
<td>30.7%</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>12</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>30</td>
<td>18.4%</td>
</tr>
<tr>
<td>C F</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>22</td>
<td>13.5%</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>17</td>
<td>10.4%</td>
</tr>
<tr>
<td>C P</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>4.3%</td>
</tr>
<tr>
<td>D F</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1.8%</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1.2%</td>
</tr>
<tr>
<td>I P</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1.2%</td>
</tr>
<tr>
<td>C D</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>C I</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>C I P</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>S</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>N (None)</td>
<td>5</td>
<td>7</td>
<td>0</td>
<td>5</td>
<td>9</td>
<td>26</td>
<td>16.0%</td>
</tr>
</tbody>
</table>

Note: Unit 4 omitted because the instructor did not post in this forum.
Table 12 shows the distribution of direct instruction messages by discussion group. Within each discussion group, the instructor showed a similar preference for posting Present, Confirm, and Focus direct instruction messages as previously discussed, except for Group C where the instructor posted more Confirm messages (39%) than Present messages (32%). For Present messages across the three discussion groups, the instructor posted as follows: 38% for Group A (18 of 47 messages), 42% for Group B (19 of 45 messages), and 32% for Group C (23 of 71 messages). For Confirm messages across the three discussion groups, the instructor posted as follows: 38% for Group A (18 of 47 messages), 36% for Group B (16 of 45 messages), and 39% for Group C (28 of 71 messages). For F messages across the three discussion groups, the instructor posted as follows: 26% for Group A (12 of 47 messages), 24% for Group B (11 of 45 messages), and 27% for Group C (19 of 71 messages).
Table 12

*Distribution of Direct-Instruction Messages by Discussion Group*

<table>
<thead>
<tr>
<th>Direct Instruction Code(s)</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Count of Code</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>17</td>
<td>14</td>
<td>19</td>
<td>50</td>
<td>30.7%</td>
</tr>
<tr>
<td>C</td>
<td>10</td>
<td>6</td>
<td>14</td>
<td>30</td>
<td>18.4%</td>
</tr>
<tr>
<td>C F</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>22</td>
<td>13.5%</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>17</td>
<td>10.4%</td>
</tr>
<tr>
<td>C P</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>4.3%</td>
</tr>
<tr>
<td>D F</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1.8%</td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1.2%</td>
</tr>
<tr>
<td>I P</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1.2%</td>
</tr>
<tr>
<td>C D</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>C I</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>C I P</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>S</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>N (None)</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>26</td>
<td>16.0%</td>
</tr>
</tbody>
</table>

*Content Analysis Results*

**Research Question One**

*Among the instruction indicator types, are there differences in the number of students who view the instructor’s message?*
A Kruskal-Wallis H-test was executed to investigate the significant differences between the independent variable of direct instruction content of the instructor’s messages and the dependent variable of instructor messages viewed by students (RD-I). Only instructor messages coded as Confirm, Focus, or Present were included in this test because too few instructor messages were coded as Diagnose (1 message), Inject (2 messages), or Summarize (no messages).

Table 13 presents the descriptive statistics for this data set. Focus instructor messages were viewed (RD-I) most \( (M_F = 4.82) \), and Present instructor messages were viewed least \( (M_P = 3.40) \). Table 14 summarizes the H-test results for this data set. Statistically significant rank difference \( (p = .001) \) was found among instructor messages coded with these three direct instruction indicators.

Table 13

Descriptives for Viewing C, F, and P Instructor Messages (RD-I)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>4.37</td>
<td>1.712</td>
<td>.313</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>4.82</td>
<td>.951</td>
<td>.231</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>3.40</td>
<td>1.414</td>
<td>.200</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>3.95</td>
<td>1.550</td>
<td>.157</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>
To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RD-I. Table 15 summarizes the results of these U-tests. Students viewed instructor messages (RD-I) containing Confirm more than Present instructor messages, and this difference was significant ($p = .015$). Similarly, students viewed Focus instructor messages more than Present instructor messages, and this difference was significant ($p = .000$). However, no significant difference ($p = .306$) was found between students viewing Confirm and Focus instructor messages.
Table 15

*U*-test Results for Viewing C, F, and P Instructor Messages (RD-I)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>U</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>22.50</td>
<td>675.00</td>
<td>210.00</td>
<td>.306</td>
</tr>
<tr>
<td>F</td>
<td>26.65</td>
<td>453.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>48.40</td>
<td>1452.00</td>
<td>513.00</td>
<td>.015</td>
</tr>
<tr>
<td>P</td>
<td>35.76</td>
<td>1788.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>48.32</td>
<td>821.50</td>
<td>181.50</td>
<td>.000</td>
</tr>
<tr>
<td>P</td>
<td>29.13</td>
<td>1456.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A number of instructor messages were coded with more than one direct instruction indicator. Of these messages, 22 instructor messages were coded as Confirm-Focus. Only 7 instructor messages were coded as Confirm-Present, and three Diagnose-Inject messages were posted. All other direct instruction combinations had two or fewer instructor messages. Instructor messages coded as Confirm-Focus were added to the previous data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RD-I) and the independent variable of direct instruction content of the instructor’s messages.

Table 16 presents the descriptive statistics for this data set. Students viewed instructor messages (RD-I) containing Focus most (MF = 4.82 and MCF = 5.14), and students viewed the Present instructor messages least (MP = 3.40). Table 17 summarizes the H-test results. Statistically significant rank difference ($p = .000$) was found among instructor messages coded with these three direct instruction indicators.
Table 16

Descriptives for Viewing C, CF, F, and P Instructor Messages (RD-I)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>4.37</td>
<td>1.712</td>
<td>.313</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>5.14</td>
<td>1.642</td>
<td>.350</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>4.82</td>
<td>.951</td>
<td>.231</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>3.40</td>
<td>1.414</td>
<td>.200</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>4.17</td>
<td>1.628</td>
<td>.149</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 17

H-test Results for Viewing C, CF, F, and P Instructor Messages (RD-I)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>63.82</td>
<td>20.862</td>
<td>3</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>77.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>76.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>44.56</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RD-I. Table 18 summarizes the results of these U-tests. Students viewed instructor messages (RD-I) containing Confirm, Confirm-Focus, and Focus more than Present instructor messages, and this difference was significant ($p = .015, p = .000,$ and $p = .000$ respectively). No significant differences were found among the other pairwise comparisons.
Table 18

*U-test Results for Viewing C, CF, F, and P Instructor Messages (RD-I)*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>U</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>23.92</td>
<td>717.50</td>
<td>252.500</td>
<td>.144</td>
</tr>
<tr>
<td>CF</td>
<td>30.02</td>
<td>660.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>22.50</td>
<td>675.00</td>
<td>210.000</td>
<td>.306</td>
</tr>
<tr>
<td>F</td>
<td>26.65</td>
<td>453.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>48.40</td>
<td>1452.00</td>
<td>513.000</td>
<td>.015</td>
</tr>
<tr>
<td>P</td>
<td>35.76</td>
<td>1788.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>20.68</td>
<td>455.00</td>
<td>172.000</td>
<td>.661</td>
</tr>
<tr>
<td>F</td>
<td>19.12</td>
<td>325.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>49.75</td>
<td>1094.50</td>
<td>258.500</td>
<td>.000</td>
</tr>
<tr>
<td>P</td>
<td>30.67</td>
<td>1533.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>48.32</td>
<td>821.50</td>
<td>181.500</td>
<td>.000</td>
</tr>
<tr>
<td>P</td>
<td>29.13</td>
<td>1456.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Unit 6 discussions had a different discussion task and a very different ratio of instructor-to-student messages, compared to the other unit discussions. Additionally, the instructor posted almost exclusively Present messages in Unit 6, whereas she posted very few Present messages in the other unit discussions. Instructor messages from Unit 6 were removed from second data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RD-I) and the independent variable of direct instruction content of the instructor’s messages. Removal of the Unit 6
instructor messages left too few Present messages for analysis, so only Confirm, Confirm-Focus, and Focus instructor messages were analyzed.

Table 19 shows the descriptive statistics for this data set, and Table 20 shows the H-test results. No statistically significant rank differences \( (p = .512) \) were found among these three direct instruction types/combinations.

Table 19

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>28</td>
<td>4.61</td>
<td>1.499</td>
<td>.283</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>5.14</td>
<td>1.642</td>
<td>.350</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>4.82</td>
<td>.951</td>
<td>.231</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>4.84</td>
<td>1.431</td>
<td>.175</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 20

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>31.02</td>
<td>1.340</td>
<td>2</td>
<td>.512</td>
</tr>
<tr>
<td>CF</td>
<td>37.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>34.76</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This study found statistically significant rank differences between the number of students who viewed instructor messages and the direct instruction content of the
instructor messages. Specifically, students viewed instructor messages containing Confirm, Confirm-Focus, and Focus direct instruction more than Present instructor messages. No significant differences were found among the other direct instruction types/combinations included in this analysis. Insufficient data was available to analyze differences among the other direct instruction types (Diagnose, Inject, and Summarize), nor other direct instruction combinations. Additionally, these finding should not be generalized beyond this study because of the small sample size, only 15 student subjects.

**Research Question Two**

*Among the instruction indicator types, are there differences in the number of students who directly reply to the instructor’s message?*

A Kruskal-Wallis H-test was executed to investigate the significant differences between the independent variable of direct instruction content of the instructor’s messages and the dependent variable of student replies to instructor messages (RP-I). Only instructor messages coded as Confirm, Focus, or Present were included in this data set because too few instructor messages were coded as Diagnose (1 message), Inject (2 messages), or Summarize (no messages).

Table 21 presents the descriptive statistics for this data set. Students replied (RP-I) to Focus instructor messages most \((M_F = .53)\) and least to Confirm messages \((M_C = .13)\). Table 22 summarizes the H-test results. Statistically significant rank difference \((p = .001)\) was found among instructor messages coded with these three direct instruction indicators.
Table 21

*Descriptives for Replying to C, F, and P Instructor Messages (RP-I)*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>.13</td>
<td>.346</td>
<td>.063</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>.53</td>
<td>.514</td>
<td>.125</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>.30</td>
<td>.544</td>
<td>.077</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>.29</td>
<td>.499</td>
<td>.051</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 22

*H-test Results for Replying to C, F, and P Instructor Messages (RP-I)*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>42.33</td>
<td>14.515</td>
<td>2</td>
<td>.001</td>
</tr>
<tr>
<td>F</td>
<td>61.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>48.87</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RP-I. Table 23 summarizes the results of these U-tests. Students replied to instructor messages (RP-I) containing Focus more than Confirm instructor messages, and this difference was significant ($p = .004$). However, no significant difference ($p = .166$) was found between students replying to Confirm and Present instructor messages, and no difference ($p = .063$) was found between Focus and Present instructor messages.
As previously described, a number of instructor messages were coded with more than one direct instruction indicator. Instructor messages coded as Confirm-Focus were added to the previous data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RP-I) and the independent variable of direct instruction content of the instructor’s messages.

Table 24 presents the descriptive statistics for this analysis. Students replied (RP-I) to Confirm-Focus instructor messages most ($M_{CF} = .73$), and students replied to Confirm instructor messages least ($M_C = .13$). Table 25 summarizes the H-test results. Statistically significant rank difference ($p = .000$) was found among instructor messages coded with these four direct instruction types/combinations.
Table 24

Descriptives for Replying to C, CF, F, and P Instructor Messages (RP-I)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>.13</td>
<td>.346</td>
<td>.063</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>.73</td>
<td>.550</td>
<td>.117</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>.53</td>
<td>.514</td>
<td>.125</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>.30</td>
<td>.544</td>
<td>.077</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>.37</td>
<td>.535</td>
<td>.049</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 25

H-test Results for Replying to C, CF, F, and P Instructor Messages (RP-I)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>47.23</td>
<td>20.214</td>
<td>3</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>79.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>70.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>55.40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RP-I. Table 26 summarizes the results of these U-tests. Students replied to instructor messages (RP-I) containing Confirm-Focus and Focus more than Confirm instructor messages, and this difference was significant ($p = .000$ and $p = .004$ respectively). Additionally, students significantly
(\(p = .001\)) replied to Confirm-Focus instructor messages more than Present instructor messages. No significant differences were found among the other pairwise comparisons.

Table 26

\emph{U-test Results for Replying to C, CF, F, and P Instructor Messages (RP-I)}

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>U</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>20.40</td>
<td>612.00</td>
<td>147.000</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>34.82</td>
<td>766.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20.63</td>
<td>619.00</td>
<td>154.000</td>
<td>.004</td>
</tr>
<tr>
<td>F</td>
<td>29.94</td>
<td>509.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>37.20</td>
<td>1116.00</td>
<td>651.000</td>
<td>.166</td>
</tr>
<tr>
<td>P</td>
<td>42.48</td>
<td>2124.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>21.50</td>
<td>473.00</td>
<td>154.000</td>
<td>.362</td>
</tr>
<tr>
<td>F</td>
<td>18.06</td>
<td>307.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>46.66</td>
<td>1026.50</td>
<td>326.500</td>
<td>.001</td>
</tr>
<tr>
<td>P</td>
<td>32.03</td>
<td>1601.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>40.21</td>
<td>683.50</td>
<td>319.500</td>
<td>.063</td>
</tr>
<tr>
<td>P</td>
<td>31.89</td>
<td>1594.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As previously described, the Unit 6 discussions differed from the other unit discussions. Therefore, instructor messages from Unit 6 were removed from the second data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RP-I) and the independent variable of direct
instruction content of the instructor’s messages. Removal of these instructor messages left too few Present messages for analysis, so only Confirm, Confirm-Focus, and Focus instructor messages were analyzed.

Table 27 shows the descriptive statistics for this data set. Students replied (RP-I) to Confirm-Focus instructor messages most ($M_{CF} = .73$), and students replied to Confirm instructor messages least ($M_C = .14$). Table 28 summarized the H-test results. Statistically significant rank difference ($p = .000$) was found among instructor messages coded with these three direct instruction indicators.

Table 27

*Descriptives for Replying to C, CF, and F Instructor Messages (RP-I), without Unit 6*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>28</td>
<td>.14</td>
<td>.356</td>
<td>.067</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>.73</td>
<td>.550</td>
<td>.117</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>.53</td>
<td>.514</td>
<td>.125</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>.43</td>
<td>.529</td>
<td>.065</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 28

*H-test Results for Replying to C, CF, and F Instructor Messages (RP-I), without Unit 6*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>24.71</td>
<td>15.912</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>43.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>37.47</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RP-I. Table 29 summarizes the results of these U-tests. Students replied to instructor messages (RP-I) containing Confirm-Focus and Focus more than Confirm instructor messages, and this difference was significant ($p = .000$ and $p = .006$ respectively). However, no significant difference ($p = .277$) was found between students replying to Confirm-Focus and Focus instructor messages.

Table 29

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>U</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>19.50</td>
<td>546.00</td>
<td>140.00</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>33.14</td>
<td>729.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>19.71</td>
<td>552.00</td>
<td>146.00</td>
<td>.006</td>
</tr>
<tr>
<td>F</td>
<td>28.41</td>
<td>483.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>21.50</td>
<td>473.00</td>
<td>154.00</td>
<td>.277</td>
</tr>
<tr>
<td>F</td>
<td>18.06</td>
<td>307.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This study found statistically significant rank differences between the number of students who replied to instructor messages and the direct instruction content of the instructor messages. Specifically, students replied to instructor messages containing Confirm-Focus and Focus direct instruction more than Confirm instructor messages. Students also replied to Confirm-Focus instructor messages more than Present Instructor
messages. No significant differences were found among the other direct instruction types/combinations included in this analysis. Insufficient data was available to analyze differences among the other direct instruction types (Diagnose, Inject, and Summarize), nor other direct instruction combinations. Additionally, these finding should not be generalized beyond this study because of the small sample size, only 15 student subjects.

**Research Question Three**

*Among the instruction indicator types, are there differences in the number of students who view other student responses to the instructor’s message?*

A Kruskal-Wallis H-test was executed to investigate the significant differences between the independent variable of direct instruction content of the instructor’s messages and the dependent variable of students viewing other student’s reply to instructor messages (RD-S). Only instructor messages coded as Confirm, Focus, or Present were included in this test because too few instructor messages were coded as Diagnose (1 message), Inject (2 messages), or Summarize (no messages).

Table 30 presents the descriptive statistics for this data set. Students viewed other student replies (RD-S) to the Focus instructor messages most ($M_F = 1.35$) and to Confirm instructor messages least ($M_C = .40$). Table 31 summarizes the H-test results. Statistically significant rank difference ($p = .006$) was found among instructor messages coded with these three direct instruction indicators.
Table 30

Descriptives for Viewing Student Replies to C, F, and P Instructor Messages (RD-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>.40</td>
<td>1.037</td>
<td>.189</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>1.35</td>
<td>1.367</td>
<td>.331</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>.50</td>
<td>1.403</td>
<td>.198</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>.62</td>
<td>1.326</td>
<td>.135</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 31

H-test Results for Viewing Student Replies to C, F, and P Instructor Messages (RD-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>44.93</td>
<td>10.355</td>
<td>2</td>
<td>.006</td>
</tr>
<tr>
<td>F</td>
<td>63.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>46.50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RD-S. Table 32 summarizes the results of these U-tests. Students viewed student replies (RD-S) to instructor messages containing Focus direct instruction more than Confirm and Present instructor messages, and this difference was significant ($p = .009$ and $p = .004$ respectively). However, no significant difference ($p = .653$) was found between students viewing student replies to Confirm and Present instructor messages.
As previously described, a number of instructor messages were coded with more than one direct instruction indicator. Instructor messages coded as Confirm-Focus were added to the previous data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RD-S) and the independent variable of direct instruction content of the instructor’s messages.

Table 33 presents the descriptive statistics for this data set. Students viewed student replies (RD-S) to Confirm-Focus instructor messages most ($M_{CF} = 2.05$), and students viewed student replies to Confirm instructor messages ($M_{C} = .40$) least. Table 34 summarizes the H-test results. Statistically significant rank difference ($p = .000$) was found among instructor messages coded with these four direct instruction types/combinations.
Table 33

Descriptives for Viewing Student Replies to C, CF, F, and P Instructor Messages (RD-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>.40</td>
<td>1.037</td>
<td>.189</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>2.05</td>
<td>1.914</td>
<td>.408</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>1.35</td>
<td>1.367</td>
<td>.331</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>.50</td>
<td>1.403</td>
<td>.198</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>.88</td>
<td>1.547</td>
<td>.142</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 34

H-test Results for Viewing Student Replies to C, CF, F, and P Instructor Messages (RD-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>50.03</td>
<td>25.520</td>
<td>3</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>82.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>72.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>51.74</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RD-S. Table 35 summarizes the results of these U-tests. Students viewed student replies (RD-S) to instructor messages containing Confirm-Focus direct instruction more than Confirm and Present instructor messages, and this difference was significant ($p = .000$ and $p = .000$ respectively). Additionally, students viewed student replies (RD-S) to instructor messages containing
Focus direct instruction more than Confirm and Present instructor messages, and this difference was significant ($p = .009$ and $p = .004$ respectively). No significant differences were found among the other pairwise comparisons.

Table 35

_U-test Results for Viewing Student Replies to C, CF, F, and P Instructor Messages (RD-S)_

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>U</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>20.60</td>
<td>618.00</td>
<td>153.000</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>34.55</td>
<td>760.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20.90</td>
<td>627.00</td>
<td>162.000</td>
<td>.009</td>
</tr>
<tr>
<td>F</td>
<td>29.41</td>
<td>501.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>39.53</td>
<td>1186.00</td>
<td>721.00</td>
<td>.653</td>
</tr>
<tr>
<td>P</td>
<td>41.08</td>
<td>2054.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>21.52</td>
<td>473.50</td>
<td>153.50</td>
<td>.323</td>
</tr>
<tr>
<td>F</td>
<td>18.03</td>
<td>306.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>49.59</td>
<td>1091.00</td>
<td>262.00</td>
<td>.000</td>
</tr>
<tr>
<td>P</td>
<td>30.74</td>
<td>1537.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>43.06</td>
<td>732.00</td>
<td>271.00</td>
<td>.004</td>
</tr>
<tr>
<td>P</td>
<td>30.92</td>
<td>1546.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As previously described, the Unit 6 discussions differed from the other unit discussions. Therefore, instructor messages from Unit 6 were removed from the second data set, and a Kruskal-Wallis H-test was executed to investigate the significant
differences between the dependent variable (RD-S) and the independent variable of direct instruction content of the instructor’s messages. Removal of these instructor messages left too few Present messages for analysis, so only Confirm, Confirm-Focus, and Focus instructor messages were analyzed.

Table 36 shows the descriptive statistics for this data set. Students viewed student replies (RD-S) to Confirm-Focus instructor messages most (M_{CF} = 2.05) and Confirm messages least (M_C = .43). Table 37 summarizes the H-test results. Statistically significant rank difference (p = .001) was found among instructor messages coded with these three direct instruction indicators.

Table 36

*Descriptives for Viewing Student Replies to C, CF, and F Instructor Messages (RD-S), without Unit 6*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>28</td>
<td>.43</td>
<td>1.069</td>
<td>.202</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>2.05</td>
<td>1.914</td>
<td>.408</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>1.35</td>
<td>1.367</td>
<td>.331</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>1.19</td>
<td>1.607</td>
<td>.196</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>
Table 37

*H-test Results for Viewing Student Replies to C, CF, and F Instructor Messages (RD-S), without Unit 6*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>25.21</td>
<td>13.394</td>
<td>2</td>
<td>.001</td>
</tr>
<tr>
<td>CF</td>
<td>42.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>36.97</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RD-S. Table 38 summarizes the results of these U-tests. Students viewed student replies (RD-S) to instructor messages containing Confirm-Focus and Focus more than Confirm instructor messages, and this difference was significant ($p = .000$ and $p = .013$ respectively). However, no significant difference ($p = .323$) was found between students viewing replies to Confirm-Focus and Focus instructor messages.
Table 38

*U*-test Results for Viewing Student Replies to C, CF, and F Instructor Messages (RD-S), without Unit 6

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Sum of Ranks</th>
<th>U</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>19.71</td>
<td>552.00</td>
<td>146.00</td>
<td>.000</td>
</tr>
<tr>
<td>CF</td>
<td>32.86</td>
<td>723.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20.00</td>
<td>560.00</td>
<td>154.00</td>
<td>.013</td>
</tr>
<tr>
<td>F</td>
<td>27.94</td>
<td>475.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CF</td>
<td>21.52</td>
<td>473.50</td>
<td>153.50</td>
<td>.323</td>
</tr>
<tr>
<td>F</td>
<td>18.03</td>
<td>306.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This study found statistically significant rank differences between the number of students who viewed student replies to instructor messages and the direct instruction content of the instructor messages. Specifically, students viewed student replies to instructor messages containing Confirm-Focus and Focus direct instruction more than Confirm instructor messages. Students also viewed student replies to Confirm-Focus and Focus instructor messages more than Present instructor messages. No significant differences were found among the other direct instruction types/combinations included in this analysis. Insufficient data was available to analyze differences among the other direct instruction types (Diagnose, Inject, and Summarize), nor other direct instruction combinations. Additionally, these finding should not be generalized beyond this study because of the small sample size, only 15 student subjects.
Research Question Four

Among the instruction indicator types, are there differences in the number of students who reply to other student responses to the instructor’s message?

A Kruskal-Wallis H-test was executed to investigate the significant differences between the independent variable of direct instruction content of the instructor’s messages and the dependent variable of students responding to other student replies to instructor messages (RP-S). Only instructor messages coded as Confirm, Focus, or Present were included in this test because too few instructor messages were coded as Diagnose (1 message), Inject (2 messages), or Summarize (no messages).

Table 39 presents the descriptive statistics for this data set. Only two students replied to other student responses to the instructor’s message (RP-S), and both of these instructor messages were coded Present ($M_p = .04$). Table 40 summarizes the H-test results. No statistically significant rank difference ($p = .387$) was found among instructor messages coded with these three direct instruction indicators.

Table 39

Descriptives for Responding to Replies to C, F, and P Instructor Messages (RP-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>.00</td>
<td>.000</td>
<td>.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>.00</td>
<td>.000</td>
<td>.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>.04</td>
<td>.198</td>
<td>.028</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>.02</td>
<td>.143</td>
<td>.015</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
As previously described, a number of instructor messages were coded with more than one direct instruction indicator. Instructor messages coded as Confirm-Focus were added to the previous data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RP-S) and the independent variable of direct instruction content of the instructor’s messages.

Table 41 presents the descriptive statistics for this data set. Three students replied to other student responses (RP-S) to Confirm-Focus instructor messages ($M_{CF} = .14$), and two students replied to other student responses to Present instructor messages ($M_{P} = .04$). Table 42 summarizes the H-test results. No statistically significant rank difference ($p = .076$) was found among instructor messages coded with these four direct instruction indicators/combinations.
Table 41

Descriptives for Responding to Replies to C, CF, F, and P Instructor Messages (RP-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>30</td>
<td>.00</td>
<td>.000</td>
<td>.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>.14</td>
<td>.351</td>
<td>.075</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>.00</td>
<td>.000</td>
<td>.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
<td>.04</td>
<td>.198</td>
<td>.028</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>119</td>
<td>.04</td>
<td>.201</td>
<td>.018</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 42

H-test Results for Responding to Replies to C, CF, F, and P Instructor Messages (RP-S)

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>57.50</td>
<td>6.873</td>
<td>3</td>
<td>.076</td>
</tr>
<tr>
<td>CF</td>
<td>65.61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>57.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>59.88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Unit 6 discussions had a different discussion task and a very different ratio of instructor-to-student messages, compared to the other unit discussions. Additionally, the instructor posted almost exclusively Present messages in Unit 6, whereas she posted very few Present messages in the other unit discussions. Instructor messages from Unit 6 were removed from the second data set, and a Kruskal-Wallis H-test was executed to investigate the significant differences between the dependent variable (RP-S) and the
independent variable of direct instruction content of the instructor’s messages. Removal of these instructor messages left too few Present messages for analysis, so only Confirm, Confirm-Focus, and F instructor messages were analyzed.

Table 43 shows the descriptive statistics for this analysis. Only three students replied to other student responses to the instructor’s message (RP-S), and these three instructor messages were coded Confirm-Focus ($M_{CF} = .14$). Table 44 shows the ANOVA results. Statistically significant rank difference ($p = .042$) was found among instructor messages coded with these three direct instruction indicators.

Table 43

*Descriptives for Responding to Replies to C, CF, and F Instructor Messages (RP-S), without Unit 6*

<table>
<thead>
<tr>
<th>DI Code</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Std. Error</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>28</td>
<td>.00</td>
<td>.000</td>
<td>.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CF</td>
<td>22</td>
<td>.14</td>
<td>.351</td>
<td>.075</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>17</td>
<td>.00</td>
<td>.000</td>
<td>.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>.04</td>
<td>.208</td>
<td>.025</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 44

H-test Results for Responding to Replies to C, CF, and F Instructor Messages (RP-S), without Unit 6

<table>
<thead>
<tr>
<th>DI Code</th>
<th>Mean Rank</th>
<th>Chi-square</th>
<th>df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>32.50</td>
<td>6.328</td>
<td>2</td>
<td>.042</td>
</tr>
<tr>
<td>CF</td>
<td>37.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>32.50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To determine which direct instruction types were different, Mann-Whitney U-tests were performed to test all pairwise comparisons for RP-S. Table 45 summarizes the results of these U-tests. Students replied to other student responses (RP-S) to Confirm-Focus instructor’s messages more than Confirm instructor messages, and this difference was significant (p = .046). However, no significant differences were found among the other pairwise comparisons.
This study found statistically significant rank differences between the number of students who responded student replies to instructor messages and the direct instruction content of the instructor messages. When the Unit 6 instructor messages were not included in the analysis, students responded to other student replies to Confirm-Focus instructor messages more than Confirm instructor messages. However, when the Unit 6 instructor messages were included in the analysis, this difference between Confirm-Focus and Confirm instructor messages was not significant. No significant differences were found among the other direct instruction types/combinations included in this analysis. Insufficient data was available to analyze differences among the other direct instruction types (Diagnose, Inject, and Summarize), nor other direct instruction combinations. Additionally, these findings should not be generalized beyond this study because of the small sample size, only 15 student subjects.
Chapter Summary

In this study, the instructor posted predominately discussion messages with Confirm, Focus, and Present direct instruction content, and she also posted a significant number of messages coded as Confirm-Focus. Therefore, this study analyzed those four types/combinations of direct instruction messages. Overall, students responded more to Focus and Confirm-Focus instructor messages than to Confirm and Present instructor messages.

For Research Question 1, students viewed instructor messages (RD-I) containing Confirm, Confirm-Focus, and Focus more than Present instructor messages.

For Research Question 2, students replied to instructor messages (RP-I) containing Confirm-Focus and Focus direct instruction more than Confirm instructor messages. Students also replied to Confirm-Focus instructor messages more than Present Instructor messages.

For Research Question 3, students viewed student replies to instructor messages containing Confirm-Focus and Focus direct instruction more than Confirm instructor messages. Students also viewed student replies to Confirm-Focus and Focus instructor messages more than Present instructor messages.

For Research Question 4, students responded to other student replies to Confirm-Focus instructor messages more than Confirm instructor messages, but only when the Unit 6 instructor messages were not included in the analysis.
Chapter 5: Discussion and Conclusion

This chapter presents the findings of the current study and relates those findings to existing literature. This chapter is organized into four sections. The first section summarizes the major findings of the current study. The second section examines the findings related to direct instruction and the community of inquiry model. The next section focuses on findings related to reading instructor messages. And, the final section discusses the findings on replying to instructor and student messages. Conclusions of the current study are summarized at the end of this chapter.

Findings

Based on the analysis for Research Question 1, the current study found significant differences regarding the direct instruction content of instructor messages and students viewing/reading those instructor messages (RD-I). Specifically, students viewed instructor messages containing Confirm, Confirm-Focus, and Focus direct instruction more than Present instructor messages. No significant differences were found among the other three direct instruction types/combinations. However, the instructor posted almost exclusively Present messages in Unit 6, whereas she posted very few Present messages in the other unit discussions. Additionally, the Unit 6 discussions had a different discussion task and a very different ratio of instructor-to-student messages, compared to the other unit discussions. As discussed in Chapter 5 of this dissertation, these differences for Present instructor messages may be due to the different Unit 6 discussion task, and not the direct instruction message content.
For Research Question 2, the current study found significant differences regarding the direct instruction content of instructor messages and students directly replying to those instructor messages. Specifically, students replied to instructor messages containing Confirm-Focus and Focus direct instruction more than Confirm instructor messages. Students also replied to Confirm-Focus instructor messages more than Present Instructor messages. No significant differences were found among the other direct instruction types/combinations in this study. As previously mentioned, these differences for Present instructor messages may be due to the different Unit 6 discussion task, and not the direct instruction message content.

For Research Question 3, the current study found significant differences regarding the direct instruction content of instructor messages and students viewing other student responses to those instructor messages. Students viewed student replies to instructor messages containing Confirm-Focus and Focus direct instruction more than Confirm and Present instructor messages. However, no significant differences were found between Confirm-Focus and Focus instructor messages. Again, these differences for Present instructor messages may be due to the different Unit 6 discussion task, and not the direct instruction message content.

Finally, for Research Question 4, the current study found some significant differences regarding the direct instruction content of instructor messages and students responding to other student replies to those instructor messages. Students responded to other student replies to Confirm-Focus instructor messages more than Confirm instructor messages, but this difference was significant ($p = .046$) only when the Unit 6 messages were not included in the analysis.
Discussion

**Direct instruction and the community of inquiry model**

In the current study, 84% (137 of 163 messages) of instructor messages were coded with at least one direct instruction indicator. This amount is consistent with previously published amounts of direct instruction, which ranged from 67% to 88% (Anderson et al., 2001; Rourke & Anderson, 2002). In light of the current study and previously published studies, instructors do considerable direct instruction in their online course discussions, and direct instruction may be a useful coding system for classifying the content of instructor discussion messages.

**Range of direct instruction messages**

The current study provided needed understanding for several gaps in the direct instruction literature, specifically gaps about the types and amounts of direct instruction used by an instructor. First, instructors may show a preference for certain direct instruction types. In the current study, the instructor showed a preference for three direct instruction types: Confirm, Focus, and Present. She posted very few Diagnose and Inject messages, and she posted no Summary messages.

Lim & Cheah (2003) reported a similar situation when they compared student observation of certain instructor discussion behaviors and the importance students associated with those instructor behaviors. Though their study did not specifically use direct instruction, several of their student survey questions align well with the direct instruction indicators. Of the fifteen surveyed instructor behaviors, three of the top five instructor behaviors that student rated most important were also three of the top five
instructor behaviors students observed most. These top-ranked instructor behaviors were: “Gives feedback on participant’s posting/message”, “Provides cues and prompts to learners to direct participants in a certain focus of the discussion”, and “Provides views as an expert.” These behaviors are similar to Confirm, Focus, and Present instructor messages in the current study, respectively. The instructor in the current study also frequently posted these three types of discussion messages. Additionally, Lim & Cheah found instructor behaviors that “Summarizes the discussion”, were ranked by the students as the fourth most important instructor behavior, but this behavior was the third least observed instructor behavior by the students. This instructor behavior is also similar to Summarize instructor messages, which was absent from the current study.

It is possible the instructor in the current study was simply making what she considered the most appropriate and useful replies to her students, and those replies tended to be Confirm, Focus, and Present messages. However, it is also possible this instructor was not aware of or as familiar with Diagnose, Inject, and Summarize messages, as she was with the other three direct instruction types. In the latter case, faculty development about teaching presence, and specifically direct instruction, might have expanded this instructor’s range of direct instruction messages types. Shea et al. (2004) had some success with faculty attending workshops on teaching presence. Instructors who attended their faculty development workshops received higher student ratings on both teaching presence and perceived learning, than faculty who did not attend these workshops.

Although instructor training about direct instruction was considered for the current study, it was not included in the current study because such training might change
the instructor’s normal or natural response to student messages. Because the current study was a preliminary investigation of direct instruction, a less artificial and experimental discussion setting was preferred to eliminate this potentially confounding consideration and to increase transferability to other settings.

**Direct-instruction combination messages**

Additionally, instructors may post messages that include more than one type of direct instruction content. In the current study, 23% (37 of 163 messages) of instructor messages contained more than one direct instruction type, with Confirm-Focus instructor messages as the most frequent combination (13% or 22 of 163 messages). Only one instructor message was coded with three direct instruction indicators, and it was coded Confirm-Inject-Present. No instructor messages in the current study were coded with more than three direct instruction indicators.

As more fully described later in this chapter, the Confirm-Focus combination may be an effective instructor message in terms of both student reading and replying. Students replied to Confirm-Focus instructor messages most, and they read other student replies to Confirm-Focus instructor messages most. Furthermore, only five students responded to a student reply to an instructor message, and three of those instructor messages were Confirm-Focus messages.

When studying peer-moderator techniques, Chan et al. (2009) also encountered peer messages that included more than one moderator technique. Like the current study, these combination messages, particularly the combinations that included questioning, were very likely to receive student replies. Plus, messages using the other moderator
techniques (i.e., pointing, resolving, and summarizing) alone were slightly less likely to receive student replies than combination messages of questioning paired with these other techniques. However, their findings were based on a small number of combination messages, ranging from two to fourteen messages.

**Discussion task and direct instruction**

Comparing the Unit 6 discussions with the other unit discussions offers some insight into the relationship between discussion task and direct instruction. In Units 1-5, the discussion task was similar. The instructor posted a series of questions; students answered and discussed those questions; and the instructor provided feedback, information, and guidance. With the exception of Unit 4 where the instructor was absent from the discussion, the instructor posted 15-20% of the discussion messages, and the majority (67%) of these instructor messages were Confirm, Confirm-Focus, and Focus messages, with only 8% Present instructor messages.

However, the Unit 6 discussion task was different. For Unit 6, the instructor simulated a conference poster session, where she posted a presentation about one of her research studies. Students read this presentation and asked the instructor questions about her research study, and the instructor answered those student questions. In Unit 6, the instructor posted almost half (45%) of the discussion messages, and these instructor messages were predominately (83%) Present messages or Present combinations, with only 3% Confirm, Confirm-Focus, or Focus instructor messages. Also, the instructor posted no Focus messages or combination messages including Focus, so she did not focus the Unit 6 discussions on a topic, issue, or idea.
These comparisons support the research that discussion task affects discussion participation (Jorczak & Bart, 2009; Kanuka et al., 2007). Furthermore, these comparisons indicate the instructor provided different direct instruction depending on the discussion task, and these differences may be related to students initially posting answers in Unit 1-5 discussions but posting questions in Unit 6 discussions. However, insufficient Present instructor messages were posted outside of Unit 6 to determine if students read and replied to Present instructor messages differently than in Units 1-5. Likewise, insufficient Confirm, Confirm-Focus, and Focus messages were posted in Unit 6 to determine if students read and replied to those messages differently than in Units 1-5.

Unmoderated discussions

The absence of the instructor in the Unit 4 discussions offers an unexpected opportunity to examine unmoderated online discussions and compare those discussions to moderated online discussions. As previously discussed in Chapter 2 of this dissertation, too little instructor involvement in an online discussion is similar to an unmoderated discussion, with students posting simply to meet grade requirements and not moving the discussion toward productive educational outcomes (Dennen, 2005, 2007; Morris et al., 2005). Additionally, student discussion participation is positively correlated with instructor participation (Bliss & Lawrence, 2009b; Kirkiakidis & Parker, 2008). Contrary to this literature, the Unit 4 discussions had the most student messages of all the unit discussions, despite having no instructor participation.

Two studies may provide some insight into this otherwise contradictory situation. By Unit 4, the instructor had provided and modeled teaching presence in three previous
discussions. In her absence during the Unit 4 discussions, students may have provided missing teaching presence and kept the discussions productive.

Shea et al. (2010) compared social, cognitive, and teaching presence in two online course discussions taught by two different instructors. In one course, the instructor initially posted a high number of messaging containing direct instruction content, but that instructor decreased his discussion participation and eventually stopped posting completely. In the other course, the instructor posted more consistently throughout the course, but his messages were primarily informational, encouragements, and acknowledgements. However, student participation in both courses was comparable, and students in the first course, where the instructor stopped posting, had higher cognitive presence than students in the second course. When the first instructor stopped posting, his students compensated by posting messages containing teaching presence, maintaining a consistent level of teaching presence in their discussions. Students in the second course posted few messages containing teaching presence.

Similarly, Lui et al. (2007) studied expertise presence, which they considered similar to direct instruction, but better recognizing both students and instructors could provide expertise presence. These researchers also found an increase in student expertise presence sometimes occurred when instructor expertise presence decreased.

**Viewing/reading messages**

The current study adds to the research literature examining the influence of message content on viewing or reading messages, and more specifically it is the first study examining the influence of direct instruction content of instructor messages on
student viewing/reading instructor and student messages. Confirm-Focus instructor messages were viewed by students most ($M_{CF} = 5.14$), but Focus and Confirm instructor messages were frequently viewed as well ($M_F = 4.82$ and $M_C = 4.37$). Present instructor messages were viewed least ($M_P = 3.40$). Additionally, the current study found significant differences regarding the direct instruction content of instructor messages and student viewing those instructor messages, with students viewing Confirm, Confirm-Focus, and Focus instructor messages significantly more than Present instructor messages. The analysis did not include Diagnose, Inject, and Summarize instructor messages because too few of these instructor messages were posted in this course.

The current study also found significant differences regarding the direct instruction content of instructor messages and students viewing other student replies to those instructor messages. Students viewed replies to Confirm-Focus and Focus instructor messages more than Confirm and Present instructor messages. Again, the analysis did not include Diagnose, Inject, and Summarize instructor messages because too few of these instructor messages were posted in this course.

It is puzzling that students would make these distinctions viewing messages without directly knowing message content. One possible explanation, at least for the first research question, is the different discussion task for Unit 6. The current study found no significant differences among students viewing Confirm, Confirm-Focus, and Focus instructor messages, and those types of instructor messages were almost exclusively posted in Units 1-5, which all had the same discussion task. However, the current study found significant differences between students viewing Present instructor messages and all three of the other direct instruction message types/combinations. Present instructor
messages were almost exclusively posted in Unit 6, which had a different discussion task than Units 1-5. Further analysis of this possibility could not be made in the current study because the instructor posted too few Present messages in Units 1-5, and she also posted too few Confirm, Confirm-Focus, and Focus messages in Unit 6.

On the other hand, the current study did find students viewed other student replies to Confirm instructor messages significantly less than they viewed Confirm-Focus and Focus instructor messages. Furthermore, these differences were significant with and without the Unit 6 messages. Within the Unit 1-5 discussions, which had the same discussion task, students made distinctions viewing messages without directly knowing message content.

Jeong (2003) presents another possible explanation. He contends that each discussion message can influence future messages, even beyond the immediate direct reply message. For example, Jeong found replies to Disagree messages were most likely to be additional Disagree messages, a Disagree-Disagree pair. But, replies to a Disagree-Disagree pair were likely to be Agree or Hypothetical Action messages. Though his work was limited to message replies, the current study’s findings indicate message influence may extend to viewing/reading messages as well. In the current study, no difference viewing messages might be expected because a student would not know about message content until a message is read. However, the differences found in viewing student replies to instructor messages suggest something in the direct instruction content of the instructor message may have influenced their decision to view a reply message. After reading a Confirm-Focus or Focus instructor message, students may have anticipated useful or
interesting replies to those types of instructor messages, and therefore, they tended to read those student replies more than replies to Confirm instructor messages.

**Super-lurkers**

Ross, Kukulska-Hulme, Chappel, & Joyce (2004) introduced the term “super-lurker” to describe and encourage students to read discussion messages in other discussion groups than the group to which they were assigned. In addition to recognizing super-lurking as an acceptable discussion practice in their course, they emphasized that students should take ideas gleaned from other discussion groups and introduce those ideas to their groups.

In the current study, students also engaged in super-lurking, though reading messages in other discussion groups was neither encouraged nor prohibited. On average, Confirm-Focus instructor messages were read by 5.14 students, even though each discussion group only had five students in it. Further examination of the discussion data also showed super-lurking occurred, with as many as eight different students sometimes reading an instructor message.

**Reading messages as an important and normal discussion activity**

Finally, the current study helps answer an important question raised by Walker (2004): Does a discussion message have value if it does not elicit a reply? Although Walker investigated synchronous chats, not asynchronous discussions, she examined student responses to instructor chat messages coded with the DISCOUNT system (Pilkington, 1999). She found some message types elicited more student replies than
other types of messages, but she emphasized that student overt responses were not the only indicator of successful instructor moderation. She speculated that instructor messages, which received few replies, may contribute to the overall discussion in other important ways, such as providing encouragement.

The current study provides some support for this speculation by Walker. That is, students read discussion messages, even if they do not reply to those messages. Although only 50 of 163 (31%) instructor messages in the current study received a student reply, the average instructor message was viewed/read by 4.5 students. Similarly, only 5 of these 50 (10%) student responses received a student reply, but these 50 student responses were viewed/read, on average, by 2.4 students.

Furthermore, even though students may not reply to a discussion message, students learn by reading messages (Wu & Hiltz, 2004). In Beaudoin (2002), 19 of 24 students felt they learned as much or more reading other messages than writing their own messages. Additionally, Ransdell (2010) found reading messages was correlated (r = .20) with student scores on a standardized exam testing critical thinking. On the other hand, Palmer et al. (2008) found no correlation between reading discussion messages and final unit grades. Likewise, Poole (2000) also found no correlation between reading messages and final course grade, and she speculated that students may have completed other tasks to learn the course material.

In terms of reading discussion messages and thread development, the current study adds support that reading messages is an important and normal part of online discussion participation (Dennen, 2008; Hrastinski, 2008). Though reading a message does not directly develop or extend a thread through a reply, reading a message may be a
prerequisite to replying. Ahren & El-Hindi (2000) found messages read by students was a predictor of student replies, with about one reply for every eight messages read. In Dennen (2008), 69% of students said they read messages to find an appropriate message for responding. Potter (2008) criticized the online discussions in his study because students replied to messages, but their reply messages did not expand or extend ideas presented in the original message. Potter argued that students were not reading a message before replying to it.

**Replying to messages**

The current study adds to the research literature examining the influence of message content on replying to messages, and more specifically it is the first study examining the influence of direct instruction content of instructor messages on student replies to instructor and student messages. In the current study, Confirm-Focus and Focus instructor messages received the most student replies ($M_{CF} = .73$ and $M_F = .53$), and Confirm and Present instructor messages received the least student replies ($M_C = .13$ and $M_P = .30$). Additionally, the current study found significant differences regarding the direct instruction content of instructor messages and students replying to those instructor messages, with students replying to Confirm-Focus and Focus instructor messages significantly more than Confirm and Present instructor messages. However, these differences for Present instructor messages may be due to the different Unit 6 discussion task, and not the direct instruction message content. Also, the analysis did not include Diagnose, Inject, and Summarize instructor messages because too few of these instructor messages were posted in this course.
These findings from the current study are also consistent with other studies that examined discussion message content and replies to those messages. Poscente & Fahy (2003) examined discussion replies to instructor and student messages coded using the Transcript Analysis Tool (Fahy et al., 2000) as question (vertical or horizontal), statement (non-referential or referential), reflection, scaffolding, or quotation/citation. Of the coded message types, only horizontal or open-ended questions were triggers, defined as receiving four or more responses, and none of the message types were duds, defined as receiving no responses.

Walker (2004) examined student responses to instructor synchronous chat messages coded using the DISCOUNT system (Pilkington, 1999). Of the messages types used more than a few times, students responded to 76% (22/29) of probes (elicit more information) and 73% (19/26) of challenges (elicit a defense). However, students only replied to 19% (3/16) of encouragements (give encouragement) and 29% (10/35) of metastatements (comment about task rather than topic).

Chan et al. (2009) coded student moderator messages as pointing, questioning, resolving, and summarizing. They found questioning messages received a 100% response rate (16 of 16 messages), followed by summarizing messages with a 70% response rate (7 of 10 messages), and resolving messages with a 62% response rate (18 of 29 messages). Only one pointing message was posted, and it did not receive a reply.

Jeong (2003, 2004, 2005a) analyzed unmoderated student debate discussions. He found certain types of student messages, such as arguments to support a position, were more likely to receive a student reply, than other message types. Furthermore, he found different messages types were more likely to receive different types of replies messages.
For example, argument messages were likely to receive argument reply messages, but arguments were unlikely to receive reply messages that evaluated the content of the original argument message.

Chen & Chiu (2008) used multilevel analysis to determine the effect of earlier messages on later messages in unmoderated student discussions. They found messages coded as disagreement or content contribution elicited more replies than other message types (i.e., agreement, unresponsive, repetition, and null content).

**Learner-learner interaction**

Unlike replying to instructor messages, students responded to another student reply to an instructor message only five times. Three were replies to a Confirm-Focus instructor message, and the other two were replies to a Present instructor message. Additionally, the current study only found significant differences between Confirm-Focus and Confirm instructor messages, and then only when the Unit 6 instructor messages were removed from the analysis.

This finding adds to the sparse literature examining discussion message replies beyond immediate direct reply messages. It is consistent with Jeong’s (2003) finding that a message’s content can influence replies to that message, as well as responses to those replies. Like the current study, Jeong found a stronger relationship between message content and direct replies than for responses to those replies. It may be that message content is an important factor affecting replies, but many other factors affect replies as well. As a thread develops, the influence of the original message content is lessened.
In the current study, minimal learner-learner interaction occurred when the instructor posted a message in a discussion thread. Instructor messages did not terminate a discussion thread—students replied to the instructor message, but once the instructor posted, students stopped responding to each other in subsequent messages in that thread. It is possible the discussion task, which did not require collaborative or consensus answers, may partially explain this lack of learner-learner interaction, and students may have responded differently given a different discussion task (Kanuka et al, 2007).

**Confirm-Focus combination messages**

The Confirm-Focus combination may be an effective instructor message in terms of both student reading and replying. The following message is an example Confirm-Focus instructor message from this course:

I agree that a qualitative approach to the study of this problem would be fruitful and grounded theory would provide you with a “theory” about the process of transfer and the resulting feelings, etc. that occur in these patients. Good idea. In the studies that you found in your lit search, did they use quantitative or qualitative designs... were any measures/tools for anxiety used??

Not only did students reply to Confirm-Focus instructor messages most, but they also read other student replies to Confirm-Focus instructor messages most. Plus, only five students responded to another student reply to an instructor message, and three of those were to a Confirm-Focus instructor message.

Further examination of the discussion data for message combinations revealed that two of the three Diagnose-Focus instructor messages received a student reply. The Confirm-Inject instructor message and the Confirm-Inject-Present instructor message both received a student reply, and one of the two Inject-Present instructor messages
received a reply. But, none of the seven Confirm-Present instructor messages received a student reply, and the one Confirm-Diagnose instructor message did not receive a student reply.

Based on this very limited data, other combinations—in addition to Confirm-Focus messages—may be effective at receiving student replies. However, some combinations, such as the Confirm-Present instructor messages, may not be effective at receiving student replies. Simply having a combination may not necessarily be enough to elicit student replies.

Schrire (2006) described instructor messages that extended discussion threads as having two parts, similar to a Confirm-Focus instructor message: Follow-up to a previous student message combined with an initiation into a new discussion direction. The Diagnose-Focus instructor messages, of which two of three received student replies, may also match Schrire’s description, having both follow-up (Diagnose) and new initiation (Focus). However, the current study has insufficient Diagnose-Focus data to support more than simply suggesting this possibility.

Though also working with very limited data, Chan et al (2009) examined response rates for discussion messages which included combinations of pointing, questioning, resolving, and summarizing message content. When questioning was combined with the other three message types, reply rates slightly increased. Also, of the five combination messages that had resolving and summarizing content, none received a reply. Williams & Humphrey (2007) also found the presence of a direct question in a discussion message was a significant predictor ($p < .001$) of that message receiving a reply.
The effectiveness of combination messages, such as Confirm-Focus and possibly Diagnose-Focus, has an important implication for moderating online discussions. The community of inquiry model is not just descriptive, but it is also prescriptive. This model asserts that effective instruction includes the various elements in the model, including direct instruction. However, given the findings in the current study, an instructor faces a dilemma when posting a reply message containing Confirm direct instruction content. Although the Confirm content may be appropriate and even necessary, it may also end the discussion thread. On the other hand, the instructor could reply with a Confirm-Focus combination message, which would both provide the needed Confirm content and extend the thread by eliciting a student reply.

**Reply expectation**

The findings of the current study provide support for the speculation by several researchers that some discussion messages demand, obligate, or necessitate a reply by other discussion participants. Schrire (2006) described some instructor messages as containing “a demand function… predicting a subsequent turn by another participant” (p. 65). Chan et al. (2009) speculated “questioning could help foster a sense of obligation on the other participants to reply to the questions” (p. 450). And, Jeong (2004) also conjectured “students probably felt the necessity to post rebuttals to opposing criticisms” (p. 45).

In the current study, Focus, Confirm-Focus, and possibly Diagnose-Focus messages received more replies than other instructor messages in this course. Because Focus instructor messages focus the discussion on an issue, sometimes by asking a
question, instructor messages that include Focus may have received more replies because these messages have a reply expectation. However, Dillon (1982) cautions that questions force the conversation in the direction of the questioner’s (instructor’s) interests, rather than allowing the students to pursue their interests.

Conversely, Confirm instructor messages received less student replies than the other three instructor message types/combinations; only 13% of Confirm instructor messages (4 of 30 messages) received a student reply. On the surface, one might expect Confirm instructor messages to receive a student reply because students might want to post an improved answer, possibly improving their understanding and grade. Despite Confirm instructor messages appearing to have a reply expectation, students in this study replied to few Confirm instructor messages. The idea that some messages have a reply expectation may need further refinement and research.

**Expertise and authority**

The current study extends our understanding of expertise and authority in online discussions. Studies have reported discussion threads end when the instructor posts to the thread (Dennen, 2007; Kanuka & Garrison, 2004; Morgan, 2011; Xie, Durrington, & Ten, 2011). When the instructor posts to an online discussion as an expert authority, other studies have reported students engage with the instructor as an authority, and they interact with the instructor (learner-instructor interaction) and not with other students (learner-learner interaction) (Daley, 2002; Dennen, 2007; Jefferies, Grodzinsky, & Griffin, 2004).

Gibbs (2006) also described two online discussions similar to the unit discussions in the current study. In one discussion activity, similar to the discussions in Units 1-5, a
guest expert posted a discussion paper along with eleven questions about the paper, and students were required to answer eight of those questions in the discussion forum. Each time the expert posted a response to a student message, the thread ended. In the other discussion activity, similar to the Unit 6 discussions, a guest expert also posted a position paper, and students were required to make two discussion postings about the paper as well as read and respond to other student discussion messages. Of the twelve times the expert posted a response to a student message, ten threads ended, and only two instructor messages received a student reply.

In the current study, students were discussing among themselves (learner-learner interaction) in these unit discussions, but students frequently did not discuss with the instructor (learner-instructor interaction), despite many instructor postings offering opportunities to do so. Students in this course posted 786 messages in the six unit discussions, but they only replied to 31% of instructor messages (50 replies to 163 instructor messages). Additionally, only five of these instructor-learner exchanges led to additional learner-learner interaction.

**Limitations**

Like all studies, this study has its limitations. This study used a convenience sample. Therefore, its findings may not generalize to other groups and settings.

This study examined six asynchronous online discussions in one course, and these six discussions focused on discussing course content. This course also included discussion areas for student introductions and for asking administrative questions, but these two discussion areas were not included in this study because these discussions were
not about course content. Additionally, some courses may include synchronous chat discussions, but this study only examined asynchronous discussions.

This study analyzed data from archived online discussion transcripts. It made no manipulation of these discussions or discussion participants. It was not a true experimental design and cannot establish causality.

This study also used the CoI model, teaching presence, and direct instruction as a framework for understanding online learning and classifying instructor discussion messages. Other theoretical perspectives and classification schemes exist, and those frameworks might lead to alternative research questions, procedures, and results.

This study used content analysis to classify instructor messages. This research method required researchers to make subjective inferences from text. Additionally, human coding can be prone to error and open to interpretation, especially when examining latent content. Furthermore, student reply messages were counted, but the content of those student replies was not examined.

The instructor in the current study primarily posted messages containing Confirm, Focus, and Present direct instruction. However, she posted few messages containing Diagnose, and Inject direct instruction, and she posted no messages containing Summarize direct instruction. Consequently, the current study provided little insight into Diagnose, Inject, and Summarize instructor messages.

In the current study, students discussed in small groups. Although the instructor posted a similar ratio of message types among the three discussion groups, she posted more messages in the Group C discussions than in the other two group discussions, and Group C students posted more messages than students in Groups A or B. The instructor
may have been participating differently in each group discussion, and students also may
have been participating differently in each the group. Insufficient data was available to
further analyze the research questions at a group level.

Finally, only one course was studied, and it had only 15 students in it. Findings
from the current study should not be generalized to other course discussion contexts.

**Implications for Practice**

The findings of the current study may have some implications for practice. Reading messages is an important part of online discussion, but reading a message does not provide the message poster with feedback about his or her message. Consequently, online learning systems could include feedback features indicating messages have been read, as well as ways to provide feedback about a message without replying to it, such as “Star” ratings or “Like” status. ANGEL 7.4 currently offers these capabilities, but they were not used by the instructor in the current study. Poole (2000) speculated that students may have read more messages if they knew their reading activity was tracked.

Instructors could specify the importance of both reading and replying to messages and possibly add reading in their discussion grading criteria or rubric. Such a change may validate and reward more introverted students (Sutton, 2001). This inclusion may increase replies as well.

Faculty development could emphasize the importance of teaching presence and direct instruction, make faculty aware that the content of their messages influence the discussion, and reading messages is an important part of online discussion participation.
When posting discussion messages, instructors could consider both the instructional rationale for the message content, as well as the affect this content may have on the discussion thread development. Some reply messages, such as Confirm instructor messages, may provide students with important feedback about their postings, but these same messages may end the discussion thread, reducing the educational potential of further exchanges. Confirm-Focus instructor messages could be posted instead, which may provide needed feedback to students as well as receive student replies, increasing the educational potential of these further exchanges.

Instructors could consider the advantages and disadvantages of presenting themselves as expert authorities in their online discussions. When students see the instructor as an expert authority, they may be reluctant to reply to instructor and student messages.

**Future Research**

The findings of the current study also suggest some implications for future research. Future online discussion research needs to include reading messages to fully understand online discussion participation. Although some online discussion tools may automatically capture viewing data, viewing and reading messages may not be equivalent. Some discussion participants may view a message, but they may not actually read it or may skim over it instead of thoroughly reading the message, including suggested external content (e.g., website or journal article). Recording the time a participant spends viewing a message may provide additional useful data in this regard,
but interviews may be needed to better understand the extent to which a message is being read.

Many factors impact an online discussion, and the current study attempted to minimize these affects by examining the online discussions of one course. However, that control also limits the transferability of these findings to other courses and contexts (Hammond, 2005). To confirm results in other contexts and improve transferability of these findings, the current study should be repeated in other educational contexts. Some possible considerations from the literature include: gender (Li, 2006); age (Chyung, 2007); discussion task, for example a debate activity or whole-class discussion (Sherry, 2000); course level, such as graduate or undergraduate (Artino & Stephens, 2009); instructor and course (Benbunan-Fich et al., 2005); subject discipline (Arbaugh et al., 2010); and multi-institutional and multinational settings (Arbaugh & Hiltz, 2005).

Although the current study only examined the direct instruction content of the instructor messages, student messages may have direct instruction content as well (Vaughan & Garrison, 2006). Future studies could examine and compare the influence of direct instruction in student messages on online discussions.

It is possible some student replies were simple acknowledgments where as other student replies were well-developed explanations or arguments. Some instructor messages may elicit more cognitively developed student responses than other instructor messages. A future study could examine student replies for discussion quality. Student messages could be coded for cognitive presence (Garrison et al, 2001) because cognitive presence is both a part of the community of inquiry model as well as measure of critical thinking. In addition to cognitive presence, De Wever et al. (2006) identified and
described 14 other content analysis schemes for analyzing online discussion. Because each protocol provides a different perspective of the discussion, student replies should be coded with an appropriate protocol for the discussion task and research questions (Marra, Moore, & Klimczak 2004; Schrire (2003, 2004).

Similarly, these other content analysis schemes could be used, instead of direct instruction, to code instructor messages and examine differences among those message types. As one possibility, Shea et al. (2006) propose direct instruction and facilitated discourse are actually a single construct, called “directed facilitation”. The current study could be repeated, coding instructor messages for directed facilitation instead of direct instruction. Adding the six facilitated discourse indicators to the six direct instruction indicators would make coding more difficult because messages could be coded with twelve indicators, but twelve directed facilitation indicators covers a wider range of possible instructor messages than direct instruction or facilitated discourse alone.

Larger data sets may be needed to further analyze alternative explanations. In the current study for example, not enough Present instructor messages were available for some analyses. Also, more data may have allowed group-level analysis of the research questions.

Once the instructor posted in the current study, students stopped responding to each other in subsequent messages in that thread. Future studies could determine if this finding also occurs in other discussion contexts. Additionally, these studies could probe deeper into student perception of the discussion activities and their motivation for discussion participation, as these factors may be related to this finding.
The current study analyzed course discussions by counting replies and views of instructor messages and student replies. Other methods and techniques, such as message maps, could be used in future studies to further examine how direct instruction content influences online discussions.

Future studies could interview the instructor and students about the content of instructor messages and discussion participation. For example, instructors could be interviewed about why they posted messages containing various direct instruction content, and what expectations they had regarding student responses to those messages. Students could be interviewed about the types of messages they found useful or interesting, as well as their reasons for reading and replying to different types of messages.

Regarding a research agenda based on the current study, two major questions need addressing. First, the preliminary findings of the current study need to be explored in different discussion settings, especially for discussion task. For example, students may respond differently to Focus instructor messages depending on whether discussion participation is graded, replies are required, or the activity is a debate compared to an open discussion. With a better understanding of the relationship between discussion participation and direct instruction content, future research could then focus on explaining why this relationship exists. Interviewing instructors and students about why they posted certain messages and replied to other messages would be one approach to this line of research.
Conclusions

In the current study context, the direct instruction content of an instructor message influenced students replying to that instructor message (Research Question 2) as well as students reading other student replies to that instructor message (Research Question 3). Specifically, Confirm-Focus and Focus instructor messages received more student replies than Confirm and Present instructor messages, and students read replies to Confirm-Focus and Focus instructor messages more than replies to Confirm or Present instructor messages.

The direct instruction content of an instructor message may also influence students viewing that instructor message (Research Question 1), with students viewing Confirm, Confirm-Focus, and Focus instructor messages significantly more than Present instructor messages. However, the different discussion task in Unit 6, where the instructor posted almost all her Present messages, may also explain this difference.

The direct instruction content of instructor messages may influence students responding to other student replies to those instructor messages (Research Question 4) as well. However, students responded to other student replies to Confirm-Focus instructor messages significantly ($p = .046$) more than Confirm instructor messages, and this difference was significant only when the Unit 6 messages were not included in the analysis.

Additionally, some instructor messages, such as those containing Focus direct instruction content, may have an expectation for a student reply. Furthermore, some combination messages, specifically Confirm-Focus instructor messages, may be more effective at continuing the discussion thread than instructor messages containing only one
type of direct instruction content. This influence of direct instruction content on thread development may extend beyond the initial reading of and replying to instructor messages, and it may influence responding to and reading of subsequent student replies as well.
## Appendix A: Direct Instruction Indicators and Examples

<table>
<thead>
<tr>
<th>Code</th>
<th>Indicator</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Confirm understanding through assessment and explanatory feedback</td>
<td>“You're close, but you didn't account for… this is important because…”</td>
</tr>
</tbody>
</table>

Pilot Note: Instructor message must include more than short praise or admonishment, such as “good job”; it must include some specifics about the student message.

| D    | Diagnose misconceptions | “Remember, Bates is speaking from an administrative perspective, so be careful when you say…” |

| F    | Focus the discussion on specific issues | “I think that's a dead end. I would ask you to consider…” |

| I    | Inject knowledge from diverse sources, e.g., textbook, articles, internet, personal experiences (includes pointers to resources) | “I was at a conference with Bates once, and he said… You can find the proceedings from the conference at http://www…” |

Pilot Note: Instructor message can include brief descriptions of mentioned resources.

| P    | Present content/questions | “Bates says…what do you think?” |

Pilot Note: Questions must be about content.

| S    | Summarize the discussion | “The original question was… Joe said… Mary said… we concluded that… We still haven't addressed…” |

| N    | No Direct Instruction found | |

| XX   | Combination, more than one Direct Instruction indicator found in message |

If an instructor message has more than one Direct Instruction indicator, multiple indicator codes are recorded. For example, “FS” would be recorded for a combination message which both focuses the discussion on specific issues (F) and summarizes the discussion (S).
Appendix B: Unit Discussion Prompts/Questions

Unit 1 Discussion

There will be two major lines of questions. I will post both questions for each topic so you know in advance what you will be doing. Facilitators should start the discussion with the first topic and then mid-way through the discussion period begin the discussion on the other topic.

Part #1: Describe your experiences with research and research utilization in your past clinical experience.

- Have you been a consumer of research (research utilization or evidence-based practice)? If so, was this on an individual basis or a unit/organizational basis? What was the problem that you were trying to address? How did you address the problem by using empirical evidence from research?

- Have you participated in formal research (in your work or elsewhere)? How? What role did you take? What was the purpose of the research (see Table 1.3 in Pollit and Beck, page 20)—was it for the purpose of identification, description, exploration, explanation, prediction or control?

- How does research differ from the nursing process, which is commonly thought of as a problem solving process?

Part #2: Now let’s be more hypothetical or future oriented related to research utilization and evidence based practice?

Read the Melnyk and Fineout-Overhold chapter “Reviewing Evidence to Guide Best Practice”. Six different specialty practice areas are addressed in this chapter and
include brief synopses of evidence reviews that the Melnyk and Fineout-Overhold textbook provide (not required for our course). What major specialty area is of interest to you clinically and what specific research evidence areas within the specialty area really tweak your interest? Why? Discuss this from the perspective of your clinical practice (how does it impact the care you give or impact patient outcomes) and speculate on how you might organize to address this problem using research evidence.

Facilitators may wish to organize the discussion by starting each thread, giving it a title (e.g. Part 1) and then each group member will post a new thread to answer the questions.

Unit 2 Discussion

Our Discussion Forum in Unit Two will deal with Phase I of the Research Process: the conceptualization phase. The first set of discussion questions will deal with the research problem, purpose, and research questions. The second set of questions will deal with literature review and framework of the study. Please plan your postings/interactions with your group so that you will have ample opportunity to fully participate in both parts of the discussion.

Part I. We will use two approaches to discuss our topic this week. Part of the group will be focusing on identifying a research problem, purpose, and questions from their own practice or interest areas and part of the group will focus on identifying the research, problem, purpose and questions from the Walker et al study (See Unit 2 reading list and ARES). Facilitators should assign each group member to one of the approaches or ask group members prior to the discussion start which approach they would like to
take. In groups of 5, you can make a decision as to how the division (2 or 3 for each approach) should occur. In the group of 6, 3 students should be assigned to each approach. Each student in the group will individually answer the set of questions and post the responses to the set of questions as a new thread in the discussion. Title the thread like this: Part I Real life Problem, Purpose, Question by Sally Student or Part I Walker et al Research Problem, Purpose, Question by Sally Student. So there should be 5-6 threads for part I based on the size of your group. Then for interaction post comments and questions to at least 1 real-life and 1 Walker discussion thread, as well as responding to questions you receive in your thread.

For Part I refer to Polit and Beck Chapter 4 – pp 81-103 for information on research problems, purposes, and questions. For each approach discuss the following:

1. Identify and describe the problem (from real life – practice or from the Walker et al study).
   
   - Describe the topic area and the more specific problem. (For the Walker research identify in the article the problem statement.)

   - What is the source of the problem –
     
     - For the real-life option, is it from clinical experience/practice, relevant literature, social issues, theory or external suggestions.
     - For the Walker study option, what does the problem statement suggest as the source of the problem? For the Walker et al option, where/how do you think the researchers identified the problem?

   - For the Real-life option, evaluate the research problem in terms of significance, research ability, feasibility, and researcher interest.
• For the Walker et al option, how do the researchers address the significance of the problem… why is it important to study the problem?

2. What is the purpose of the study?

• For the real-life option, what would you like to do to study the problem…. what would the purpose be? What are the variables of interest?

• For the Walker research option, what is the purpose of the study? What are the key variables under study (independent and dependent)?

3. What are the research questions?

• For the real-life option, pose a research question that would allow you to study the problem in a setting of your choice and with a sample appropriate to the question. What are the variables in the research question?

• For the Walker research option, what are the research questions under study? How are the research questions stated: as hypotheses or other? What are the independent and dependent variables? Are the problem, purpose and questions/hypotheses stated clearly—easy to identify?

Part II refer to Polit and Beck Chapters 5 and 6. Post your responses as directed in Part I. In other words, you should have 5-6 threads for part II with labels constructed like in part I. Post, respond and discuss as directed with part I…… have fun!

1. Review of the literature.

• Real-life option:
  o What key terms would you use to search the literature—try it out in a limited manner. What worked?
o What data bases did you use to do the limited search (CINAHL, Pub Med)?

o Does the review of the literature suggest that you should use a quantitative or qualitative paradigm to answer the question?

• Walker research option:
  
o What key words were used by the authors at the end of the abstract?
  
o What types of literature were reported in the article? Did the literature help you to understand the problem and the rationale for conducting the study?
  
o Does the review of the literature lend support to the quantitative approach taken for the study? Why?

2. Theoretical/conceptual framework.

• Real-life option: what theoretical framework might be useful in conducting a study to answer your research question? Did the limited review of the literature suggest any frameworks? If you think a qualitative approach would be better what method do you think would work best (grounded theory, ethnography, phenomenology… see chapter 3)?

• Walker research option: what theory was used to guide the study design/intervention and why? Do you think this theory was appropriate and why?
Unit 3 Discussion

Discussion Questions Set 1: All students should read the following articles from the Unit 3 Readings folder and Chapters 8 and 10 of Polit & Beck. However, for the discussion, half of the members of your group should focus on the Williams et al. study and other half of the members should focus on the Wilson study (facilitators please make sure each student knows which article to focus on for the discussion). For example, if you have five members in your group, 3 members will focus on Williams and 2 members will focus on Wilson.


Answer the following questions for your assigned study:

1. Identify if there is an explicit theoretical framework for each study, and if so what is it? If there is not an explicit (stated) framework) simply identify/list the major concepts under study.
2. Provide 2 examples of operational definitions provided for concepts/variables.
3. Identify the quantitative study design in each study.
4. Identify and describe the following design characteristics for your assigned study (See Table 8.2, Polit & Beck, p. 203 for description of these):
   a. Intervention
   b. Control over extraneous variables
   c. Masking
d. Comparison

e. Location of study

f. Timeframes: Prospective/Retrospective; Cross-sectional/longitudinal

g. Control or Comparison group

Discussion Questions Set 2: In the second part of your discussion time you should discuss how these characteristics differed or were similar for the studies and also how each strengthened or weakened each study.

***Suggestion, but not required: To avoid repetition of comparison of all characteristics, Facilitators might want to divide the list of characteristics in half and assign each half to half of each article focus group. Using the example of a 5 member group, 2 of the Williams and 1 of the Wilson group will provide comparisons of the first half of the characteristics, and 1 of the Williams and 1 of the Wilson group will provide comparisons of the second half of the characteristics. Make sure you raise questions of each other on how these differences and similarities impact the study and its strength.

Enjoy!

Unit 4 Discussion

Use the Williams et al (2003) article from the Unit 3 discussion (Community-based intervention for siblings and parents of children with chronic illness or disability: the ISEE study) to answer the following questions. Facilitators should assign the questions equally among the group members. Questions are in two sets as usual. Remember to not only answer the questions, but discuss! :-}
Question Set #1: Sampling

1. Describe the inclusion/exclusion criteria of the sample.

2. Describe the sampling method used, and whether this was appropriate for the study. (use your text)

3. Differentiate between random sampling and random assignment… which applies in the study by Williams et al.?

4. What was the sample size and how was the sample size determined?

5. Why is sample size important in research?

Question Set #2: Measurement and data collection

1. Select from Appendix B of the Williams et al article two instruments and describe the internal consistency (labeled Cronbach's alpha or alpha coefficient) and if the values were adequate. What is internal consistency reliability?

2. Report any validity information given for the instruments. Describe what validity assessment was reported? What type of validity? What does this validity mean regarding the measurement of the concept?

3. Go to the Quality of Life Instruments page in the Learning Activities folder for Unit 4. Go to the Proqolid website (http://www.proqolid.org/). Using the directions from the learning activity folder, choose one instrument from the site and describe the instrument and why it is interesting to you. You will not have total access to the information about the tools, including reliability and validity, so you may want to run a quick search on Google or CINAHL and
see if you can find additional information on the reliability and validity of the tool.

**Unit 5 Discussion**

There are two sets of discussion questions to space over the course of the discussion. All students should participate in both sets of discussion questions.

Set 1: Qualitative Research Discussion: Each group should choose one of the 3 qualitative research studies described in Polit & Beck on pp. 531-533… grounded theory, phenomenology, and ethnography. Obtain the full text of the study through the e-journal collection - http://mt8fd2he2v.search.serialssolutions.com/. All of these journals are available.

Read the chosen article and refer to Box 19.3 in Polit and Beck on page 531 and respond to the questions 1, 3, 4, 5, 6, 7, 8, and 9. For item #6 refer to the discussion in Chapter 20 on trustworthiness of data as suggested by Lincoln and Guba (pp 539-540). Comment on how the author(s) addressed the rigor of the study methods/data. In group discuss your impressions of the study as evaluated with the P&B evaluation criteria.

Set 2: Use of Statistics in Quantitative Research

1. Identify the level of measurement for data for each of the following:
   a. Race/Ethnicity
   b. Sex/Gender
   c. Infant feeding choice recorded on birth certificate at hospital discharge in HCA health system
   d. Heights of children in Ms Wilson’s 3rd grade class
e. Weights of infants born between January 1, 2010 and December 31, 2010 at Hospital

f. Customer satisfaction scale composed of 10 items with 4-point rating scale

g. Intelligence test scores for children in Ms Wilson’s 3rd grade glass

h. Breastfeeding duration (in days) for all mothers who commenced breastfeeding at Hospital in 2009

i. Political party affiliation

j. Verbal pain ratings on a 1-10 scale

k. Braden Pressure Ulcer Staging Scale

(www.merck.com/mmpe/sec10/ch126/ch126a.html)

l. Depression scores using the CES-D

(www.bcbsm.com/pdf/Depression_CES-D.pdf)

m. Social support scores using the Hughes Breastfeeding Support Scale (30-items, rating amount of instrumental, emotional, and informative support, response ranges from no help (1) to as much help as I wanted (4))

2. Compose a research question using two or more of the variables above and identify appropriate statistical analyses to answer the question. Use Figure 22.5 Quick guide to bivariate statistical tests on page 592 of Polit and Beck to assist.

**Unit 6 Discussion**

Join me in a mock research conference this week! In this discussion you are given opportunity to review two posters and listen to one paper presentation on some of your
instructor’s past research (Unit 6 Learning Activities Folder)! You will then have the opportunity to follow-up with me by asking questions about the studies using your acquired knowledge from the semester. These questions should be like those you might ask at the conference where the research is being presented! Questions can be based in your need for clarification as well as asking about details about the study design, findings, and interpretation. Individual group members should pose at least one question for each of the presentations. You can spread this over the discussion period. I will check in periodically to answer questions, but if you can help out with your thoughts on a question or comment of a colleague, go for it!
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