Fostering Cognitive Presence in Higher Education through the Authentic Design, Delivery, and Evaluation of an Online Learning Resource: A Mixed Methods Study

by

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dedicated with love to

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Abstract

The impact of Internet technology on critical thinking is of growing interest among researchers. However, there still remains much to explore in terms of how critical thinking can be fostered through online environments for higher education. Ten years ago, Garrison, Anderson, and Archer (2000) published an article describing the Community of Inquiry (CoI) framework which provided an outline of three core elements that were able to describe and measure a collaborative and positive educational experience in an online learning environment, namely teaching presence (design, facilitation, and direct instruction), social presence (the ability of learners to project themselves socially and emotionally), and cognitive presence (the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse).

This dissertation extends the body of research surrounding the CoI framework and also the literature on developing critical thinking in online environments by examining and exploring the extent to which teaching and social presence contribute to cognitive presence. The researcher was able to do this by offering 189 learners enrolled in 10 research methods courses and educational research courses an opportunity to use an innovative online resource (Research Design Learning Resource – RDLR) to assist them in learning about educational research and developing research proposals. By exploring how participants used this resource the researcher was able to gain insight into what factors contributed to a successful online learning experience and fostered cognitive presence.

Quantitative and qualitative research approaches (mixed methods) were used in this study. The quantitative results indicated that both social and teaching presence had a strong positive relationship with cognitive presence and that learners generally perceived to have a

positive learning experience using the RDLR. The qualitative findings helped elaborate the significant quantitative results and were organised into the following themes: making connections, multiple perspectives, resource design, being a self-directed learner, learning strategies, learning preferences, and barriers to cognitive presence. Future directions for critical thinking in online environments are discussed.

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Chapter 1

Introduction

Statement of the Problem

Research has shown that online learning and computer-mediated communication (CMC) are growing at an ever increasing rate in higher education (Cox & Cox, 2008; Nelson, 2008). Beldarrain (2006) noted the popularity of online learning has brought a shift in pedagogical and theoretical frameworks from teacher-centred instruction to that which is learner-centered and promotes interaction and collaboration. Technology has played, and continues to play, a key role in the development of online learning. As stated by Beldarrain, "As new technologies emerge, instructional designers and educators have unique opportunities to foster interaction and collaboration among learners, thus creating a true learning community" (p. 140).

Corresponding to the shift in learning from teacher centric approaches to learner centric approaches has been a plethora of research on the effectiveness of online learning (Tallent-Runnels et al., 2006) and the relevance of online interactions to learning tasks. There is a growing body of empirical evidence supporting the idea that the online environment is particularly suited to self-directed learning (SDL) (Boyd, 2004; Candy, 2004; Garrison, 2003; Hiemstra, 2005, 2006; Hiemstra & Poley, 2006). Online learning is becoming increasingly commonplace. Today, many young adults have grown up with the Internet and are comfortable using technology to learn. Hiemstra (2005) noted, "In essence, the learning orientations of today's younger people are tied to expectations of what the Web promises … and may actually make self-directed approaches to teaching and learning the default norm" (p. 7).

Furthermore, employers are seeking university graduates with strong problem-solving, critical thinking, communication, teamwork, leadership, and initiative skills (Allen & Duch,

1998). However, graduates entering the workforce often lack these skills (Uden & Beaumont, 2006). The impact of Internet technology on critical thinking is of growing interest among researchers. However, there still remains much to explore in terms of how critical thinking can be fostered through online environments for higher education and workplace training groups. Thus, it was the researcher's intention in this study to foster opportunities for critical thinking through the design, development, and application of an online learning resource. Essential to this goal was the creation of a learning environment that would enable an online learning community to progressively move to higher levels of critical thinking. There is evidence in the online learning literature that critical thinking skills can be enhanced through the use of a variety of online formats (Duphonrne & Gunawardena, 2005; Moore & Marra, 2005). However, other researchers have found that moving an online community of learners to the highest levels of critical thinking is difficult (Garrison, Anderson, & Archer, 2001; Kanuka & Anderson, 1998; Meyer, 2004; Vaughn & Garrison, 2005). The highest levels of critical thinking involve connecting, integrating, and applying new ideas (Garrison, Anderson, et al.). A possible explanation of why critical thinking was not recorded at higher levels could be because the design and expectations of the educational experience did not require learners to move to these levels (Garrison, Anderson, & Archer, 2010). Another possible reason may have been that the learners did not have the skills to achieve these levels.

A community of inquiry is an extremely valuable, if not essential, context for higher-order learning (Garrison et al., 2001). Ten years ago, Garrison, Anderson, and Archer (2000) published an article describing the Community of Inquiry (CoI) framework. At the time, the CoI framework was intended to offer a new theoretical perspective that drew upon earlier research on computer conferencing (Garrison, Anderson, et al., 2010). The framework provided an outline of

three core elements that were able to describe and measure a collaborative and positive educational experience, namely teaching presence, social presence, and cognitive presence.

Social presence is the ability of learners to project themselves socially and emotionally in an online environment (Gunawardena & Zittle, 1997). Social presence is defined as being an environment in which learners can communicate openly and purposefully, use affective expression, and have the opportunity to develop a sense of group cohesion through collaboration (Garrison & Arbaugh, 2007). However, social presence needs to evolve from establishing social relationships to intellectual focused discussions (Thompson & MacDonald, 2005). Thus social presence provides the foundation for cognitive presence (Garrison & Arbaugh).

Cognitive presence is the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in an online discussion forum (Garrison & Arbaugh, 2007) and is grounded in the critical thinking literature (Garrison et al., 2001). Moreover, cognitive presence can be operationalised by a model of critical thinking: the Practical Inquiry Model.

The Practical Inquiry Model is a four-phase process. First, the facilitator (or a learner) presents a thought provoking question or problem of interest to an online discussion that requires inquiry. Learners and facilitator then move to the exploration phase of the model in which they explore the problem or question through critical reflection and discourse. Exploration leads to a phase of integration in which learners integrate or make meaning from the ideas they have explored. The role of the facilitator is very important during this phase, “to probe and diagnose ideas so that learners will move to higher level thinking…” (Garrison & Arbaugh, 2007, p. 161). Integration then leads learners to the last stage of the model: resolution. Resolution represents the highest level of cognitive presence, in which learners apply their new knowledge. Garrison and

Cleveland-Innes (2005) found that the structure of an online course design and the leadership provided by the facilitator seemed to have an effect on whether learners are able to engage in a "deep and meaningful approach to learning" (p. 133). Thus, their findings suggested that there is a relationship between cognitive presence and teaching presence.

"Teaching presence is the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Garrison & Arbaugh, 2007, p. 163). Direction in this case refers to the instructor's or facilitator's role in guiding the interactions of the learners. Recent research has shown (Garrison & Cleveland-Innes, 2005; Kanuka, Rourke, & Laflamme, 2007) that teaching presence seemed to be significant in determining learners' perceptions of learning, course satisfaction, and sense of belonging to an online community.

For the purposes of this study, the researcher was particularly interested in the element of cognitive presence, which is based on John Dewey's notion of reflective inquiry (Swan, Garrison, & Richardson, 2009) and can be considered synonymous with the "critical thinking it seeks as an outcome" (Garrison & Arbaugh, 2007). The relationship between Dewey's phases of reflective inquiry and the CoI framework are discussed in Chapter 2. However, recent empirical research has shown that cognitive presence cannot be studied in isolation of teaching presence and social presence, as all three elements are considered both statistically and conceptually interdependent (Garrison, Anderson, et al., 2010). Few studies to date have explored the dynamics of online collaborative learning to understand the motivation of learners and critical thinking. Garrison and Arbaugh (2007) hinted that this is an area of future research and it is this gap in our understanding that the researcher wanted to explore. Online learning is a complex

phenomenon and among researchers who have used the CoI framework there has been some discrepancy about the interdependence of the elements.

If there is any criticism about the studies using the CoI framework to date, it is that there has not been an examination of the relative impact each of the three elements has on the others and how that may vary in different educational contexts. Although recent empirical research such as the factor analyses conducted by Arbaugh (2007); Arbaugh and Hwang (2006); Garrison, Cleveland-Innes, and Fung (2004); and Shea and Bidjerano (2009) certainly supports the CoI as a framework of online learning, this work needs to be reinforced by additional study. Unfortunately, to date, there are "very few studies that examine the three elements of the framework simultaneously, either quantitatively or qualitatively" (Garrison & Arbaugh, 2007, p. 159). Understanding how teaching presence and social presence relate to cognitive presence was of great interest to the researcher. Moreover, Arbaugh (2007) noted that in addition to examining the relations between the three elements of the framework, other variables such as the characteristics of learners should be studied in concert with them.

This dissertation extends the research body surrounding the CoI framework and also the literature on developing critical thinking in online environments by examining and exploring the extent to which teaching and social presence contribute to cognitive presence. The researcher was able to do this by offering learners enrolled in research methods courses and educational research courses in two higher education institutions an opportunity to use an innovative online resource to assist them in learning about educational research and developing research proposals. By exploring how participants used this resource the researcher was able to gain insight into what factors contributed to a successful online learning experience and fostered cognitive presence. Quantitative and qualitative research approaches (mixed methods) were used in this

study. The quantitative data and results enabled the researcher to explore the factors that predicted the improvement of cognitive presence; and the qualitative data and findings helped to explain the interesting or significant quantitative results by allowing the researcher to examine select participants' perceptions of their learning in more detail (Creswell & Plano Clark, 2010; Ivankova, 2004; Tashakkori & Teddlie, 1998).

Purpose of the Study

The purpose of this mixed methods sequential explanatory study was to explore cognitive presence and the learning experiences of participants using an online learning resource in higher education research methods courses. Surveys and online discussion transcripts were used to explore these phenomena and the results were then followed-up through the purposeful selection of individuals to explain the results in more detail in semi-structured interviews.

Through examination of the relationships between three elements in an online CoI (i.e., teaching, social, and cognitive presence), the researcher was able to gain further insight into whether higher levels of cognitive presence (namely, integration and resolution) can be reached in an online environment. Specifically, the researcher explored the effects of the design of the online learning resource, his direct instruction and facilitation of the discussions (teaching presence) and the extent of the development of the interpersonal relationships among users (social presence) on predicting critical thinking among users (cognitive presence). Furthermore, with regard to the examination of the CoI, the researcher wanted to determine the ability of social and teaching presence to predict cognitive presence after controlling for several additional variables (i.e., SDL readiness, prior online learning experience, and prior collaborative learning experience).

Assumptions of the Researcher

A number of assumptions were made in this research study. First, the concept of cognitive presence in the CoI framework represents the process of critical thinking. The phases of Garrison et al.'s (2000) Practical Inquiry Model were used to assess the critical thinking processes of learners in this research. The model is a four stage cognitive processing model that has been used to assess critical thinking in online discussions (Meyer, 2004).Throughout this dissertation the researcher has used the term "cognitive presence" when referring to critical thinking in an online community of inquiry. The results and conclusions on critical thinking were drawn from the analysis of the cognitive presence construct of the CoI framework. Therefore, the implications and recommendations made about critical thinking were based on Garrison et al.'s (2000) definition of cognitive presence and Garrison's previous work on critical thinking, SDL, distance education, and collaborative constructivism (Garrison, 1985a; 1985b 1991; 1992; 1993; 1995; 1997).

A second assumption, related to the first, was that critical thinking can be achieved through critical discourse, and that it can be measured through content analysis of online transcripts. Third, it was assumed that within each chosen intervention site there will be variance in the participants' online learning and collaborative learning experience and readiness for SDL. Variance in these factors is important in order that that their effects can be measured in relation to the elements in the CoI. Fourth, it was assumed there would be variability in the results from using the CoI instrument. If not, this finding would be explored in the qualitative phase of the study.

Finally, the fifth assumption was that learning is understood within an online CoI which is based on a collaborative constructivist perspective. Examples of assumptions based on

learning within the CoI would include that: all learners have life experiences that affect their thinking and that these experiences are drawn upon in creating new knowledge; learners are capable of assuming responsibility for and taking control of their own learning; and learners have or can acquire a capacity for critical thinking. These assumptions of learning within an online CoI are elaborated upon in chapter 2.

Quantitative Research Questions (Phase One)

For the first phase of this study there were seven research questions. These, along with the directional hypotheses and rationale for why the questions were addressed, are as follows:

1. Research question. How did participants perceive their learning experiences?

a. How did participants experience the Research Design Learning Resource (RDLR)?

b. Were there differences among the intervention sites?

Hypothesis. Participants will have positive learning experiences using the RDLR but there may be differences among intervention sites.

Rationale. The CoI framework is gaining attention in online education (Garrison & Arbaugh, 2007; Meyer, 2004; Shea, 2006) and is useful in explaining and prescribing effective online learning (Arbaugh et al., 2008). The CoI model was chosen as a framework for assessing learning because it is based on the notion that higher order learning experiences are conducted through an online community composed of teachers and learners, "requiring the demonstration of critical thinking and the engagement of 'real' persons to be successful" (p. 73). This notion is consistent with the constructivist ideal in higher education that discourse and reflection is integral in a collaborative community of scholars (Swan, Garrison, & Richardson, 2009). Furthermore, there are only a few frameworks designed to analyse online discussions, the CoI

framework being the most commonly used. The RDLR was used to encourage online discussion and provide participants with resources to aid them in their understanding of educational research. The RDLR was used by novice and experienced researchers, and thus there may be differences in learning experiences among intervention sites.

2. Research question. What is the relationship between social and cognitive presence, as instantiated by the RDLR and online discussions?

Hypothesis. Social presence [independent variable (IV)] will be positively related to cognitive presence [dependent variable (DV)].

Rationale. Little is known about how the elements of the CoI framework interact. “While elements of the CoI framework are seen as overlapping in nature,…studies using moderated regression to determine the extent to which the elements moderate each others’ relationship to learning outcomes is much needed” (Arbaugh, 2007, p. 82). Of all the elements comprising the CoI, social presence has been studied the most. However, the majority of this research has been done without considering its relationship to cognitive and teaching presence (Garrison & Arbaugh, 2007). Beuchot and Bullen (2005) found that increased online sociability will lead to increased online interaction, implying that it is important in cognitive presence development. Further research has shown that social presence alone will not ensure critical discourse but without it such discourse is unlikely to occur (Arbaugh, 2007; Garrison & Cleveland-Innes, 2005).

3. Research question. What is the relationship between teaching and cognitive presence, as instantiated by the RDLR and online discussions?

Hypothesis. Teaching presence (IV) will be positively related to cognitive presence (DV).

Rationale. Hoskins and van Hoof (2005) acknowledged that learner interaction and discourse are critical for higher order learning but not without structure and leadership, which are both characteristics of teaching presence. Moreover, Garrison and Cleveland-Innes (2005) concluded that "teaching presence must be available, either from the facilitator or the other students, to transition from social to cognitive presence" (p. 143).

Although it is important to gain an understanding of the relationships between teaching, social, and cognitive presence, it may be of more importance to reveal whether or not these elements really "capture the core dynamics" (Garrison & Arbaugh, 2007, p. 166) of a CoI. Thus, research questions 4-6 were proposed to examine the relationships between the CoI elements and other variables.

4. Research question. Do social and teaching presence improve the prediction of cognitive presence after controlling for SDL readiness?

Hypothesis. After controlling for SDL readiness [covariate (CV)], social and teaching presence (IVs) will not significantly contribute to the prediction of cognitive presence (DV).

Rationale. Akyol & Garrison (in press) have begun to explore the concept of metacognition (thinking about thinking or being able to evaluate one's own thinking). An aspect of metacognition is cognitive monitoring which includes willingness to and awareness of reflection. Therefore awareness of one's own cognitive presence and an ability to take responsibility for learning connects critical thinking and SDL in an online CoI. Thus, there may be a relationship between self-directedness and how we construct and confirm meaning online (cognitive presence).

5. Research question. Do social and teaching presence improve the prediction of cognitive presence after controlling for prior online learning experiences?

Hypothesis. After controlling for prior online learning experiences (CV), social and teaching presence (IVs) will not significantly contribute to the prediction of cognitive presence (DV).

Rationale. Cleveland-Innes et al. revealed that there is a period of role adjustment or "getting up to speed" before novice online learners are competent at engaging in an online community. Thus, previous online learning experience may affect how learners engage in an online CoI.

6. Research question. Do social and teaching presence improve the prediction of cognitive presence after controlling for prior collaborative learning experiences?

Hypothesis. After controlling for prior collaborative learning experiences (CV), social and teaching presence (IVs) will not significantly contribute to the prediction of cognitive presence (DV).

Rationale. The CoI framework is based on the theoretical foundation of collaborative constructivism (Garrison et al., 2000). The premise of this approach is that individual learners construct knowledge from personal experience in a social environment. It would therefore be logical that those learners who have experience working collaboratively in teams to solve common problems will be more able to engage in an online CoI.

7. Research question. What phases of cognitive presence did the participants demonstrate?

Hypothesis. Participants will achieve the highest phases of cognitive presence (i.e., integration and resolution).

Rationale. Early research conducted on computer conferencing using transcript analysis showed that participants were not able to proceed to levels of integration and resolution

(Garrison et al., 2001). Other studies since then have shown similar results. However, studies that have purposefully implemented teaching strategies, such as inviting experts and reflective deliberation (Kanuka, Rourke, & LaFlamme, 2007), or changed the setting to a work placement environment (de Leng, Dolmans, Jöbsis, Muijtjtens, & van der Vleuten, 2008), have shown moderate levels of integration and resolution messages, which suggests that the highest phases of cognitive presence may be attainable.

Qualitative Research Question (Phase Two)

For the second, qualitative phase of the study, the following question was proposed to elaborate upon the results of the quantitative phase: How can the statistical results from the quantitative phase be explained? The variables from the first phase of the study, which were chosen for investigation in the second phase, formed the topics for developing the interview protocol. These variables are explained in Chapter 5 of this study.

Definitions of Terms

Asynchronous learning is a student-centred learning method based on constructivist perspectives that combines self-study with collaborative online technologies such as discussion forums. The role of the teacher becomes that of facilitator and instructional designer. The term asynchronous refers to the idea that individuals have the opportunity to learn on their own time, as opposed to synchronous learning, which requires learners to be active at the same time. Technologies that support online synchronous learning would be videoconferencing, Skype™, and chat rooms.

Blackboard™ is an online software platform that higher education institutions use to support online courses. The RDLR was housed on the University of Ottawa and Algonquin

College's Blackboard systems. Participants had restricted access to the resource through this platform.

Cognitive presence in online learning is the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison & Arbaugh, 2007). Moreover, cognitive presence focuses on the learner's higher order thinking processes (Garrison et al. 2001).

Collaborative constructivism is based on two fundamental concepts: (1) the constructivist approach, in which learners create their own meaning and knowledge, and (2) that they collaborate to create and confirm this knowledge (Garrison & Archer, 2000). It is considered to be positioned between the more extreme radical and social constructivist positions (Garrison, 1997). Essentially, through a collaborative constructivist perspective the individual takes responsibility for constructing meaning while through participating with others will confirm worthwhile knowledge. Thus, "meaningfulness and worthwhileness reflect the cognitive and social perspectives of an educational experience" (Garrison, p. 19). Collaborative constructivism as a theoretical perspective is discussed in the following chapter.

Collaborative learning. Distance learners who previously were unable to have much contact with other learners can now take part in discussion forums and group activities. Course management systems such as WebCT and Blackboard Vista incorporate tools for synchronous and asynchronous online communication and learner presentations (Roberts, 2004).

Community of Inquiry Framework (CoI) is a conceptual model for online learning that can be used as a research tool or a guide to evaluate programs. Garrison et al. (2000) developed the CoI framework as a means to investigate how computer conference activities could promote

critical thinking. The CoI assumes that an effective online learning experience is a result of three essential interdependent elements: teaching presence, social presence, and cognitive presence.

Critical discourse in an online discussion refers to the reflective thinking and collective knowledge building between an individual and a larger group of learners. Uzuner (2007) indicates, “that removal of time and space restrictions in such discourse provides better opportunities for reflective thinking that may not be possible in time dependent spoken conversations” (p. 402). Uzuner furthers this concept by indicating that, “the sequential and recorded qualities of threaded electronic discourse and its particular demands, such as exactness, coherent organization of thought, clear, and authentic expression, have powerful affordances for collective knowledge building” (p. 402). Meyer (2003), Salmon (2002), and Swan and Shih (2005) have also contributed to the literature on critical discourse or reflective online discussions.

Critical thinking is the practice of reflection regarding thought and practice. Learners make connections between their personal and public worlds. Critical thinking is the ability of learners to use creativity, problem solving, intuition, and insight as well as to construct, make sense of and confirm meaning (Garrison & Archer, 2000). Critical thinking is both a process and an outcome. Garrison et al. (2001) acknowledged that as an outcome (e.g., critical inquiry abilities, skills, and dispositions), critical thinking is best understood from an individual perspective through assignments or finished products. The difficulty with assessing critical thinking as an outcome is that it is very complex because it involves creativity and problem solving. As a process, critical thinking can be facilitated by creating an environment conducive to higher order learning. This process can be explored using a tool to assess critical discourse and reflection—the Practical Inquiry Model (Garrison et al.).

Digital storytelling. Recent technology in media applications has increased the facility of employing stories in online learning programs. Digital storytelling has been shown to promote literacy, collaboration, creativity, and problem-solving (McLellan, 2006). Digital storytelling adds to the resources available to learners for constructing knowledge. It allows for more perspectives and ideas to be shared. “Stories originate in problematic situations; they show the way out of the situations” (McLellan, p. 28). Moreover, the use of digital storytelling and discussion boards can help engage learners in the discussion of stories and sharing of perspectives.

Facilitator. A facilitator of online discussions provides support and guidance to learners. This support can be in the form of asking questions and providing feedback to individual learners. The facilitator’s role is to keep the discussion moving in order to assist learners in achieving higher levels of cognitive presence. The facilitator is to “monitor and manage discourse to ensure that it is productive and learners stay engaged” (Garrison, 2009, p. 354).

*Instructional Design*er. An instructional designer, who approaches learning from a collaborative approach, provides learners opportunities to actively practice what they are learning. In online learning this may include working with subject matter experts to develop content, and adapting instructional materials from traditional face-to-face environments to virtual environments. “Design sets the stage and potential of the learning experience. Design is of particular concern in creating a community of inquiry and collaborative-constructivist learning experiences” (Garrison, 2009, p. 354).

Self-directed learning. SDL “is a process of learning in which people take the primary initiative for planning, carrying out, and evaluating their own learning experiences” (Merriam et al., 2007, p. 110). Knowles (1975) referred to SDL as the ability to learn on one’s own. Early

models of SDL were linear. Learners went through a series of steps to reach their learning goals. More recent models indicate that the learning process is not simply linear, and that factors such as cognitive processes, personality characteristics, and learning opportunities in one's environment can influence SDL (Merriam et al.). An example would be Garrison's SDL model (1997) which includes three overlapping dimensions: self-management (self-control); self-monitoring (cognitive responsibility); and motivation. Furthermore, some models indicate that SDL can be taught. Instructors in formal settings could integrate self-directed methods of learning into their programs and activities" (Merriam et al.).

Social presence in online learning is the ability of learners to project themselves socially and emotionally in a virtual environment; it "encompasses the ability of participants to coalesce for a common purpose" (Garrison et al., 2004, p. 63). Social presence is considered to be a perceived characteristic of the learning environment and is a critical element in an online CoI.

Teaching presence in online learning refers to the design, facilitation, and direction of social processes to facilitate purposeful and meaningful learning outcomes (Garrison & Arbaugh, 2007). The instructional designer or facilitator creates the learning activities, and guides the online discussions. The facilitator guides the discussions by asking probing questions, and providing feedback to the learners. Teaching presence is also considered to be a perceived characteristic of the learning environment and is a critical element in an online CoI.

Creation of the Research Design Learning Resource

The Research Design Learning Resource (RDLR) (Archibald, 2010) was created for this study to help foster the development of critical thinking and enhance the online learning experience. Essentially, the RDLR was an interactive online tool to help participants learn about educational research and research design. The RDLR allowed participants to watch videos of

researchers talk about the research designs of their recent studies and discuss aspects of the videos that resonated with them with other participants. The RDLR has three major components: (1) a collection of videos where researchers across Canada share their educational research stories (a sample screenshot can be found in Figure 1.1 of Appendix A-1); (2) an online repository of resources about research design, including scholarly publications of each researcher's work (a sample screenshot of the repository can be seen in Figure 1.2 of Appendix A-1); and (3) an online discussion forum that the researcher facilitated.

To improve the participants' understanding of research design, they were asked to select and view 1 of the 14 video stories, each of which was edited into five minute segments. Individual segments covered topics such as research questions, conceptual frameworks, methodology, legitimisation or validity, and lessons learned (a sample screenshot of the segments can be seen in Figure 1.3 of Appendix A-1). After viewing a segment, learners were invited to respond to several thought-provoking questions in a facilitated online discussion forum, to help guide their ideas for research, make connections with the research stories being viewed, and stimulate discussion amongst the participants (a sample screenshot presenting a thought provoking question and link to the discussion forum can be seen in Figure 1.4 of Appendix A-1). In this way, the RDLR provides participants with the opportunity to collaboratively develop a research proposal and learn about educational research. Examples of thought provoking questions would include, "What practices or polices do you want to change?", and "How could these changes be implemented?"

The video research stories created for the RDLR were framed by Maxwell's (2005) interactive model of research design (Appendix A-2). In this interactive model, the components of a research design—research questions, goals of the study, the conceptual framework, methods,

and validity—are interconnected. To create the videos, the researcher of this study approached researchers in various areas of educational research, either by telephone or email, to invite them to share a research story. All the researchers that were contacted agreed to participate and used the framework provided as best they could (see Appendix A-3 for a brief description of the 14 research stories). All researchers received a gift card for sharing their stories. The videos were recorded by a graduate student in the Faculty of Education with the support of a University of Ottawa Teaching and Learning grant and were then converted into a format that could be uploaded into the resource. The RDLR was housed on the University of Ottawa and Algonquin College's Blackboard Vista management systems.

Conceptual Framework

The conceptual framework depicted in Figure 1.5 will elucidate how this research is situated within the literature that is discussed in the next chapter. The authentic design and delivery of the RDLR may lead to educational experiences that promote critical thinking and SDL by providing a common venue for critical discourse and the opportunity for participants to take control of their own learning. The content focus of the RDLR is about the research design process. Viewing videos of research stories and participating in online discussions is an example of how teaching and learning can create collaborative networks among learners. The CoI framework (Garrison et al., 2000) is used to assess the learning processes (i.e., critical thinking and SDL), as well as the learning outcome, which is the understanding of educational research and design. The theoretical foundation of this study is grounded in collaborative constructivism. The three essential, interdependent elements of the CoI framework (teaching, social, and cognitive presence) represent the pertinent factors for a successful online higher education experience. Although it is well known (Arbaugh, 2007) that social and teaching presence

contribute to the development of cognitive presence, the online learning literature indicates there may be other factors involved, such as learning contexts (courses and subject matter) and learner characteristics. Three factors that may contribute to the development of cognitive presence are added to the conceptual framework. These factors include two entry covariates: prior online learning experience and prior collaborative learning experience; and a third covariate, SDL readiness, which is associated with metacognition. The effects of these factors are then predicted.

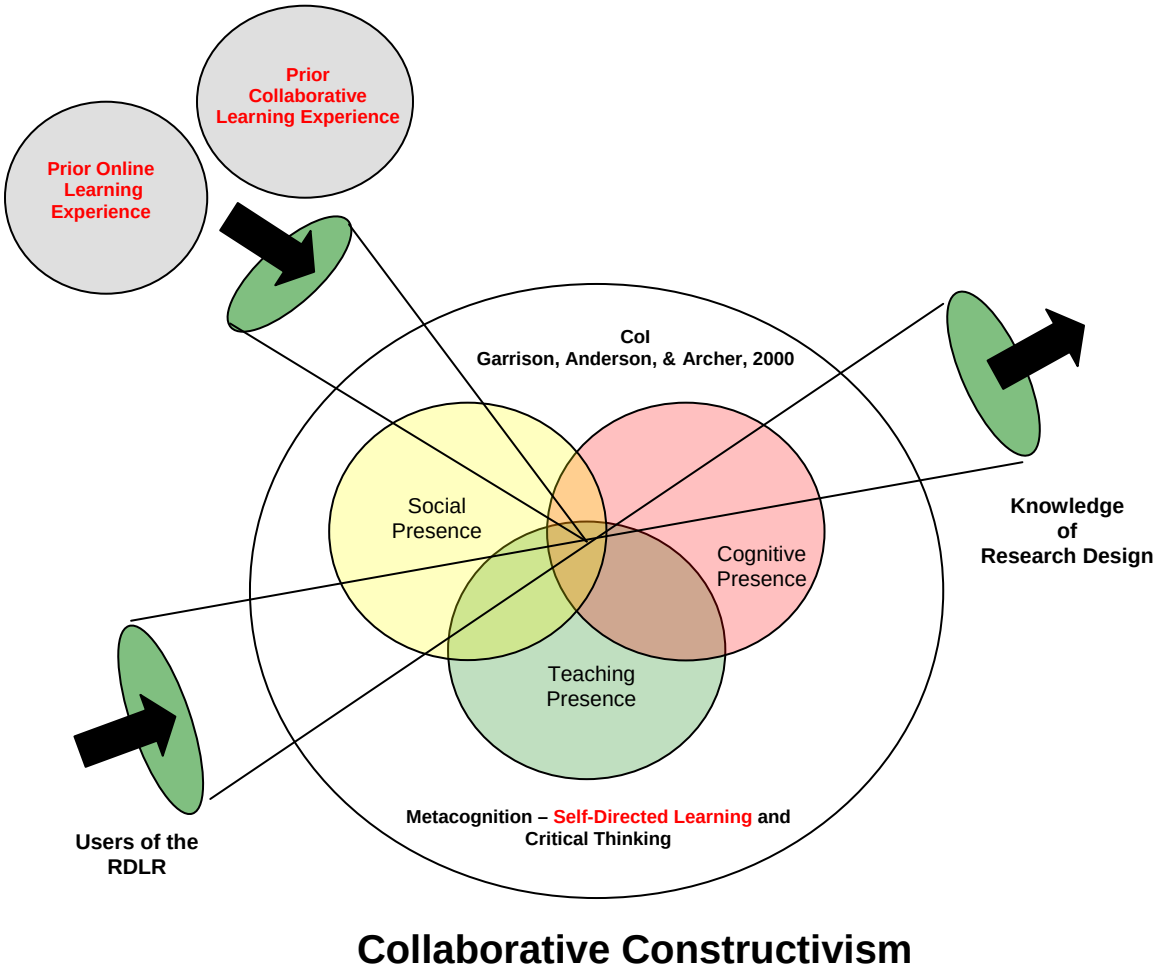

Figure 1.5. Elements of a learning experience to promote cognitive presence in higher education.

Chapter 2

Review of Literature

This chapter provides grounding for this research study in the relevant literature by drawing upon previous theoretical and empirical studies. An extensive literature review justified the creation and implementation of the RDLR as a tool to promote critical thinking through collaboration in an online environment.

The review of literature begins with a philosophical discussion about collaborative constructivism as a theoretical approach for online learning and continues with a discussion of online learning communities and a description of the CoI framework (Garrison et al., 2000). A review of studies that explored elements of the CoI framework (i.e., cognitive presence, teaching presence, and social presence) is presented. An overview of critical thinking and SDL as they relate to the CoI and online learning is made. Finally, a summary of collaborative learning strategies and the ways technology can facilitate collaborative learning is included. All the elements within the review of literature are integral to the conceptual framework of this study.

Collaborative Constructivism

The following section provides some background to collaborative constructivism as a learning perspective, beginning with a shift to constructivist learning.

Theoretical background. According to Fischler (2006), there have been two major shifts in theories of human learning in the past century. Both shifts have provided new lenses through which to view learning. The first shift occurred during the “Cognitive Revolution” of the 1960s when educators began to recognise the limits of the behaviourist approach (behaviourism) to learning. Prior to this time conditioning theories were prevalent in the psychology of learning (Schunk, 2008). The primary foci of conditioning theories from the

behavioural orientation were behaviour and the influence of the external environment on the individual's behaviour (Uden & Beaumont, 2006). Learning was defined as a change in behaviour.

During the shift of the cognitive revolution, educators and psychologists initially began to place more emphasis on cognitive processes such as information processing, memory, retrieval and storage. Then they focused more upon thinking, reasoning, and problem-solving. The mind was perceived as an information processor with short- and long-term memories, including a working memory (Hung, 2001). This approach or orientation was known as cognitive information processing. Cognitivists were interested in how the mind makes sense of environmental stimuli (Merriam, Caffarella, & Baumgartner, 2007). During this time, there was a great deal of research that explored how people selectively attend to some information, as well as the activation and retrieval of relevant knowledge (Fischler, 2006). Meaning exists in a world independent from us and learning is viewed as the transference of knowledge from outside to our minds; for example, from teacher to learner (Alessi & Trollip, 2001; Uden & Beaumont, 2006).

The next major shift occurred in more recent decades and involved a greater emphasis on learning strategies, learning theories, and the cognitive and social contexts where learning occurs (Fischler, 2006). This shift was known as the constructivist orientation to learning, in which learning is an active rather than passive endeavour (Merriam et al., 2007). The principal philosophical assumption of constructivism (which represents an array of perspectives) is that learners actively construct meaning as they make sense of their own experiences, and therefore that knowledge is unique to each individual (Merriam et al.). The constructivist perspective stresses the importance of the learner's prior knowledge and that learning stems from this

point. In addition, the importance of “transfer from the learning context to its application” (Fischler, p. 23) is emphasised. This provides the distinction between experts who are capable of retrieving knowledge to perform a relevant task and novice learners who may not be able to apply knowledge and skills in a relevant situation even once they have acquired them. These views on learning are quite different from the information processing perspective shared by cognitivists. Uden (2004) summarised the main assumptions of learning according the constructivist perspective:

1. All knowledge is constructed (albeit socially) and not transmitted.
2. Knowledge and meanings result from activity and are embedded in activity systems.
3. Knowledge is distributed in persons, tools, and other cultural artefacts.
4. Meaning arises out of interpretation and, thus, multiple perspectives are recognised.
5. Meaning construction is prompted by problems, questions, issues, and authentic tasks.

Uden and Beaumont (2006) emphasised two very important characteristics of the constructivist perspective that are critical to using a constructivist lens in an online environment, namely authentic problems and collaboration. Authentic problems are crucial because learners will only engage in learning if they perceive problems to be relevant or personally meaningful. Moreover, authentic problems are often complex and therefore more likely to elicit multiple perspectives. Finally, relevant problems generate dialogue and negotiation (Uden & Beaumont, 2006), thus laying the foundation for collaborative learning activities. Collaboration involves learners interacting with each other and also with the

facilitator to solve problems. The facilitator's role is to create the collaborative activities and guide the learning; that is, to set up the community of inquiry and engage in it. The learner's role is then to engage in the community of inquiry (Cognition and Technology Group at Vanderbilt, 1993; Uden & Beaumont).

In recent years there has been a great deal of research regarding collaboration in online learning activities. O'Donnell (2006a) considered collaboration among peers and others to be an important factor in a learner's conceptual development. She explained that collaborative learning has the "potential to increase the quality of discourse, provide alternative explanations for phenomena, generate multiple solutions to problems, and allow for the inclusion of many kinds of skills in solving problems" (p. 4). Supporters of collaborative learning, such as O'Donnell, have turned to the work of Vygotsky for philosophical grounding.

Vygotsky's social cultural theory. According to Vygotsky, a learner's social environment, culture and history are critical for the development of higher cognitive processes and the quality of learning. A learner's development is cultivated through interaction with people (social factors), and cultural-historical factors (Schunk, 2008). It is the interactions among these various factors that mediate learning and the development of the mind. In other words social interactions are not merely an influence on learning -- they are the source of learning.

Essentially, interactions with others, such as collaboration, promote cognitive development. Vygotsky considered the social environment to be of primary importance for learning and interaction within it, and responsible for transforming experiences. Using the tools of one's social environment (cultural objects, language and social institutions) in the context of interactions results in cognitive change (Schunk, 2008). Thus mediation is the key

mechanism in learning development. These social, cultural and historical influences in learning and dialogue that Vygotsky proposed support the collaborative constructivist approach in learning that fuses “individual construction of meaning and collaborative validation of understanding” (Garrison, 2009, p. 355).

Another key concept in Vygotsky’s social cultural theory is the zone of proximal development (ZPD). It is the “distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). This concept is closely associated with the term *scaffolding* which is used by collaborative learning educators. In this context, a scaffold refers to a temporary measure in which a more competent peer or teacher uses social tools and artifacts to help someone less competent to learn until the support is no longer needed (De Lisi, 2006). The idea of scaffolding is clearly present in both social and teaching elements of the CoI, particularly with regard to the development of cognitive presence.

In summary, the elements of Vygotsky’s Social Cultural Theory contribute to the underlying theory of a collaborative constructivist perspective. Vygotsky’s key elements are as follows (Adapted from Meece, 2002, pp. 155-159; Schunk, 2008, p. 244):

- Social interactions are critical; knowledge is constructed between two or more people
- Self-regulation is developed through internalisation (developing an internal representation) of actions and mental operations that occur in social interactions.
- Human development occurs through the cultural transmission of tools (language and symbols).

- Language is the most critical tool. Language development ranges from social speech, to private speech, to covert (inner) speech.
- The ZPD is the difference between what children can do on their own, and what they can do with assistance (scaffolding). Interactions with adults and peers in the ZPD promote cognitive development.

A collaborative constructivist approach to online learning. Research has shown that taking a constructivist approach to online learning and the use of educational technology is valuable because of its potential to enhance the experience for both learner and educator (Huang, 2002; Petraglia, 1998). Through online mechanisms, learners can search for and then construct their own knowledge; therefore, the Web is a popular tool for constructivist learning (Huang). For example, learners could participate in online discourse and collectively learn through collaborative social media such as wikis or blogs.

Collaborative constructivism is based on two fundamental concepts: (1) the constructivist approach, which is used to explain how learners create meaning, and (2) collaboration for creating and confirming knowledge (Garrison & Archer, 2000). Together, these two concepts form the collaborative constructivist perspective—the personal reconstruction of experience through social collaboration. From this perspective, learning is authentic and has both relevance and meaning. Moreover, learners are seen to be able to best construct knowledge from their own experiences and existing knowledge. Learning processes, such as self-directedness and critical thinking, are facilitated in a collaborative environment where individual learners are recognised and supported, multiple perspectives are shared, and misconceptions are diagnosed (Barrows, 1998; Cho, 2002; Dunlap & Grabinger, 2003;

Garrison, 2003; Garrison & Archer, 2000; Kanuka & Garrison, 2004; Peters & Gray, 2005; Thompson & MacDonald, 2005).

However, potential problems can exist with collaborative constructivist approaches; some personalities may predominate. In an online learning environment, where discussion boards have an important place in the construction of knowledge, there is a concern that some learners may monopolise the postings and undermine opportunities for sharing multiple perspectives.

From a collaborative constructivist perspective, facilitators and learners each have responsibilities for learning and controlling the nature and content of the learning activities (Garrison & Archer, 2000). Any issues surrounding the control and responsibility of learning can be negotiated. It is through control and responsibility that learners will begin to assume ownership of their learning. It is the responsibility of both the facilitator and learners to engage in an online learning community—a community of inquiry.

Online Learning Models

The notion of the learning community has been at the cornerstone of the online learning movement and has been extensively researched. Thompson and MacDonald (2005) stated that in learning communities there is a belief in the collective good and that people engage in learning together. Essentially, interaction is paramount to any learning community.

Two popular models used to asses the online learning experience include the Demand-Driven Learning Model (DDLM, MacDonald, Stodel, Farres, Breithaupt, & Gabriel, 2001) and the CoI framework (Garrison, et al., 2000). The DDLM is grounded within a constructivist framework and is defined by five main components: the quality standard of superior structure; three consumer demands of content, delivery, and service; and learner outcomes. Moreover, according to the DDLM, the design of online learning is emergent, thus providing opportunities

for ongoing adaptation, improvement, and evaluation. The DDLM proposes elements that define a superior structure for online program requirements. The elements of superior structure are required to support excellence in content, delivery, and service (MacDonald et al., 2001). When the content, delivery, service, and structure of online learning are carefully considered, multiple learner outcomes, as defined in the pinnacle of the model, are attained. A sample study using the DDLM as an evaluation framework follows.

MacDonald, Archibald, Stodel, Hall, and Chambers (2008) conducted a study to evaluate the knowledge translation of Interprofessional Collaborative Patient-Centred Practice (ICPCP). Knowledge translation is the "dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians…" (Canadian Institutes of Health Research). The project assessed whether knowledge and skills regarding ICPCP could be readily accessed using an online learning resource (The Working Together Project) and then transferred to the workplace. Fifty-nine healthcare workers from 17 Long-Term Care facilities across Ontario, Canada participated in this project. An accompanying evaluation tool for the DDLM (MacDonald, Breithaupt, Stodel, Farres, & Gabriel, 2002) was used to assess the effectiveness of the resource in assisting knowledge translation. The researchers reported that learners found using the online resource to be a satisfactory experience; were able to obtain new ICPCP knowledge and skills; and were able to successfully apply these knowledge and skills to their places of work. Learners also reported that their recently acquired ICPCP knowledge and skills had a positive effect on the residents they care.

The DDLM was later modified in 2009 and renamed *W(e)Learn. W(e)Learn* reflects and supports collaborative online learning for the purpose of improving interprofessional healthcare. It can be used as both a quality standard and a guide to design, develop, deliver, and evaluate

online interprofessional education for pre- and post-qualification healthcare providers (MacDonald, Stodel, Thompson, & Casimiro, 2009).

One weakness of *W(e)Learn* as a generalisable model for evaluating programs was that until recently it was specifically designed for online learning. Moreover, the testing for reliability and validity (MacDonald et al., 2002) was on the older DDLM version, which made it difficult to be applied to traditional learning. However, the accompanying assessment instrument *W(e)Learn* was revised in 2009 and is undergoing psychometric testing. Another weakness of the model, in terms of a constructivist online framework, is that it does not clearly frame online discourse and reflection in terms of constructing knowledge and meaning (Casimiro, 2009).

A second model is the CoI framework. Guided by collaborative constructivism, the CoI framework (see Figure 2.1) consists of three essential, interdependent elements: social presence; cognitive presence; and teaching presence; as well as categories and items that define each element. According to the model, these three elements are critical for a successful online learning experience. The CoI framework was developed to guide the research and practice of online learning. As Garrison and Arbaugh (2007) emphasised, “Higher education has consistently viewed community as essential to support collaborative learning and discourse associated with higher levels of learning” (p. 158).

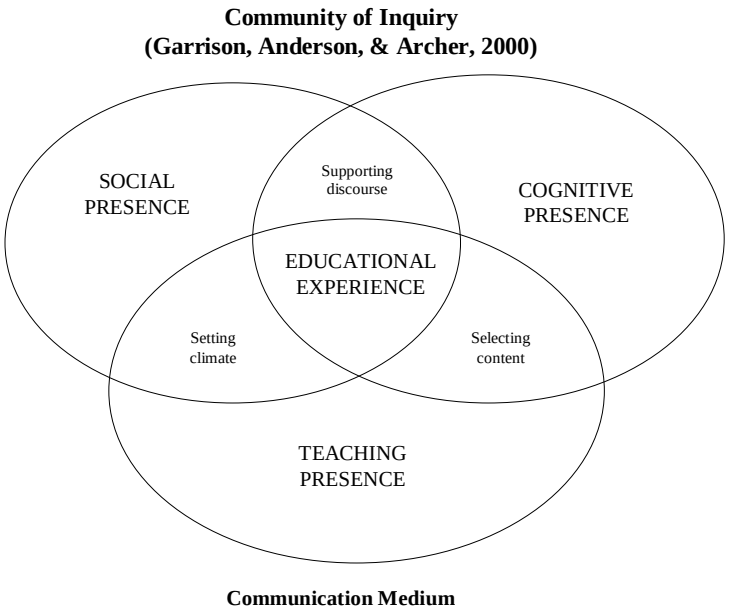

Figure 2.1. The Community of Inquiry Framework (Garrison et al., 2000)

Cognitive presence refers to the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson, & Archer, 2001). Operationally, cognitive presence is defined by Garrison et al. as a cycle of practical inquiry whereby learners move from understanding a problem to increasingly complex levels of thinking and reflecting: exploration, integration, and finally application. This is the process of practical inquiry, which Dewey (1933) and Brookfield (1995a) referred to as the experience of knowledge reconstruction and the questioning and reframing of assumptions. The Practical Inquiry Model is presented in Figure. 2.2 and is discussed in later in this chapter.

A second element in the CoI model is social presence which refers to the ability of learners to project themselves socially and emotionally online and be perceived as real people (Aragon, 2003; Gunawardena & Zittle, 1997). Of the three elements in the CoI framework, social presence has been studied the most extensively (Gunawardena et al., 2006; Gunawardena &

Zittle; Picciano, 2002; Richardson & Swan, 2003; Rourke, Anderson, Garrison, & Archer, 2001; Stodel, Thompson, & MacDonald, 2006). Qualitative and quantitative studies have been conducted using analyses of online discussion transcripts and surveys to research elements of social presence, such as risk-free and emotional expression and group cohesion.

Social presence is important but cannot be understood without also considering teaching and cognitive presence. In fact, a primary concern emerges from the intersection of social and cognitive presence: critical discourse. Learners of online courses know they are not there just for social reasons (Garrison & Arbaugh, 2007). Social presence becomes even less important if there are no collaborative learning activities in which learners can benefit from working with each other (Picciano, 2002). Richardson and Swan (2003) explored the role of social presence in online learning environments and its relationship to students' perceptions of learning and satisfaction with the course facilitator. They found that students' perceptions of social presence contributed significantly to their perceived overall learning experience. However, missing from this study was an examination of factors that relate to cognitive and teaching presence that may have contributed to the students' perceptions of social presence.

However, according to the CoI framework, social interactions alone are not enough to ensure the development of cognitive presence and effective online learning. These interactions need to have clearly defined parameters; hence the need for the third element of the CoI framework: teaching presence (Garrison & Arbaugh, 2007). Teaching presence refers to the design, facilitation, and direction of cognitive and social presence for relevant and meaningful learning (Garrison et al., 2000). Evidence of teaching presence can be found by examining the instructional design, facilitation of discourse, and direct instruction in the course. Examination of

teaching presence has been done, for example, through surveys (Shea, Frederickson, Picket, & Peltz, 2003; Arbaugh & Hwang, 2006).

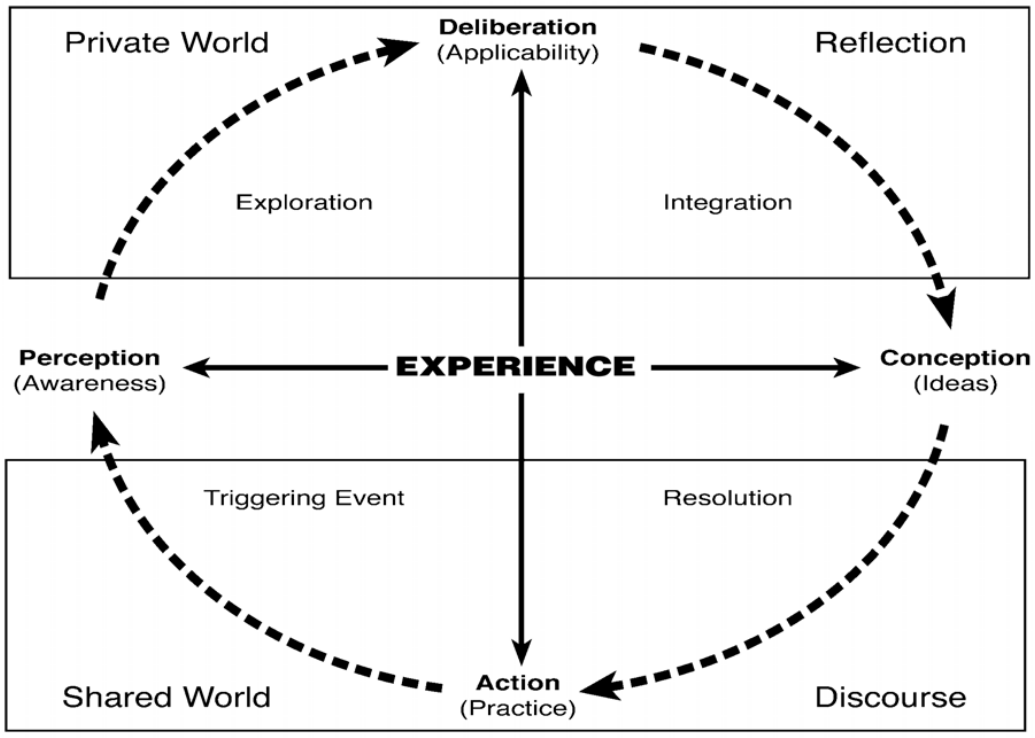

Figure 2.2. Practical Inquiry Model (Garrison et al., 2000).

In summary, The CoI framework and *W(e)Learn* are based on constructivist assumptions. As with *W(e) Learn*, the CoI framework enables researchers to explore how well learners perceive to interact with each the facilitator and the content of the program.

Critical Examination of the Elements of the CoI Framework

In January, 2010, a special issue of *The Internet and Higher Education* was released to celebrate the ten year anniversary of the publication of the CoI framework. The special issue contained research on online learning that used the CoI framework. According to Google Scholar, the initial article by Garrison et al. (2000) has been cited at least 800 times by May, 17, 2010. However, despite the prolific use of the framework in online learning research, it has not

been without criticism (Garrison, Anderson, et al., 2010). The following sections highlight some of the concerns with the CoI framework.

Cognitive presence and methodological issues. Garrison, Anderson, et al., (2010) noted that cognitive presence should be seen as a "developmental model consistent with the CoI framework as describing the dynamics of a worthwhile educational experience" (p. 6). In other words it should be based on reflective inquiry. Further, cognitive presence is determined by its interaction with social and teaching presence (Shea & Bidjerano, 2009). However, much of the early research done on the framework explored each of the presences independently of the others. In complex situations, such as assessing learning, researchers need to consider the big picture.

Early work on the development of cognitive presence focussed entirely on the four phases of the Practical Inquiry Model. The most common method for assessing cognitive presence within a course was to analyse the asynchronous online discussion transcripts using quantitative content analysis (e.g., Garrison et al., 2001; Kanuka et al., 2007; Meyer, 2002; Schrire, 2004). This method involved searching for indicators that represented each of the four phases. However, this approach, developed by Garrison et al., had a number of methodological issues. Rourke et al. (2001) conducted a review of 16 studies that used content analysis to analyse the transcripts of online discussions. Only three of these studies reported inter-rater reliability figures that indicated the analysis could be replicated by others. In instances where a quantitative framework for transcript analysis is used, the inter-rater reliability needs to be proven.

Determining the unit of analysis in content analysis was another issue (Garrison et al., 2001; Garrison, Anderson, et al., 2010). Considerations included whether to use a single

message, a threaded discussion, or only a single phrase. Garrison and colleagues decided to use "a single message" as the unit (Garrison et al., 2001). A message refers to what an individual participant posts in one thread of a discussion on a single occasion. Lastly, identifying the processes that are involved in each phase of the Practical Inquiry Model needed to be figured out. Being able to identify the level of cognitive presence is another difficult task as the phases are subjective. Therefore, it is difficult to achieve consistency across coders. To help remedy this, a set of descriptors that described the processes within each phase of the model was determined.

In sum, quantitative content analysis was seen as the best way to reliably analyse online discussion transcripts but it had flaws because of the way it was implemented. It is difficult to ensure objectivity in transcript analysis and so researchers need to triangulate the data with other means. Triangulation of data using multiple sources continues to be used in online research studies.

Teaching presence. Teaching presence has been the least studied of all the CoI elements (Arbaugh, 2007). However, researchers have slowly started to realise its importance in an online CoI (Garrison & Cleveland-Innes, 2005). Recent studies examining teaching presence have led to discrepancies among researchers as to what it comprises. Shea, Frederickson, Pickett, and Pelz (2003) created a survey to assess teaching presence that incorporated items related to design and organisation, facilitation, and direct instruction. This survey was then administered to 1150 learners enrolled in online courses at the State University of New York's (SUNY) Learning Network. Their study provided insight for faculty development in online learning. Areas of strength were instructional design and organisation; areas that needed improvement were the facilitation of discourse and direct instruction. Shea (2006), in a later study, using the same instrument, conducted an exploratory factor analysis using results from more than 2000 surveys.

He found that the items clustered around two factors that he labelled “design and organization” and “facilitation”; there was no distinction between facilitation and direct instruction, as defined by the CoI (Garrison et al., 2000). Around the same time, Arbaugh and Hwang (2006) conducted an investigation to test the validity of Shea et al.’s (2003) instrument designed to assess teaching presence. Their sample size was much smaller—190 learners enrolled in an online MBA program—however, they found items loaded onto three factors representing design and organisation, facilitation, and direct instruction. Reasons for this discrepancy may be that the Shea study involved many learners from multiple institutions, while the Arbaugh and Hwang study consisted of fewer learners from within a single program. Issues with regard to the make-up of teaching presence still need to be resolved. Regardless, these studies represent the first attempts to validate the CoI framework on a large scale.

Social presence. Many studies exploring social presence have compared online learning with traditional face-to-face learning. Often, there is a link made between learner satisfaction and their perception of learning (Bangert, 2009). For example, Stodel et al. (2006) determined that the degree to which learners felt they were part of an online community was influenced by the social relationships or cohesiveness they developed with each other and the course facilitator. In turn, this finding reflected on the learners’ commitment to participate in an online community of inquiry. Stodel et al. also called for further research to explore how the elements in the CoI framework relate to each other.

Swan and Shih (2006) conducted a mixed methods study to explore how social presence developed in online discussions. They studied learners enrolled in four online graduate courses. Quantitative results from analyses of surveys showed significant correlations between perceived social presence and satisfaction with online discussions. Their qualitative findings, which

included comparisons of learners with the highest and lowest perceptions of social presence, supported the quantitative results. Swan and Shih found that learners who perceived themselves as having high social presence also projected themselves more in online discussions. The main criticism of this study, as with others (e.g., Richardson & Swan. 2003), is that social presence was explored without consideration of the other presences. This issue was problematic because both teaching and cognitive presence may influence social presence.

It is clear the CoI framework has framed much online learning research over the past ten years. In the ensuing sections, an overview of critical thinking, collaborative learning, collaborative learning online, and SDL as they relate to this research study is presented. Specifically, the purpose of the next section is to provide a rationale for the covariates used in the study. Covariates are variables that may influence scores on the dependent variable (Pallant, 2007). In this study, the dependent variable was cognitive presence.

Critical Thinking

> Critical thinking is a lived activity, not an abstract academic pastime. It is something we all do, though its frequency, and the credibility we grant it, vary from person to person. Our lives are sufficiently complex and perplexing that it would be difficult to escape entirely from feeling that at times the world is not working the way we thought is was supposed to, or that there must be other ways of living. (Brookfield, 1987, p. 14)

The concept of critical thinking can probably be traced back to Socrates almost 2,500 years ago (Fasco, 2003; Paul, 1985). Socratic questioning is a technique where the teacher or facilitator asks probing questions that lead learners to understanding and knowledge. Since the time of Socrates, many philosophers and, in more recent times, psychologists have put forth various theories with regard to the process of thinking (Fasco). However, it may be beneficial to

preface this section on critical thinking by making reference to studies on adult psychological and cognitive development, beginning with Daniel Levinson's age-graded model (Levinson, Darrow, Klein, Levinson, & McKee, 1978) and Erikson's psychosocial development model (1963).

Levinson, through a series of intensive interviews with men, and in some cases, their wives as well, proposed that adults may go through a series of phases as they develop. Details of the study are found in *The Season's of a Man's Life* (1978). Levinson et al. suggest that the phases are preceded by transitional periods which correlate with age. The four periods or "seasons" lasting about 25 years, include Childhood and Adolescence (pre-adulthood; ages), early adulthood, middle adulthood, and late adulthood. Refer to Figure 2.1.

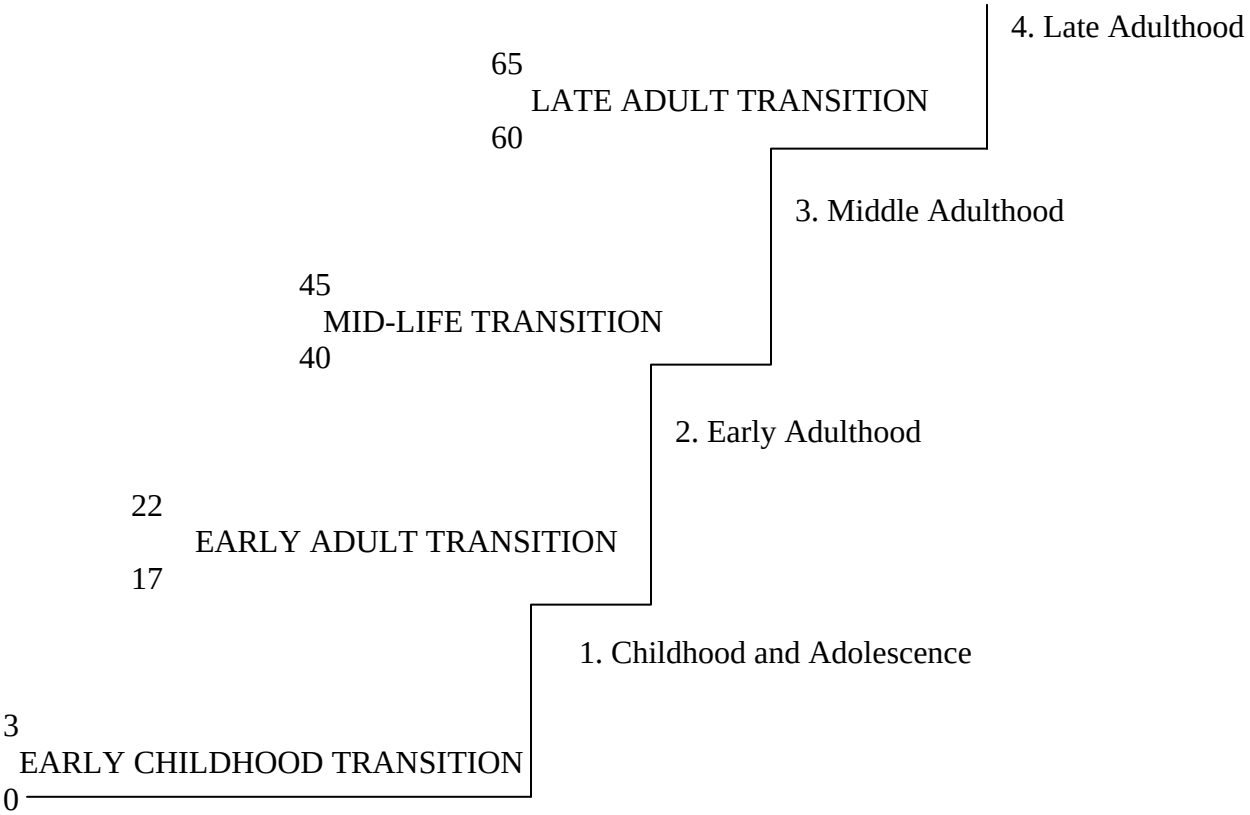

Figure 2.1 Eras in the male life cycle (Adapted from Levinson et al., 1978, p. 20).

The underlying pattern of an individual's life at any particular time, or of one's life structure overall, is established during these seasons and changes during the transition periods. One's life structure is molded by the social and physical environment. For example, "During his twenties, a young man ordinarily forms a preliminary adult identity. He makes the first major choices, such as marriage, occupation, residence and style of living that define his place in the adult world" (Levinson et al., 1978, p. 22).

The age-graded model is of particular interest to many educators because it suggests a link between age-appropriate tasks and behaviours which may have implications for adult learning activities (Merriam et al., 2007). "The idea of the teachable moment is grounded in the concept of developmental task – tasks that arise at a certain period in a person's life…" (p. 308). Correlated with psychological development is a sociocultural approach to adult development – that is, how society defines people as individual learners. In this approach teaching strategies should allow participants: to connect learning content to their own life experiences; to have an opportunity for self-reflection; and to connect theory to practice (Caffarella, 1992). These concepts of teachable moments, connecting learning to one's life experience, and providing opportunities for reflections are important considerations for the development of the RDLR and may have implications for this study.

Another model of psychological development was Erikson's psychosocial development model (1963) which entailed eight stages of development, each involving crises or conflicts that people deal with over their lifetime. There are positive and negative choices that a person needs to make at each stage and one needs to achieve a favourable ratio of positive over negative to move to the next stage (Merriam et al., 2007). The notion was that at each stage one must confront these crises successfully before moving to the next stage, or else the issues may again

arise. For example, in middle adulthood (35 to 65 years of age), one needs to resolve conflict between generativity (productivity for the betterment of society) and stagnation (lack of productivity and meaninglessness), resulting in loving others and bettering society. As with Levinson's model, Erikson's model may suggest possible implications for this researcher's study in so far as participants need to reach a stage of development to be able to think critically. Another perspective that needs to be considered is how individual's thinking changes over time – that is, adult cognitive development.

Perry's is the best known and most often used developmental scheme in the study of young adults (Merriam et al., 2007). Perry described how white male college students learn; view knowledge, truth, and the world; and make decisions. The scheme is a progressive, sequential continuum that is divided into nine positions, each position representing a different way of interpreting learning experiences. A university student may proceed through each of these positions. The positions move from simple thinking to a complex way of obtaining knowledge and reflecting, or "a maturity in which a person has developed an experience of 'who he is'" (Perry, 1970, p. 154). Perry's scheme of cognitive development suggested that individuals move from "dualistic (right-wrong) thinking toward dialectical thinking, where students are able to hold contradictory notions in their mind" (Merriam et al., p. 332).

Merriam et al. (2007) have noted that Perry's positions have been used to describe how learners view the role of the teacher and their own roles as learners. Learners at the higher end of the continuum tend to view teachers as facilitators or guides, such that knowledge is more contextual in nature, in that learners are able to evaluate the views and ideas of others and themselves. Merriam et al. also noted that Perry's scheme has been recently criticised for not accounting for cultural differences, and because older adults possibly show more dualistic

thinking than younger adults. Dannefer (1996) wrote about adult development from a sociocultural perspective, including how social environment influences development. The social cultural perspective acknowledges race, gender, sexual orientation, and socioeconomics as factors that affect our development. Moreover, in response to the early work of Perry and others such as Kohlberg (1973), who studied moral development, researchers such as Carol Gilligan (1982) expanded their studies to include women. Gilligan concluded that women's moral reasoning is based on connections to others.

In summary, the foundational work on adult development is very important when examining critical thinking. The various perspectives and seminal work by some of the researchers mentioned above may influence the some of the more recent work on critical thinking, "The development of critical-thinking abilities appears to be generally more appropriate and teachable in mature learners who have as a precondition, the foundational knowledge and experience" (Garrison, 1991, p. 302).

Critical thinking and education. Critical thinking as a modern educational concept can be traced back to Dewey (1933). He used the term "reflective thinking" to describe this concept. Reflective thinking gives learners the opportunity to consciously plan and deepen the meaning of their own experiences. Dewey believed that if a person was not critical of her ideas then she would not be reflective (Garrison, 1991), and deconstructed reflective thought into five phases: suggestions; converting the problem into a question that can be solved; hypothesising; reasoning; and finally testing the hypothesis. Similarly, Brookfield (1995b) viewed critical thinking in terms of identifying and challenging assumptions (assumption hunting) and exploring alternative solutions for improved well-being. Brookfield (1987) proposed five similar phases of critical

thinking which included: a trigger event; an appraisal; an exploration; developing an alternative perspective; and an integration or resolution.

Brookfield referred to a *trigger event* as an unexpected happening that prompts or triggers a sense of perplexity. Examples are typically negatively perceived events, such as divorce, disability, unemployment, and bereavement. However, Brookfield notes that there are also positive triggers that can lead to dramatic changes in thinking when someone feels "an overwhelming sense of 'coming home'" (1987, p. 32). Examples may include new relationships, work settings, political causes, or even an artistic creation. Furthermore, and very relevant to this study, is that teachers or facilitators can help learners to become critical thinkers: "through their enthusiastic presentation of alternative ideas, concepts, and interpretative frameworks, teachers and trainers can also serve as motivators for critical thinking" (p.33). This initial stage of critical thinking seems to have parallels with Garrison et al.'s Practical Inquiry Model*;* however, a situation in which a facilitator or learner shares a triggering or evocative question would not appear to be as powerful or transformative some of the examples Brookfield cites.

Following a trigger event, one enters the next phase of *appraisal* or self-scrutiny and engages in self-examination (Brookfield, 1987; Mezirow, 1977), which leads to admitting to a discrepancy in life or a problem, and looking to others dealing with similar issues. The next stage of *exploration* involves searching for alternative explanations to this discrepancy or problem. Mezirow refers to this stage as exploring new ways of acting, including publically sharing of a problem. This stage of exploration corresponds to the exploration stage in the Practical Inquiry Model when a learner first moves from her 'personal world' to a 'shared world' within a community of inquiry.

The final two stages, *developing alternative perspectives* and *integration*, have to do with acting out one's new ways of thinking and integrating them into everyday life. As we develop alternative perspectives that fit, or as Brookfield notes, "'make sense' for our situations" (1987, p. 27), new knowledge and skills are developed. During the final phase, new knowledge and skills are integrated into an individual's life. These phases seem to correspond to the *integration* and *resolution* stages of the Practical Inquiry Model. However, it is interesting to note that the *integration* phase of the model is about coming to a consensus in an online community, which fits more with developing an alternative perspective than it does with Brookfield's integration phase. The *resolution* phase of the Practical Inquiry Model mirrors the *integration* phase in Brookfield's critical thinking process. In fact, Brookfield refers to an individual's new ways of thinking as "resolutions".

After analysing both Dewey's phases of reflective thought and Brookfield's phases of critical thinking it is not difficult to ascertain how Garrison et al. arrived at the Practical Inquiry Model, as both involve reflection and action components. Garrison also incorporates McPeck (1981) and Sternberg (1986) into his views of critical thinking. Both authors view critical thinking as a relational process that occurs between a person's inner mind and outer context --an integral feature of the Practical Inquiry Model.

Garrison (1991) considered the process of critical thinking as all-encompassing, involving both problem solving and creative thinking. In fact the processes of problem solving and creative thinking are very similar to critical thinking. Critical thinking has often been associated with problem solving, however, it is more complicated: "critical thinking consists of more skills than are used in the problem-solving approach, and some of these steps include intuitive and creative elements that do not involve any evaluation or justification" (D'Angelo,

1971, p. 19). Viewing critical thinking from a process perspective would include creative elements such as sensing difficulties, finding gaps in information, and being insightful (Garrison, 1991; McPeck, 1981; Perkins, 1986; Sternberg, 1988).

Garrison's earlier work on critical thinking involved connecting and making sense of its complexity which included problem solving and creative thinking. His early model (1991) included the deductive processes of problem solving and the inductive processes of creative thinking (refer to figure 2.2). It is this model of the critical thinking/learning cycle that seems to have provided the basis for the Practical Inquiry Model.

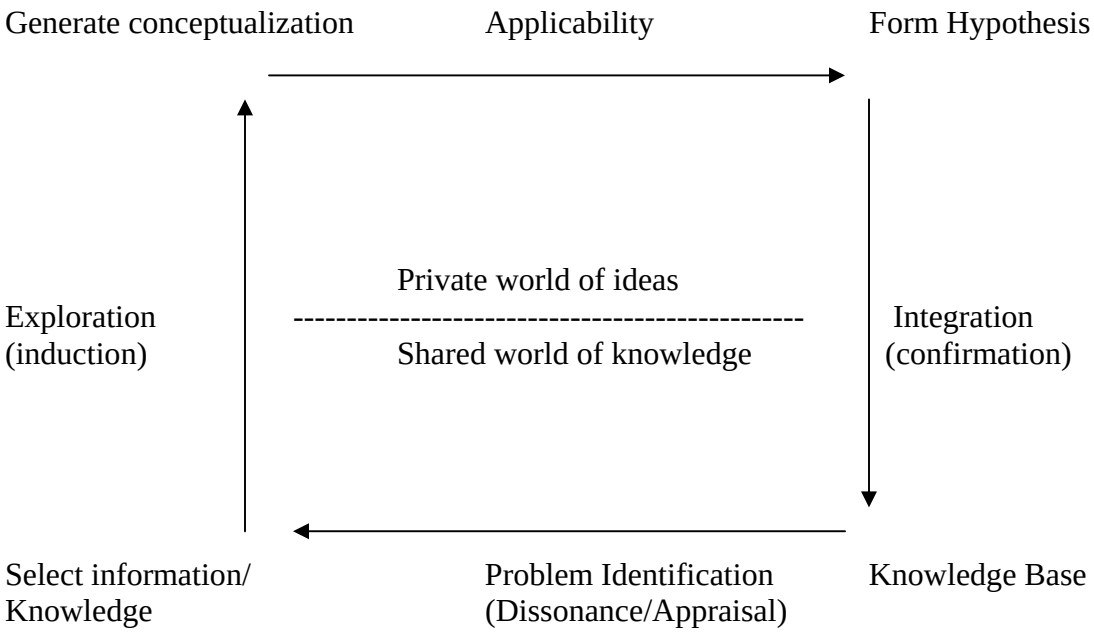

Figure 2.2. Critical thinking/learning cycle (Adapted from Garrison, 1991).

Garrison and Archer (2000) suggested that critical thinking results when meaningful learning is realised through a process whereby learners have control and responsibility for their thinking. To demonstrate the critical thinking process, Garrison and Archer developed the

Practical Inquiry Model, which operationalises critical thinking. The following studies are examples of how the model has been used in online education.

Schrire (2004) conducted a multiple case study involving three online computer conferences or discussion forums, each representing a single case. She wanted to know what patterns of interaction could be found in online discussions, what kinds and levels of critical thinking were present, and how interactions and critical thinking were connected. Each case was studied separately and then cross-case comparisons were made. Her first case represented the full case study in the investigation. The other two cases were partially analysed in order to answer questions that arose in the study of the first case. She used three models to evaluate critical thinking or cognitive development: Bloom's taxonomy (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956), the Structure of Observed Learning Outcomes (SOLO) taxonomy (Biggs & Collis, 1982), and the Practical Inquiry Model (Garrison et al., 2001).

Schrire (2004) identified patterns of interaction in all three online discussions, including the following interaction types: instructor-centred, student-centred, synergistic, developing synergism, scattered, and message chains. She also found isolated messages that did not contribute to interaction. The interaction type that indicated collaborative learning processes was the synergistic pattern. Higher order critical thinking skills were demonstrated in two thirds of the messages using all three of models of cognitive development. This percentage is uncharacteristically high compared to other studies that have used content analysis to examine cognition in online transcripts (Garrison et al., 2001; Kanuka et al., 2007). Perhaps this was due to the fact that multiple models, discussions, and coders for analysis were used.

Schrire's (2004) main finding related to the "correspondence found between the type of interaction occurring in asynchronous computer conferencing and the phase of critical thinking.

… Synergistic threads showed more advanced phases of critical thinking on the Practical Inquiry Model of cognitive presence than instructor-centered threads" (p. 494). This finding suggests that social constructivist approaches to teaching and learning may lend themselves to developing critical thinking in an online community of inquiry. It should be noted that Schrire's findings were based on a limited number of cases. The online discussions were part of doctoral degree courses, and so generalisability may be limited. Moreover, the inter-rater agreement in the coding was only considered to be fair to moderate (Schrire, 2004).

Critical thinking is an important skill for adult learners, as is the process of applied thinking (Lipman, 2003). Garrison and Archer (2000) noted that critical thinking "integrates the reflexive and rational activities of the learning process with the shared activities of the educational experience" (p. 14). They reminded their readers that critical thinking and SDL are complementary. Critical thinking involves the content being studied and SDL is primarily concerned with context (Garrison & Archer). They furthered recognised that self-direction encourages the monitoring and management of individual and shared learning experiences. Therefore, critical thinking and SDL are two complementary and integral processes of an ideal learning situation. The ideal learning situation according to Garrison and Archer is described as follows:

1. all learners have life experience relevant to the learning task at hand, so are able to engage in constructivist creation of knowledge;
2. the group constitutes what may be referred to as a collaborative community of learners;
3. the learners are all capable of assuming responsibility for their own learning;
4. learners have, or can acquire, a capacity for critical thinking;

5. the balance of control in the learning situation is congruent with the educational goals and learner capabilities;
6. the learning situation includes a purpose which gives students substantial motivation to master and manage their own learning; that is, they have incentive to be self-directed. (pp. 3-4)

Garrison (1992) indicated that a self-directed learner must be responsible for connecting new ideas to previous knowledge and share it with others to justify and validate it. A self-directed learner needs to be critically reflective.

> From the perspective of critical thinking, the process begins with a self-directed learner who, in struggling to understand an anomalous situation generates insight and possible alternatives. …It is not sufficient to simply self-reflect critically on an experience or idea. One must integrate and confirm that knowledge by acting upon it and sharing it with others through discourse. (Garrison, 1992, p. 146)

Self-Directed Learning (SDL)

In this section, a critical review of the SDL literature is presented with the goal of determining the best instrument for assessing the potential of SDL in an online learning community. SDL is a highly researched area of adult education. Recent research in SDL as a learning process has focused on its applicability to lifelong learning, human resource development, and online learning (Merriam et al., 2007). Professions, in particular, are recognising the importance of developing lifelong learners. Higher education institutions have an important role to play in promoting the development of the self-directed skills needed for lifelong learning.

Knowles (1975) defined SDL as "the process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing learning strategies, and evaluating learning outcomes" (p. 18). This seminal definition still remains applicable in the contemporary online context. Importantly, this definition notes that the process of SDL may involve the help of others. The idea that SDL is not an isolated process has been proposed by many researchers (e.g., Barrows, 1998; Brookfield, 1984, 1995a, 1995b; Candy, 1991; Cho, 2002; Dunlap & Grabinger, 2003; Garrison, 2003; Peters & Gray, 2005) and is essential for understanding the online learning experience. However, despite the importance of others in the SDL process, most studies have omitted collaborative factors of learning such as relational knowing and the social context of knowing (Peters & Gray).

Collaborative learning emphasises both individual and group learning (Peters & Gray, 2005). In their paper, Peters and Gray proposed a conceptual model of teaching and learning that included collaborative learning and explored some implications of the model. Their model included multiple forms of knowing. This consisted of *knowledge-that* (knowledge expressed as theory or principles); *know-how* (practical knowledge or skills); and *knowledge from within* (a special kind of knowledge that exists within a group and in certain situations; Shotter, 1993). Other elements of the model included dialogical space in which learners develop relationships that allow them to dialogue with one another; a focus on knowledge construction; and cycles of action and reflection in which individual learners, "…examine their own assumptions that they bring to the collaborative learning experience, as well as jointly examine what it is they do together while engaged in knowing" (Peters & Gray, p. 18). Peters and Gray suggested that this model has a couple of implications for SDL and research in SDL. The first implication is to

include collaborative learning activities in a SDL experience. These activities may involve an informal group with interests in working together to solve a shared problem. Others are more than just resources; they become co-participants in the self-directed learner's project. Second, collaborative learning is a type of teaching and learning that needs to be recognised if research in SDL is to be advanced. Collaborative learning is an important aspect of SDL and increasingly so is the growing prevalence of the Internet.

Merriam et al. (2007) noted that the impact of technology on SDL has been of growing interest, especially with the prevalence of the Internet and Web-based instructional strategies. However, despite the plethora of literature on SDL and the growing interest in the impact of technology on SDL, only within the last few years have there been studies addressing how SDL can be fostered online for higher education and workplace training (Boyer & Mayer, 2005; Derrick, Ponton, & Carr, 2005; Hanor & Hayden, 2004; Kim, 2004; MacLachlan, 2004; Ponton, Derrick, Confessore, & Rhea, 2005; Shinkareva & Benson, 2006).

Moreover, the degree of SDL expected from the online learner is a function of the course designer and facilitator. In an online environment, due to its self-paced nature, the "learners' ability to monitor and regulate their own learning is critical" (Dabbagh & Bannan-Ritland, 2005, p. 38). Of course, not all online learning consists of formal coursework or professional development programs. Much of the learning that occurs online is pursued informally. The Internet supports self-directed learning by increasing the learner's control over learning and by providing mechanisms (i.e., search engines) that help the learner find pertinent information (Hiemstra, 2006).

Assessment of SDL. Mok and Lung (2005) acknowledged that SDL is a complex process with many interrelated and interacting components. Moreover, the dynamic nature of SDL

requires close, long-term monitoring. Therefore, when studying SDL, data collection methods that focus on a single aspect of SDL need to be complemented by other means, such as in-depth interviews or self-reporting, to do justice to the complex process of SDL.

In the workplace and higher education, a wide range of research designs have been used to investigate SDL. The research methods vary depending on the purpose of the investigation. Generally, studies that administered instruments to assess aspects of self-directedness used quantitative methods in data collection and analysis (e.g., Long & Agyekum, 2004; Ponton, Derrick, Confessore, & Rhea, 2005; Shinkareva & Benson, 2006). Conversely, studies that investigated learner characteristics, such as motivation, in a SDL program tended to use qualitative methods for data collection and analysis (e.g., Boyer & Mayer, 2005; Kim, 2004). According to the researcher of this research project, the most informative findings tended to use mixed methods (e.g., Boyer & Kelly, 2005; MacLachlan, 2004; Park, Candler, & Durso, 2005; Ryan, 1993; Sibbald, 2004; Williams, 2004). Typically, these studies incorporated at least one rating instrument and either interviews or personal narratives.

In the studies examined, the online questionnaire was found to be the most common method for assessing self-directedness in online learning. Two such instruments have been widely used in the literature: the Oddi Continuing Learning Inventory (OCLI; Oddi, 1986), which measures variables such as self-efficacy, personal responsibility, and on-the-job learning; and the Self-Directed Learning Readiness Scale (SDLRS; Guglielmino, 1977), which measures qualities pertaining to readiness for SDL, such as initiative, independence, and the tendency to be goal oriented. These two instruments, among others, have been effectively modified and used on their own or in conjunction with other methods to assess the self-directedness of learners and can be applied in the online environment. Further, interviews, online transcripts of discussion

postings, email, and online chats can be valuable data sources for investigating SDL in an online context and providing valuable insights when designing and facilitating online learning to promote self-directedness (Mok & Cheng, 2001).

To this point in the literature review the researcher has endeavoured to establish collaborative constructivism as a theoretical lens for exploring learning in an online community and the CoI as a framework for exploring critical thinking, as well as to make the connection between critical thinking and SDL. The final section of the literature review includes a discussion of collaborative teaching and learning strategies and technologies that can be used to promote critical thinking and SDL in both traditional and online settings.

Collaborative Teaching and Learning Experiences

Appropriate online collaborative teaching and learning strategies can be used by facilitators to guide learners through the phases of critical thinking and help them manage their own learning. Recent literature (Akyol & Garrison, in press) has shown that self-direction applies to cognitive monitoring as well as managing learning activities. Thus critical thinking and self direction come together in terms of metacognition.

The structure of inquiry is very important in designing collaborative activities. A description of this and several of collaborative teaching and learning strategies are discussed in the ensuing pages.

Structure of inquiry. An inquiry entails understanding how an issue or problem is structured and then finding a resolution. Duffy, Dueber, and Hawley (1998) outlined a structure of inquiry or problem-solving.

1. *Define the problem*. Learners must be able to understand the problem, which means they need to consider the constraints around the problem and the ways it needs to be focused or expanded upon to provide a better understanding of the issues.
2. *Develop and evaluate solution alternatives*. When seeking a solution, learners must generate possible solutions, issues, and evidence to be used in the evaluation.
3. *Come to some resolution*. There must be movement towards resolution or understanding the problem.
4. *Developing a plan of action.* A solution must be applied, possibly through a term paper or project. There needs to be an implementation of the plan.
5. *Reflection on the process.* Reflection is the final step in the inquiry process. The equivalent of debriefing after a business project or the completion of an Objective Structured Clinical Examination (OSCE) in medical training. However, Garrison and Archer (2000) argued that reflection is not the final step of the process and instead should be an ongoing process throughout the entire inquiry.

Duffy, Dueber, and Hawley (1998) noted that these components do not necessarily occur in a linear fashion. For example when a plan of action is developed one can see new solution options that need to be evaluated. Moreover, they indicated, “Rather than specific phases, these five components can be thought of as essential focus points for critical thinking in any problem-solving activity” p. 57.

In the following three sub-sections of this review, the researcher outlines three collaborative teaching and learning strategies that incorporate a structure of inquiry or problem-solving. These strategies relate to the conceptual framework of this study in two ways. First, with regard to teaching presence, it was important for the researcher to design the RDLR so that it

fostered cognitive presence (critical thinking). Previously in this review the researcher made the connection between problem solving and critical thinking. Thus the three strategies that follow provided the researcher with the best design ideas for the RDLR.

Second, with regard to social presence, it was important to establish the mediating role between teaching presence and cognitive presence. “Social presence must be seen as the mediating variable between teaching and cognitive presence” (Garrison, Anderson, & Archer, 2010). This notion was supported by two recent studies (Shea & Bidjerano, 2009; Garrison, Cleveland-Innes, & Fung, 2010). In order to establish social presence as the mediating variable it was important to incorporate activities that supported collaborative learning so that learners had the opportunity to engage with each other.

Team-based learning (TBL). Collaboration in the inquiry process is different from individual inquiry. Conversation is the foundation of collaborative inquiry (Duffy et al., 1998). TBL is one example of collaborative teaching and learning that exemplifies this foundation. TBL is an instructional and learning strategy that combines cooperative learning with “structured intellectual conflict” in which learners argue pro and con positions on an issue in order to stimulate problem-solving and critical thinking (Michaelsen, Knight, & Fink, 2004). This type of instructional strategy dramatically shifts the focus of classroom time from the instructor conveying course concepts to the application of course concepts by learner groups. This application process is implemented through three major phases: preparation, application, and assessment.

In the first phase, learners (who have been placed in teams) are given reading ahead of time in order to prepare for the TBL session. For example in a first year medical school anatomy class study (Neider, Parmelee, Stolfi, & Hudes, 2005) posted specific assignments on the course

Web site, including live and online lectures, textbook readings, computer exercises in sectional anatomy and imaging, and dissection lab sessions. In addition to the assignments, learners received a list of objectives for the TBL sessions.

All TBL sessions are scheduled to allow adequate time for students to complete the assignments and study for the session. During the application phase, learners complete an Individual Readiness Assurance Test (IRAT), based on the content of the pre-session materials; and a small-Group Readiness Assurance Test (GRAT), which is the same test as the IRAT but done as a team. Teams are then given a case or problem to work on together with accompanying questions, so they can apply their newly acquired knowledge. These are called whole-group application questions (GAP). Immediate feedback is provided by the instructor for questions on the IRAT and GRAT, as well as GAP. Assessment is a very important part of the TBL process.

Neider et al. (2005) described the third phase, assessment and evaluation, of their anatomy course using a TBL approach. They indicated that a group consensus process determined the contribution of various TBL activities to the TBL grade on the first day of class. Learners were asked to define a weighting system for the IRATs, GRATs, and GAPs. The determined distribution was 20% individual performance, 50% group performance, and 30% peer evaluation. TBL activities comprised 25% of the course grade.

In this same study Neider et al. (2005) compared the examination scores of the learners in the class that used TBL with a previous cohort's scores that did not use a TBL approach. Course evaluation data were collected from learners, as was faculty feedback. Learners and faculty indicated support for TBL. Moreover, faculty noted improvements in the learners' preparedness and group problem-solving skills; TBL engaged students in "unique and positive ways,

and students came prepared" (p. 59). However, the learners' mean scores on the examinations were not significantly different from those of previous years. Yet, the authors did note that there was a significantly smaller variance in examination scores, translating into a lower failure rate compared to previous years. Neider et al. concluded that TBL is a superior method for small group learning in their anatomy course and that TBL may be beneficial for under-performing learners. This may be due to the feedback learners received on their preparedness and the opportunities they had for developing higher critical thinking skills. Learning how to incorporate the ideas and perspectives of others and work through differences can enhance one's own ability to think critically. There is a shift of responsibility for learning from the facilitator to the learner. At the same time, there is a group learning shift to the application of new knowledge in new and diverse situations.

Problem-Based Learning (PBL). PBL is a collaborative teaching and learning framework that uses intrinsically authentic problems or challenges to facilitate the development of problem-solving and SDL skills, as well as to foster the disposition towards lifelong learning. Barrows and Tamblyn (1980) stated, "Problem-based learning is the learning that results from the process of working towards the understanding or resolution of a problem" (p. 1). PBL is based on the epistemological assumption that knowledge is constructed with a purpose in mind (Hmelo-Silver, 2004; Jonassen, 2002; Savery & Duffy, 1995). Further, PBL is a collaborative process. Small groups of learners are presented with a complex problem and each person generates a hypothesis based on prior knowledge or experience and new information. Then, the learners shift to working independently and engage in SDL to find their own resources to address the problem. When the group meets again the problem is revisited with the new information gathered. The cycle may be repeated as new knowledge is applied and new learning issues arise

until the problem is solved. It should be noted that the problem does not always have a single solution and that a number of possibilities may need to be investigated.

The main educational goals of PBL are to develop learners' thinking and reasoning skills and for learners to become independent, reflective, and self-directed (Barrows & Tamblyn, 1980). PBL has been applied to medical curricula since the 1960s when it was first used at McMaster University (Evensen & Hmelo, 2000). Since that time, it has been adopted by many medical and nursing schools across the world because "medical schools are turning to problem-based curricula to develop in graduates the capacity to 'self-direct' further learning" (Miflin, Campbell, & Price, 2000, p. 299). Further evidence for the success of PBL comes from the fact that it has spread to other faculties of higher education (Evensen & Hmelo). However, despite PBL's claims to foster SDL, a recent systematic review revealed that the effects of PBL have been limited to knowledge competency (Koh, Khoo, Wong, & Koh, 2008).

There is a growing movement towards conducting PBL through online media and technologies (Keppell, Elliott, Kennedy, Elliott, & Harris, 2003; Savin-Baden & Wilke, 2006). Studies by Cheaney and Ingebritsen (2005) and Atan et al. (2005) provided evidence that PBL in an online environment fosters the same SDL skills as when it is conducted in the traditional face-to-face setting. Moreover, online PBL can increase "higher order learning and deeper student understanding" (Cheaney & Ingebritsen, p. 13).

An example of using online technology and PBL was the Secondary Teacher Education Project (STEP; Steinkuehler, Derry, Woods, & Hmelo-Silver, 2002) at the University of Wisconsin-Madison. It was a model of pre-service teacher education reform. The initiative was to design social and technological activities that fostered knowledge building among pre-service teachers, using PBL as the framework. Learners were to learn to teach science through PBL,

based on video-cases of actual classroom instruction. Learners were to redesign the instructions depicted in the video based on what they had learned about science research. First, individuals analysed the video and then met with their PBL group online to "share and negotiate" their ideas, generate learning issues, and conduct research. The learners had a set of online tools called *My notebook* which helped them organise their individual work, which included a *reflection* page that contained open-ended questions such as, "What would you do differently next time?" to prompt reflection.

During the collaborative group learning step, asynchronous discussion boards were used called the *Teacher's Conference*. Collaboratively learners would develop a group report. Learners also had a *Case Library* of innovative and traditional pedagogical techniques to help them. There were design issues with this part of the study as noted in Steinkuehler, Derry, Hmelo-Silver, & Delmarcelle (2002). A comment on this study would be that more time and consideration should have been given to the resource design to ensure that all directions for the learners were clear. There was also a program called *PBL Help* which was an online resource containing a glossary of terms, examples, and explanations to help steer learners to solve their task.

Case-Based Learning (CBL). Jonassen (2006) devised a typology of CBL. Authentic problems or cases can serve as trigger events that require learners to collaboratively work through the phases of critical thinking to reach new ideas and solutions. Jonassen (2006) noted, "The role of the examples is to serve as models of ideas. ... learners are expected to construct schemas from the examples, store the schemas in memory, and later analogically transfer them" (p. 12). He further argued that research has shown that learners examine examples and then apply lessons learned from them to their own work. CBL tells a story, focuses on an "interest-

arousing issue", and requires learners to collaboratively solve questions that have no single answer (Queen's University, Centre for Teaching and Learning, 2010).

Of the three strategies that promote problem solving and in turn critical thinking outlined above, CBL seemed to be the most feasible for this study. A researcher sharing her research story would serve as an authentic case that could possibly trigger learners to think about their own research and initiate critical thinking. The following two sections outline some of the research being done in collaborative learning, through the contexts of adult education and online learning. Previously in this review collaborative learning was alluded to with regard to a constructivist view on learning. At this point it is pertinent to explore collaborative learning in more detail.

Collaborative Learning in Adult Education

The roles of peers and the teacher are very important in collaborative learning. O'Donnell (2006b) wrote of the role of peers in group learning. She identified that peer learning is an umbrella term that includes collaborative and cooperative learning and other forms of learning in which peers help one another. The concept of peer learning is important in considering the role of social presence in fostering cognitive presence in an online community of inquiry.

Interestingly, O'Donnell (2006b) wrote from a social cohesion perspective which relies on "positive interdependence among group members" (p. 783). Interdependence is fostered through group members' concern for one another. Although O'Donnell used examples from an elementary classroom there is certainly a connection between the social cohesion perspective and social presence of the CoI. Social cohesion is considered to be a critical sub-element in social presence (Garrison et al., 2000). In the social cohesion perspective learners work together to solve complex tasks requiring complex cognitive skills (O'Donnell, 2006b). Another interesting topic that O'Donnell discussed in this chapter is the importance of quality in discourse. She

acknowledged that most learners need support in generating quality discourse. The teacher can support high levels of cognitive activity through providing questions to the learners, which illustrates the role of the teacher in peer learning.

O'Donnell (2006b) identified a number of roles that a teacher plays in peer learning: community builder, task developer, teacher as model, coordinator of activities, and evaluator. These roles play a critical role in teaching presence of the CoI model. The teacher as model is a very important role for example, and sets the stage for social and cognitive presence. The teacher or facilitator provides triggering questions to stimulate critical thinking but also provides feedback to learners. In the researcher's experience as a classroom teacher and online facilitator this feedback often includes personal stories and references from refereed articles; it becomes a sort of scaffolding. As learners participate further in the discussions the facilitator gradually lets their own support fade as learners look to each other for feedback. The notion of learners providing feedback and support is not new. Bielaczyc and Collins (2006) refer to this sort of scaffolding as creating knowledge-building communities. In knowledge-building communities knowledge is shared by all participants and scaffolds are developed. A community of knowledge building may lead to argumentation (development of arguments that lead to higher order learning) which is an important feature of collaborative learning. "In effective collaborative argumentation learners share a focus on the same issues and negotiate about the meaning of each other's information" (Andriessen, 2006, p. 199).

Collaborative learning plays an important role in other learning communities as well. Taylor, Abasi, Pinsent-Johnson, and Evans (2007) wrote about collaborative learning in communities of literacy practice. In this international study, data was collected in nine intervention sites over a period of four months. Although this study focused on how adult

students learn collaboratively with their peers in formal and informal adult literacy programs, it did not extend to higher education contexts. However, the Taylor, Abasi, et al., study is very relevant to collaborative online learning and this project. Their findings suggested that collaborative learning may serve as a foundation that supports a community of practice across various adult learning programs. Key components include the facilitator's teaching and learning philosophy, leadership style, strategies that promote collaboration, the transition from guided learning to independent learning, and finally personal agency (refer to Figure 2.2).

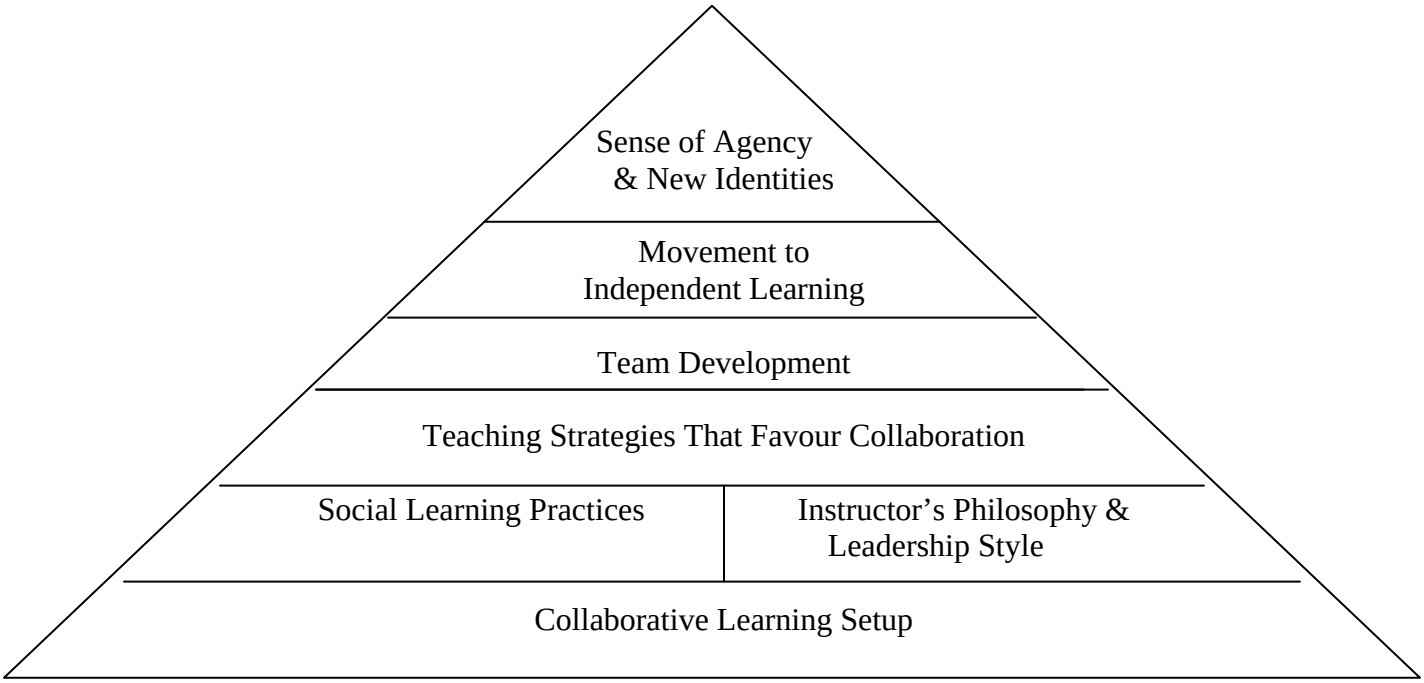

Figure 2.2. Collaborative learning as the foundation for communities of literacy practice (Taylor, Abasi, et al., 2007)

The collaborative learning setup in this model is very similar to the design and organisation of teaching presence in an online CoI. Taylor, Abasi, et al. (2007) suggested that the facilitator or instructor of an adult learning program relies on their previous teaching experience to set up the class for social learning practices based on the needs of the learners. Similarly,

facilitators attempting to create an online CoI must create an environment that promotes successful learning. The instructor's philosophy and leadership style, and teaching strategies that favour collaboration also seem to be related to teaching presence in the CoI model; particularly with regard to the sub-element of facilitation. In Taylor, Abasi, et al.'s model an instructor who believes in participatory practices is critical in developing a community of literacy practice: "they believe in the power of collaborative learning and view themselves as facilitators and orchestrators of activities always scanning the environment and observing the small group interaction" (p. 7). Taylor, Abasi, et al. also identified that in all sites the teaching strategies were used by instructors to favour collaboration. These consisted of authentic, real-life activities that were relevant to the learners. Furthermore many instructors created problems to encourage group participation and provided learners with open-ended questions. As with the work of others described previously, many parallels can be drawn between Taylor, Abasi et al.'s work and the creation of a CoI. Authentic activities which make learning meaningful are critical to creating online learning communities (MacDonald et al., 2001).

Finally, the remaining three components of teamwork development –movement to independent learning, and personal agency -- have implications for online learning as well. In teamwork development less capable learners watch and learn from more capable peers in the class. This can occur in online learning communities (MacDonald & Thompson, 2005). Learners that are new to or uncomfortable with online discussions may wait to view postings from more experienced online learners. Taylor, Abasi, et al. (2007) stated that in collaborative learning the roles of the instructor and learners gradually change, moving toward independence and autonomy, which is a position where a learner takes responsibility and control of her own learning. This concept was discussed previously in this literature review with relation to critical

thinking and SDL. The final component of Taylor, Abasi, et al.'s model is personal agency, in which a learner makes connections between learning new skills and applying them outside of the classroom. When this occurs some learners experience a personal transformation (Taylor, Abasi et al.). Can this personal transformation correspond to Brookfield's *integration* phase of critical thinking (1987)? Is there a connection with the *resolution* phase of the Practical Inquiry Model (Garrison et al. 2000)? Can learners in an online learning environment reach personal agency and can they experience a personal transformation?

Technologies That Can Support Collaborative Learning

Web-based technologies can be used to create a rich learning environment within the collaborative constructivist perspective. Technologies are cognitive tools that can help learners engage in meaningful learning alone and with others. The Internet provides immense resources for learners to use when searching for information, solving problems, collaborating with others, and constructing knowledge. Therefore, the Internet is ideal for supporting constructivist learning (Huang, 2002; Jonassen, 2000). Technologies should be used as intellectual partners, engagers, and facilitators of thinking and knowledge construction (Jonassen, Peck, & Wilson, 1999). Digital storytelling is one application of technology that can be used as a tool to support collaborative constructivist learning and is discussed in the next section.

Digital storytelling. Ohler (2005) argued that, "Digital stories can be used to strengthen students' critical thinking" (p. 46). Digital stories allow learners to problem solve in ways that may lead to a personal transformation, "through creating narratives, students develop the power of their own voices and become heroes of their own learning stories" (p. 47). However, in all the examples that Ohler cited, learning is independent. He neglected to acknowledge the role that

peers have other than in the general sense that digital stories help engage the audience. Others however have described how digital storytelling can lead to collaboration.

Digital storytelling can promote literacy, collaboration, creativity, and problem-solving (McLellan, 2006; Robin, 2008). Stories have been used over the millennia as a tool for learning. In fact, storytelling is the original form of teaching (Sadik, 2008). Recent technology advances and their pervasiveness into our everyday lives have increased the ease with which stories can be employed in online learning.

Table 2.1 outlines the seven elements of digital storytelling. Robin (2008) indicated that these elements are often cited as a starting point for using digital stories and following these seven elements is vital for the creation of a successful story. Economy and pacing are critical elements of the framework. Learners will not watch a digital story for 30 minutes. It needs to be broken into manageable viewing bits that have a main point, to which a “dramatic question” can be added.

Table 2.1.

The Seven Elements of Digital Storytelling (Robin, 2008) Adapted from the Center for Digital Storytelling (www.storycenter.org)

Element		Description
1.	Point of view	What is the main point of the story and what is the perspective of the author?
2.	A dramatic question	A key question that keeps the viewer's attention and will be answered by the end of the story.
3.	Emotional content	Serious issues that come alive in a personal and powerful way and connect the story to the audience.
4.	The gift of voice	A way to personalize the story to help the audience understand the context.
5.	The power of the soundtrack	Music or other sounds that support and embellish the storyline.
6.	Economy	Using just enough content to tell the story without overloading the viewer.
7.	Pacing	The rhythm of the story and how quickly it progresses.

The creation of digital stories can help learners construct knowledge. It allows for more perspectives and ideas to be shared. "Stories originate in problematic situations; they show the way out of the situations" (McLellan, 2006, p. 28). Her comment stems from learners creating

their own digital stories but it can also be applied it by watching digital stories as a learning case in which new knowledge is constructed as problems are discussed and solved (Jonassen, 2006).

Recently, Lowenthal and Dunlap (2010) explored ways to increase social presence in an online community of inquiry. They started their online courses with an introductory "biography-like" activity designed to allow learners to get to know each other and the facilitators. However, Lowenthal and Dunlap (2010) were still not satisfied with how learners perceived them as teachers so they created digital stories "to establish their social presence as instructors" (p. 71). When designing their courses they strived to build in opportunities to engage in authentic activities to establish and encourage social presence. Stories are powerful strategies that help make meaning from experiences and help build connections with prior knowledge (Bruner, 1996; Lowenthal and Dunlap).

In their stories, they divulged their educational and personal values, identified their teaching approaches, and reminded learners that they were once students too. They found that digital stories do in fact promote social presence. Further, they encouraged all online instructors to experiment with digital stories in their courses as a unique way to establish social presence and promote cognitive presence. Since having created stories to introduce themselves to their students and having asked students to create them to introduce each other, Lowenthal and Dunlap have also used stories in other contexts. These included demonstrating conceptual understanding and using stories as formative and summative assessments. They have used digital storytelling as an alternative form for students to convey their learning. They have cited examples such as: using digital stories to explore conceptions and misconceptions of complex

topics; illustrating understanding of the application of theory to professional work, and summarising a lesson or unit.

Future Directions for Online Collaborative Learning

Educators must keep pace with advances in technology in order to be able to provide an ideal learning environment and meet the needs of today's learners (Burbles & Callister, 2000; Jonassen 2000; MacDonald, Stodel, & Farres, 2005; Tham & Werner, 2005). Further research is needed in order to reach a more comprehensive understanding of how technology can be incorporated into online learning (Stodel et al., 2006).

There is a need to improve online education programs through creating authentic learning environments and facilitating relevant learning. In recent years, online collaborative learning has generated interest in higher education and in the workplace as online technologies allow for interaction, socialisation, and collaboration. The Internet can provide learners with the option of working synchronously or asynchronously. Through discussion boards, shared whiteboards, video-conferencing, and chat rooms, learners are able to work collaboratively online to solve problems. Given the fundamental importance of collaboration in developing SDL, it is logical to argue that the use of technology to facilitate online collaboration to solve authentic problems will improve critical thinking skills and ultimately the online learning experience.

Summary

In this review of literature, the theoretical and empirical studies relevant to this study were addressed. Research on SDL, critical thinking, and collaborative learning strategies revealed a solid body of evidence supporting connections between these elements. Further, it is apparent that an online learning environment can foster and support these learning approaches and outcomes. Given the growing interest in online learning, there is a need for future research to

explore how SDL and critical thinking can be fostered online through collaborative Web-based technologies. Web-based technologies hold the potential to develop self-directedness and critical thinking in learners (Garrison & Archer, 2000).

Web-based technologies can facilitate collaborative networks among learners and the facilitator. However, in order to provide an online environment that is conducive to collaborative activities, courses must support the use of alternative forms of knowledge representation and authentic forms of assessment (Jonassen, 2002). Online courses should include Web-based technologies that improve the collaborative and interactive aspects of the online environment.

Chapter 3

Methodology

Characteristics of the Mixed Methods Approach

> If the only tool researchers have is a hammer, they tend to see every problem as a nail. An appreciation of both quantitative and qualitative approaches can enhance a researcher's ability to answer complex questions in a manner which is efficient, internally valid, and generalizable. (Stange & Zyzanski, 1989, p.451)

The nature of online learning is complex. Accordingly, the nature of educational research methods used to investigate online learning must reflect this complexity. An effective means of investigating online learning issues is through a combination of quantitative and qualitative methods. The process of using these two methods for collecting and analysing data is referred to as mixed methods. Sometimes, when using mixed methods, inferences can be contradictory rather than complementary. While divergent inferences can be problematic for educational researchers, they can also lead to valuable findings. Rossman and Wilson (1985) emphasised that "searching for areas of divergent findings may set up … dissonance, doubt, and ambiguity. … It can therefore initiate interpretations and conclusions, suggest areas for future analysis, or recast the entire research question" (p. 633).

Mixed methods can answer research questions that neither qualitative nor quantitative methods can address alone. Quantitative, deductive research attempts to establish relationships and explain causes of change in measured social facts (Bryman, 1988). Conversely, qualitative research is said to be exploratory. Consequently, it is useful in cases where little is known about a certain topic or when a "deep, wide-angle lens" is needed to elucidate the depth and breadth of a phenomenon (Johnson & Christensen, 2008). Therefore, a major advantage of mixed methods

research is that it allows the researcher to answer exploratory questions as well as verify and generate theory in the same study (Teddlie & Tashakkori, 2003). In this study, the main methodological thrust is of a quantitative, deductive nature. However, qualitative data were used to help explain the quantitative results.

A topic much discussed in the mixed methods research literature is that of paradigms of inquiry or world views. Morgan (2007) presented four versions of the paradigm concept, one of which, a shared belief system within a research field, resonates most with the researcher. Several authors (Denscombe, 2008; Creswell, 2009; Creswell & Plano Clark, 2010) referred to this as a "community of scholars" perspective. Thus, mixed methods researchers need to engage in reading mixed methods literature in educational research to identify with the authors to create a common community.

In a community of scholars, multiple paradigms may be used in mixed methods research (Creswell, Plano Clark, Gutmann, & Hanson, 2003). Accordingly, researchers must be explicit in their use of the paradigms, recognising their different strengths and weaknesses. The tenet that research paradigms reflect different ways of knowing about the world is known as the dialectical perspective, as proposed by Greene and Caracelli (1997, 2003). Pallas (2001) further supported the notion of embracing multiple paradigms, in that "educational researchers need to engage with multiple epistemological perspectives" (p. 7). Creswell et al. have presented the most appealing perspective for embracing multiple paradigms, which consists of matching mixed methods research designs to the appropriate philosophical paradigms. As the design of this study was sequential in nature, the quantitative phase of this research was based on positivist assumptions that there are stable, social facts, within a single reality, capable of being measured by an instrument. The qualitative phase will be based on constructivist assumptions of multiple

realities and the tenet that knowledge is socially constructed through individual and collective perceptions. As quantitative and qualitative methods were used in distinct phases the assumptions of each paradigm could be recognised. However, it should be noted that in concurrent mixed method studies, in which quantitative and qualitative data are collected at the same time to answer the same research question, pragmatism may be the most appropriate philosophical approach for a researcher to embrace.

When designing a mixed methods study there are three factors that need to be considered: priority (i.e., which method will be given more emphasis?), implementation (i.e., will the data be collected and analysed concurrently and sequentially?), and integration (i.e., how will the data be mixed?) (Creswell & Plano Clark, 2010; Wilkins & Woodgate, 2008). A sequential explanatory research design as outlined by Ivankova, Creswell, and Stick (2006), and Wilkins and Woodgate were used for this study. Ivankova et al. conducted a mixed-methods sequential explanatory study to identify factors contributing to doctoral students' persistence in a distance learning program in educational leadership. Data were obtained from a survey of 278 students and then through follow-up with four selected individuals to explore the quantitative results in more depth through a qualitative case study analysis. Wilkins and Woodgate, however, did not provide an empirical study but rather a theoretical manuscript that outlined visual models for concurrent and sequential mixed methods research designs, which were used to help frame the procedure for this study.

The sequential explanatory research design is typically used when qualitative data are used to provide more in-depth information about statistically significant or non-significant quantitative results, distinguishing demographic characteristics, or unexpected results. In this design, the researcher first collects and analyses numeric data and then the text data is collected

and analysed and connected at the intermediate phase of the study. The rationale for this approach is that the quantitative analysis provides a general understanding of the research problem and the qualitative analysis refines and explains the statistical results in more depth. This design has been discussed extensively in the mixed methods literature (Creswell, 2003; Creswell & Plano Clark, 2010; Rossman & Wilson, 1985; Tashakkori & Teddlie, 1998).

Mixed Methods Sequential Explanatory Design

The first (quantitative) phase of this research study, was based on positivist assumptions that there are stable, social facts, within a single reality, capable of being measured by instruments. Data were collected using three online surveys, a demographic questionnaire, the Learner Preference Assessment (Guglielmino & Guglielmino, 1991), and the Community of Inquiry Survey Instrument (Arbaugh et al., 2008). The goals of the quantitative phase were to: (1) determine whether the use of an online learning resource and participating in online discussions fostered a positive learning experience about educational research design among learners in research method courses and workshops; (2) explore the relationships between three well known elements of an online community of inquiry (social, teaching, and cognitive presence) to gain further insight into whether higher phases of critical thinking can be reached in an online environment; (3) determine the ability of social and teaching presence to predict cognitive presence after controlling for additional variables (SDL readiness, prior online learning experience, and prior collaborative learning experience); and (4) explore how participants experienced the development of cognitive presence.

The data were subjected to a number of analyses including preliminary analyses, multiple regression, independent t-tests, one-way analysis of variance tests (ANOVA), Chi Square Automatic Interaction Detection analysis (CHAID), and quantitative content analysis. The results

of these analyses were then used to develop an interview protocol and purposefully select participants for the second phase of the study.

The second (qualitative) phase of the study was based on constructivist assumptions of multiple realities and the tenet that knowledge is socially constructed through individual and collective perceptions. Text data were collected from semi-structured interviews. These data helped explain a number of the significant and non-significant results from the first (quantitative) phase of the research. The quantitative results provided an overall, general view of the research problem; that is, the overall learning experience of the participants and the effects social presence, teaching presence, SDL readiness, prior online learning experience, and prior collaborative learning experience had on the development of cognitive presence. The qualitative findings, on the other hand, explained the statistical results by allowing the exploration of the participants' learning experiences in more detail.

In terms of the relative weight given to the quantitative and qualitative data, priority was given to the first (quantitative) phase of the study. The rationale for this weighting was that data were collected from three surveys involving a number of robust analyses. Although the secondary, qualitative phase was very time consuming, the purpose was to enrich and confirm the findings of the first phase.

The quantitative and qualitative methods were connected between the two phases; the interview questions were developed based on the statistical results from the first phase. The results of the two phases were then integrated during the interpretation (discussion) stage of the study. A visual model depicting the procedure and timing of the research design is presented in Figure 3.1 of Appendix B.

Strengths and limitations of the sequential explanatory design. Many researchers have discussed the sequential explanatory design. Both strengths and weaknesses of the design have been identified. In the ensuing sections the strengths and limitations of using this design in the research are presented.

Strengths. There are two notable advantages of this design for the study. First, the sequential explanatory mixed methods design is generally straightforward as it is a two-phase project. Data from one collection method can be obtained and then the results can be further explored, at a later date via other, qualitative means. Thus, single researchers are able to collect and analyse one type of data at a time, making it logistically possible to collect all the data. Second, the sequential explanatory design allows the researcher to explore the quantitative results in more detail, which results in a richer study. The quantitative data help answer the "what" questions, such as factors that contribute to doctoral students' persistence in a distance learning program in educational leadership (Ivankova et al., 2006). However, it is the qualitative data that revealed answers to the "why" questions. For example, the qualitative data helped explain why certain external and internal factors, tested in the first phase, were predictors of students' persistence (Ivankova et al.).

Limitations. The limitations of using this design for the study included the length of time required to complete; it took a full year to collect all the data. For example, there was not an adequate sample size to complete some of the statistical analysis for this study; additional intervention sites were added to the study, which extended the data collection period by a full semester (four months). The qualitative analysis was also very time consuming as there were additional interviews and transcripts to code resulting from the increased number of intervention sites. As is the case when any single researcher implements a mixed methods design, it required

obtaining adequate knowledge and skills in both quantitative and qualitative methods. Acquiring these skills meant completing additional courses in the Ph.D. program. Furthermore, this research design required additional resources to collect and analyse the data such as analytic software for conducting statistical analysis and qualitative analysis.

Participant Recruitment

Ethics approval for this study was obtained from the University of Ottawa's Research Ethics Board (REB) and the Algonquin College REB (Appendix F).

Participants in this study were learners enrolled in one of the following: (1) a professional development workshop for practising physicians offered by a professional organisation, (2) one of five graduate level courses offered through a Faculty of Education, (3) one of three nursing research methods courses, one at the undergraduate level, one at the graduate level, and one post-graduate, offered at two established Nursing Schools, or (4) an interprofessional community healthcare course. Descriptions of the above intervention sites are presented in Appendix E. Sample sizes for each intervention site are presented in Table 4.2 of Appendix H-1. Ten intervention sites were chosen in order to allow for comparisons to be made between groups of learners from different disciplines. Each site addressed educational research and research design in their course, the topics covered in the RDLR.

All learners in the courses mentioned above were invited to participate in this research. When recruitment began in May, 2008 there were only four intervention sites selected. It was originally anticipated that each intervention site could involve between 25-40 participants (totalling approximately 130 participants); more than adequate for achieving the required sample size for the first phase of the study. However, due to decreased enrollments in these courses and

limited recruitment success, six more intervention sites were added, extending the data collection period of the project.

In order to recruit participants, the researcher went to each intervention site and presented learners with an introductory letter (Appendix G-1) and an informed consent form (Appendix G-2) at the beginning of the course/workshop. The course instructor was asked to leave the room at this time so as not to bias the learners' decisions to participate in the study. The course instructors were not told which learners had agreed to participate in the study and which had not.

The anonymity of the participants was protected throughout the study. In the first phase of the study the participants used their student identification numbers or assigned participant codes and unique passwords to access the three online surveys. In addition, pseudonyms were used to report the results of the second phase of the. Participants were assured that it would not be possible to trace responses back to any specific individual during dissemination of the results.

Procedures

Phase 1 - Quantitative data collection. In the first phase of the study, three surveys were administered: a demographic survey, Learning Preference Assessment (Guglielmino & Guglielmino, 1991), and a standardised instrument for the CoI framework (Arbaugh et al., 2008). Course transcripts were also examined using a tool for quantitative content analysis based on the Practical Inquiry Model (Garrison et al., 2001).

Demographic questionnaire. The participants were asked to complete a short online demographic questionnaire (Appendix C-1) before beginning their course. In addition to garnering basic demographic data, the questionnaire solicited information regarding the participants' computer skills and experience, as well as their attitudes towards online learning

and collaborative learning. The demographic questionnaire took the participants approximately five minutes to complete.

Self-Directed Learning Readiness Scale (SDLRS)/Learning Preference Assessment (LPA). The SDLRS (Guglielmino, 1977) is the most commonly used quantitative instrument for measuring the attitudes, values, and abilities of learners regarding their readiness to engage in SDL. The LPA is the self-scoring format of the SDLRS and was published in 1991 (Guglielmino & Guglielmino, 1991). The SDLRS/LPA has been psychometrically tested and has strong reliability and validity (Maltby, Lewis, & Hill, 2000). The SDLRS/LPA can be administered online and participants were provided with a link to the tool at the beginning of the course. Use of the LPA by researchers and the public requires a fee. The researcher paid a reduced, student fee to allow participants access to the LPA. The data collected from this tool, in conjunction with that collected from the standardised instrument for the CoI framework and the demographic questionnaire, was used to answer the quantitative research questions of the first phase. It took participants between 10 and 20 minutes to complete the LPA (see Appendix C-2 for a sample of the LPA items).

Survey instrument for the CoI framework. The CoI framework survey instrument is a 34-item questionnaire that uses a five point Likert scale. The instrument comprises items from each of the three elements of the CoI framework, namely cognitive, social, and teaching presence. In this study, the tool was used to measure the learning outcomes and processes associated with using the RDLR, as well as provide an indication of each participant's critical thinking. Participants were invited to complete the questionnaire online after using the RDLR for a semester. The questionnaire took participants approximately 10 minutes to complete (Appendix

C-3). Recent reliability and validity analyses have determined the CoI survey instrument to be an accurate instrument for measuring online learning experiences.

Course transcripts. Course transcripts refer to the discussion group postings that resulted from the course activities and included postings by the participants, as well as the researcher. Since the course transcripts result from the course activities, the generation of these data for research purposes did not require any additional time from the participants.

Phase 2 - Qualitative data collection. In the second, qualitative phase of the study, participants were purposefully selected to participate in semi-structured interviews. Participants were selected for the interviews, based on the data collected throughout the course, in order to capture the heterogeneity of the population in terms of age, gender, ethnicity, previous online learning experience, and attitude towards the current online learning experience. The researcher wanted to interview some participants who had, and some who did not have, a positive experience using the RDLR and participating in the online discussions. The questions for the interview protocol were created based on the significant and interesting findings from the first phase of the study.

Individual semi-structured interviews. Twenty-five participants participated in an in-depth, semi-structured, individual, face-to-face or telephone interview approximately two weeks after they had finished using the RDLR (usually after the course had been completed). The purpose of the interviews was to obtain deeper insight into the data collected from the demographic questionnaire, SDLRS/LPA, and CoI framework survey. The interviews lasted between 30 and 45 minutes and took place either on campus at the University of Ottawa or Algonquin College or on the telephone. The interview protocol is presented in Appendix D.

Data Analysis

Quantitative data analysis involved summarising the responses on the demographic questionnaire and CoI survey instrument by calculating frequency and descriptive statistics (e.g., means and standard deviations). The total score for each participant on the LPA was calculated. As well, t-tests and ANOVAs were conducted to discover any differences in results among intervention sites. In addition, the researcher conducted a series of multiple regression analyses. Specifically, standard multiple regression was used to determine the ability of social presence and teaching presence to predict cognitive presence. To examine these relationships further, a CHAID analysis was conducted to determine which items of social presence and teaching presence most likely predicted cognitive presence. The rationale for using a CHAID analysis was to explore relationships between teaching and social presence with cognitive presence in detail. CHAID produces a regression tree that allowed the researcher to examine the relationship of individual items which could lead to further insight into the development of cognitive presence. Hierarchical regression analyses were then conducted to determine the effect any of the co-variates (SDL readiness, prior online learning experience, and prior collaborative learning experience) had on the ability of teaching and social presence to predict cognitive presence. According to Tabachnick and Fidell (2007), the minimum number of participants required for conducting a multiple regression can be calculated using the equation $N \geq 50 + 8m$ (where m is the number of predictor variables). Since three predictor variables were used in each hierarchical regression analysis, the sample size needed to be at least 74.

SPSS basic software (version 18) and the additional decision tree module were used for most of the statistical analyses, including the CHAID analysis. Quantitative content analysis of the course transcripts was done by hand using printed copies of the course transcripts. The text

from the course transcripts was organised according to the phases of cognitive presence development. Details of the content analysis procedure are explained further in this chapter.

The qualitative data in the second phase of the study was analysed inductively, with the assistance of qualitative analytic software (QSR NVivo 8), to organise the data into emerging themes. These themes were then used to connect the quantitative results of the first phase. Direct quotations were used throughout the reporting of the data.

Reliability and Validity

Validity of the study. In a mixed methods study it is important to examine the validity (i.e., being able to draw meaningful inferences from a population) of the quantitative data. Psychometric studies generally provide results that contribute to validity. These results can contribute to a growing body of evidence that can be used to formulate validity arguments to support or refute the intended purpose and use of the instrument (Bangert, 2009). Both the LPA and the CoI survey instrument have been shown to have validity with respect to content validity, criterion-related validity, and construct validity (see below for a summary of the psychometrics of these instruments). Construct validity refers to determining if the scores from an instrument are significant and useful for researchers (Creswell, 2008). Through statistical procedures that examine the correlation among items of the instrument such as principal components analysis (PCA) and factor analysis, evidence for construct validity can begin to be established.

As well, the validation or trustworthiness of the qualitative data is also important. This is to ensure that accounts provided by the participants are trustworthy (Guba & Lincoln, 2005). To ensure qualitative validation the researcher used a number of strategies. First, opportunity was provided for the participants to review the findings and then provide feedback as to whether they were an accurate reflection of their experience. Second, the data were triangulated using various

sources (i.e., transcripts and individual interviews) and multiple participants. Finally, any disconfirming evidence was reported. Managing the trustworthiness of the qualitative data was generally straightforward as there was a logical order for the data collection and analyses.

Validity of the SDLRS/LPA. Content validity of the SDLRS/LPA was established by Guglielmino (1977) using a modified Delphi technique. She asked a panel of experts to complete three rounds of surveys to settle on the preliminary items. A number of years later, Finestone (1984) found congruence between the original Delphi results and an extensive literature review to provide further support for the content validity of the SDLRS/LPA. Considering only the total score used in the LPA, Delahaye and Smith (1995) established construct validity with the Student's Orientation Questionnaire (Christian, 1982) with a value of .35 ($p = .01$). Regarding criterion-related validity, Hall-Johnsen (1981) and Hassan (1981) found significant correlations between projects they had undertaken and SDLRS/LPA scores. In addition, Graeve (1987) reported a significant positive relationship between hours spent engaged in SDL and SDLRS/LPA scores. Construct validity of the SDLRS/LPA has been debated for years. Brockett (1985) and Brookfield (1985) argued that the instrument was designed for more educated people, which prompted Guglielmino (1989) to create a basic form of the instrument. In summary, following a review of the validity of the SDLRS/LPA, Maltby et al. suggested that the SDLRS/LPA can be used with acceptable confidence to provide an accurate measurement of readiness for SDL.

Validity of the CoI Survey Instrument. Content validation involved using experts (i.e., Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, and Swan) in the field to create a list of items that would assess the elements of the CoI framework. These experts are all researchers who have conducted qualitative and quantitative investigations that helped define the three

presences in the CoI framework (Bangert, 2009). Furthermore, all these researchers have reported results from their own work that support the alignment of the subscales and survey items with the elements of the CoI framework (Shea & Bidjerano, 2009).

A number of recent psychometric analyses have been conducted to support the construct validity of the CoI (Arbaugh et al., 2008; Bangert, 2009; Shea & Bidjerano, 2009). The Shea & Bidjerano study involved the most diverse participants, including students enrolled in online courses at community colleges, liberal arts colleges, and a university. Participants in the Bangert study were a mixture of undergraduate and graduate students at mid-sized American university enrolled in online or blended online courses. The Arbaugh et al. project involved participants studying at the graduate level in Education or Business.

Arbaugh et al. (2008) conducted a PCA to verify the three element structure of the 34 items of the CoI instrument. The researchers used an oblique rotation based on the theoretical grounds that elements were interdependent. A reasonable sample size of 287 was obtained. The Keyser-Meyer-Olkin (KMO) measure of sampling adequacy ranged from .92 to .98 indicating that factor analysis should yield distinct and reliable factors. When the researchers specified a three factor solution, factor loadings for the 34 items supported the validity of the CoI (accounting for 61.3% of the total variance in scores). PCA did yield an additional factor (interpreted as instructional design and organisation) with an eigenvalue greater than 1. However, this factor was dropped by the researchers because the respective scree plot "failed to inform the possibility of an additional fourth factor" (Arbaugh et al., p. 135). Cronbach's alpha for each factor yielded internal consistency of .95 for cognitive presence; .94 for teaching presence; and .91 for social presence. Bangert (2009) obtained similar findings to Arbaugh et al. (2008) when he conducted an exploratory factor analysis with a sample size of 1173. He found

that three factors accounted for about 65% of the total variance. The first factor extracted captured all items from the cognitive presence subscale except for one and accounted for 52% of the total variance. All factors assessing teaching presence loaded on the teaching presence factor (accounting for 9% of the variance) and all factors assessing social presence loaded on the social presence factor (accounting for 4% of the variance). Item 28 was found to cross load significantly on both cognitive presence (.42) and social presence (.45). Bangert found the Cronbach's alpha yielded internal consistency reliabilities of .95 for cognitive presence; .96 for teaching presence; and .91 for social presence. Shea and Bidjerano (2009) also had similar findings to Bangert in the factor analysis they conducted with 2159 subjects. However, they did not find that item 28 cross loaded onto two factors.

Reliability of the study. In a mixed methods study it is important to examine the reliability (i.e., stability of instrument scores over time) of the quantitative data. Reliability of scores from an instrument need to be determined by empirical means (Johnson & Christiansen, 2008). There are many different ways of assessing reliability: test-retest (a measure of the consistency of scores over time); equivalent forms (consistency of a group of individual's scores on two equivalent forms of a test measuring the same thing); internal consistency (consistency with which items measure a single construct); and inter-scorer (the degree of agreement between two or more raters) (Johnson & Christiansen, pp. 14-150).

***Reliability of the LPA*.** In the most recent comprehensive review of the SDLRS/LPA, Maltby et al. (2000) noted the following regarding the reliability of the questionnaire: "Studies have demonstrated satisfactory to excellent levels with coefficient alpha and split-half between .67 and .96" (p. 858). Maltby et al. identified the reported internal consistency analyses of the following studies to support this claim: Brockett (1985), Delahaye and Smith (1995), Finestone

(1984), Graeve (1987), Guglielmino (1977, 1989), Hall-Johnsen (1981), Hassan (1981), and Skaggs (1981). However, a number of researchers in the field have found that some of these numbers are high (Brockett, 1985; Long & Agyekum, 1983). Delahaye and Smith (1995) found the internal reliability coefficient for learners aged 20 and over was .72 and deemed this to be a more reasonable number.

Reliability of the CoI Survey Instrument. Ice et al. (2007) reported Cronbach Alpha scores for each subscale of the CoI survey instrument as follows: teaching presence (13 items, alpha = .93), social presence (9 items, alpha = .92), and cognitive presence (12 items, alpha = .95). These scores show excellent reliability and are supported by previous internal consistency analyses of the CoI framework scales (Arbaugh, 2007; Arbaugh & Hwang, 2006; Garrison et al., 2004). More recently, Bangert (2009) and Shea and Bidjerano (2009) reported Cronbach Alpha scores of .95 for cognitive presence, .96 for teaching presence, and .92 for social presence. These studies had large sample sizes; 2159 online participants in the Shea and Bidjerano study, and 1173 online and blended learners in the Bangert study.

Reliability of quantitative content analysis. Garrison et al. (2001) calculated the inter-rater reliability of two coders that first used their framework for content analysis. It is useful to determine the amount of agreement between coders when refining an instrument and determining its reliability. Using Holsti's coefficient of reliability (CR), which is a percent-agreement measure in which the number of agreements between the first coder and second coder is divided by the total number of coding decisions; and Cohen's kappa (k), which compensates for chance agreement, Garrison et al. found that the raters using their five category coding scheme reached a reasonable k value of .74. It was not clear from the article how Garrison et al. determined the k

value, whether manually using a statistical formula or with statistical software, although Cappozzoli, McSweeney, and Sinha (1999) are referenced.

Reliability of quantitative content analysis is often an issue because of the subjective nature of the analysis. Garrison et al. (2001) noted that quantitative content analysis is a difficult task in even the best of circumstances and this is amplified when you are dealing with latent variables such as the phases of cognitive presence. A number of papers on the methodological issues of online transcript content analysis have been written (Garrison, Cleveland-Innes, Koole, & Kappelman, 2006; Rourke & Anderson, 2004; Rourke et al., 2001). Ultimately, the limitations of quantitative content analysis can be overcome by triangulating the results with other methods as the researcher has done in this study. Moreover, the researcher asked a colleague to code a sample of the pilot data. Then using QSR NVivo8 the researcher ran a coding comparison query and found that we were in agreement 80.11% of the time, which is higher than the 70% Miles and Huberman (1994) quoted for first time inter-coder reliability.

Role of the Researcher

The role of the researcher in each of the two phases of the study was very different. In phase one of the study, in keeping with the assumptions of post-positivism, data were collected and analysed using rigorous predetermined procedures and the researcher's voice was not heard in order to keep the data objective (Guba & Lincoln, 2005). Conversely, in the second phase, the researcher's role was much more participatory. Over time, the researcher developed a supportive rapport with many of the participants. It was important during the interviews that participants could speak frankly with the researcher about their learning experiences using the RDLR. During the data analysis phase the categories were shaped based on the literature and the research questions but the researcher's background and experience also shaped the categories. However,

the data were verified to ensure the categories and findings were representative of the participants' experiences and meanings. There were several verification procedures that were undertaken during this study and these are discussed in chapter five.

Pilot Project

A pilot project was conducted in March and April, 2008. The purpose of conducting a pilot study was to determine the strength of the correlations between the elements of the CoI framework and also between the control variables and cognitive presence (DV). In addition, the pilot provided an opportunity to work out any "bugs" in the online components of the study to ensure everything worked smoothly when the research began. The RDLR was a prototype at the time of the pilot study, with only one research story and a very limited repository; however, it was sufficient to pilot the resource, discussions, and surveys. Twenty-seven graduate students in the Faculty of Education at the University of Ottawa were recruited to participate in the pilot study via an email that explained the purpose of the study. Males and females participated in the pilot and were enrolled in either Doctoral, Masters of Arts, or Masters of Education programs. The participants were given access to the RDLR, discussion forums, and surveys via the University of Ottawa virtual campus.

Summary of the findings from the pilot. Twenty-five of the 27 participants (93%) completed all three surveys (i.e., demographic, SDLRS/LPA, and CoI instrument).

Standard multiple regression analysis. SPSS REGRESSION was used to compute a standard multiple regression between cognitive presence (DV), teaching presence (IV), and social presence (IV) and SPSS EXPLORE was used to evaluate the assumptions. In the preliminary analysis, no violation of the assumptions of normality, linearity, multicollinearity, and homoscedacity were found. No cases had missing data.

Table 3.1 displays the correlations between the variables, the unstandardised regression coefficients (B), the standardised regression coefficients (β), the semi-partial correlations (sr^2), the amount of variability accounted for by the predictor variables (R^2), and the adjusted R^2. The adjusted R^2 value of .40 was used because of the small sample size (Pallant, 2007). The Beta values in the regression analysis were of great interest in this study as they compared the relative contribution of social and teaching presence to cognitive presence. Teaching and social presence accounted for over 40% of the variability in cognitive presence. The semi-partial correlation coefficient squared (sr^2) give an indication of the relative contribution of each independent variable to the total R^2. In other words, it indicated how much total variance in the cognitive presence was uniquely explained by social presence and teaching presence and how much the R^2 would drop if either social presence or teaching presence were not included in the model. It was found that teaching presence accounted for 17% of the variance in the cognitive presence.

Table 3.1.

Summary of Standard Regression Analysis in an Online CoI - Pilot Study (N = 25)

Variable	Cog. Pres.	Soc. Pres.	Teach. Pres.	B	β	sr^2 (unique)
Social Pres.	0.53			0.29	0.32	
Teaching Pres.	.61	.47		0.41	0.46*	0.17
Mean	3.53	3.51	3.89			
Standard Dev.	0.49	0.54	0.56			
					$R^2 = 0.45$	
					Adjusted $R^2 = 0.40$	
					$R = 0.67^*$	

*p<.05

In conclusion, it appeared there was a positive relationship between social presence and cognitive presence, and teaching presence and cognitive presence in the CoI framework. Together, social and teaching presence accounted for 40% of the variance of cognitive presence.

Similar findings appear in the literature. Researchers have found that the development of cognitive presence is strongly influenced by social and teaching presence (Arbaugh, 2007; Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005). Moreover, the findings of the standard regression analysis indicate that teaching presence has a very strong ability to predict cognitive presence, which is support by Kanuka et al. (2007). Although the sr^2 =.32 on its own social presence did not significantly predict cognitive presence. This may be due to the small sample size.

Hierarchical multiple regression analysis. In the next step of the analysis, hierarchical multiple regression was used to assess the ability of social presence and teaching presence to predict cognitive presence after controlling for the influence of three covariates: SDL readiness, prior online learning experience, and prior collaborative learning experience. Tables 3.2–3.4 display the correlations between the variables, the unstandardised regression coefficients (B), the standard error (SE B), the standardised regression coefficients (β), the amount of variability accounted for by the predictor variables (R^2), and the R^2 change values (ΔR^2). In the preliminary analysis, no violation of the assumptions of normality, linearity, multicollinearity, and homoscedacity were found. No cases had missing data.

Table 3.2

Hierarchical Regression Analysis of Social and Teaching Presence on Predicting Cognitive Presence in a CoI after Controlling for SDL readiness – Pilot Study (N = 25)

Variable	Cog. Pres.	Soc. Pres.	Teach. Pres.	LPA Score	B	SE B	β
Step 1							
LPA Score	0.19	0.23	0.16		0.004	0.005	0.185
Step 2							
LPA Score	0.19	0.23	0.16		0.001	0.004	0.040
Social Pres.	0.53		0.47	0.23	0.28	0.17	0.31
Teaching Pres.	0.61	0.47		0.16	0.40	0.16	0.46*
Mean	3.53	3.51	3.89	242.68			
Standard Dev.	0.49	0.54	0.56	20.7			

Note. R^2 = .04 for Step 1; ΔR^2 = .42 for Step 2 (ps<.05)
*p<.05

Table 3.3

Hierarchical Regression Analysis of Social and Teaching Presence on Predicting Cognitive Presence in a CoI after Controlling for Prior Online Learning Experience (N = 25)

Variable	Cog. Pres.	Soc. Pres.	Teach. Pres.	Prior OL	B	SE B	β
Step 1							
Prior OL	0.54	0.63	0.42		0.37	0.12	0.54*
Step 2							
Prior OL	0.54	0.63	0.42		0.17	0.14	0.25
Social Pres.	0.53		0.47	0.63	0.16	0.19	0.18
Teaching Pres.	0.61	0.47		0.42	0.37	0.16	0.43*
Mean	3.53	3.51	3.89	3.33			
Standard Dev.	0.49	0.54	0.56	0.71			

Note. $R^2 = .04$ for Step 1; $\Delta R^2 = .42$ for Step 2 (ps<.05)

*p<.05

Table 3.4

Hierarchical Regression Analysis of Social and Teaching Presence on Predicting Cognitive Presence in a CoI After Controlling for Prior Collaborative Learning Experience (N = 25)

Variable	Cog. Pres.	Soc. Pres.	Teach. Pres.	Prior CL	B	SE B	β
Step 1							
Prior CL	0.55	0.31	0.53		0.52	0.16	0.55*
Step 2							
Prior CL	0.55	0.31	0.53		0.27	0.17	0.29
Social Pres.	0.53		0.47	0.31	0.27	0.16	0.30
Teaching Pres.	0.61	0.47		0.53	0.28	0.17	0.32
Mean	3.53	3.51	3.89	3.64			
Standard Dev.	0.49	0.54	0.56	0.52			

Note. R^2 = .04 for Step 1; Δ R^2 = .42 for Step 2 (ps<.05) *p<.05

In three separate hierarchical regression analyses, SDL readiness, prior online learning experience, and prior collaborative learning experience were entered at Step 1. SDL readiness explained -0.8% of the variance in cognitive presence, prior online learning experience explained 26% of the variance, and prior collaborative learning experience explained 27% of the variance. The adjusted R^2 values were used to indicate the variance in cognitive presence as opposed to the R^2 values because of the small sample size. After the entry of social presence and teaching presence at Step 2, the total variance explained by each model as a whole was 37.5% for SDL readiness ($F(3, 21) = 5.807$, $p < .05$), 41.5% for prior online learning experience ($F(3, 21) = 6.665$, $p < .05$), and 44.3% for collaborative learning experience ($F(3, 21) = 7.353$, $p < .05$%).

Controlling for self-directed learning readiness. Social presence and teaching presence explained an additional 42% of the variance in cognitive presence after controlling for SDL

readiness, $\Delta R^2 = .42$, F change (2, 21) = 8.051, $p < .05$. In the final model, only teaching presence was statistically significant recording a beta value of .46. This finding indicates that only teaching presence significantly and substantially contributed to cognitive presence after controlling for SDL readiness.

*Controlling for prior online learning experience***.** Social presence and teaching presence explained an additional 20% of the variance in cognitive presence after controlling for prior online learning experience, $\Delta R^2 = .20$, F change (2, 21) = 4.109, $p < .05$. In the final model, only teaching presence was statistically significant recording a standardised beta value of .43. This finding indicates that only teaching presence significantly and substantially contributed to cognitive presence after controlling for prior online learning experience. The importance of teaching presence in predicting cognitive presence confirmed results from previous studies on the role of teaching presence in the online learning experience (Arbaugh & Hwang, 2006; Garrison & Cleveland-Innes, 2005; Kanuka et al., 2007).

*Controlling for prior collaborative learning experience***.** Social presence and teaching presence explained an additional 21% of the variance in cognitive presence after controlling for prior collaborative learning experience, $\Delta R^2 = .21$, F change (2, 21) = 4.511, $p < .05$. In the final model, neither social presence nor teaching presences were statistically significant. This finding indicates that neither social presence nor teaching presence contributed to cognitive presence after controlling for prior collaborative learning experience.

As a result of the small sample size the findings in this pilot cannot be considered completely reliable. Small changes in the data from only a few cases would make significant changes in the results. Indeed, there were issues around the amount of time learners had to use the resource, technical difficulties, and commitment to the study; all of which could have

impacted the learners' responses on the surveys. However, this pilot study revealed: (1) variance within the CoI model; (2) strong correlations between the CoI framework elements; (3) correlations between two of the covariates (but not SDL readiness) and the dependent variable; and (4) similar findings to other studies examining the CoI framework, with the exception of social presence not making a significant contribution to the development of cognitive presence.

Content analysis of the online discussions. An early version of the RDLR was used by participants in the pilot. At the time, only one research story was available. Data from the discussion forum were collected over a period of about two weeks in March, 2008. In total there were 111 messages within 17 threaded discussions (each thread contained one to eleven posts). Twenty-six people participated in the discussions, including the researcher who also served as the facilitator. The main focus of the discussions was about a researcher's experience using grounded theory to study electronic patient records. Quantitative content analysis was conducted on the postings. The postings were analysed to determine which phase of critical thinking was demonstrated in the posting. The distribution of the postings across the four phases of critical thinking is presented in Figure 3.2.

Results from the content analysis suggested that higher level critical thinking was at play in the discussion forums. Messages that demonstrated integration represented 27% of the total number of messages. However, messages that demonstrated resolution of an issue only comprised 4% of the total. This is a similar finding to that of Garrison et al. (2001) and is not surprising as the participants only had two weeks to review the research story and participate in the discussion forums. It would appear that this was not adequate time for participants to apply their learning.

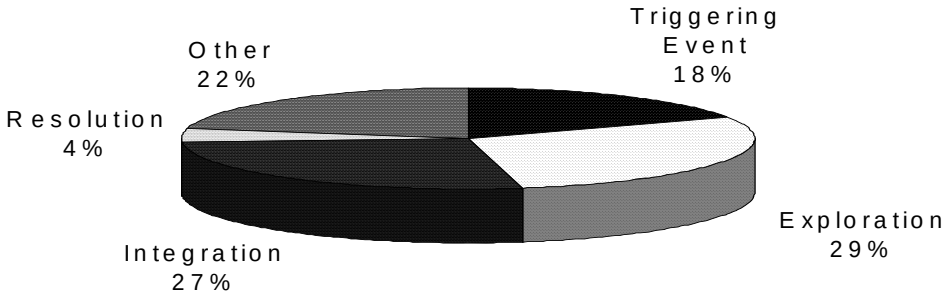

Figure 3.2. Percentage of postings that represented the four phases of critical thinking.

Lessons Learned from the Pilot

The pilot study proved to be beneficial for a number of reasons. First, it enabled the researcher to test the RDLR. The format of the resource, with videos, repository, and discussion board was favourable for the researcher and participants. Second, there were issues around time availability to use the resource, technical difficulties, and commitment to the study. The technical difficulties involved navigation through the components of the resource and broken links which were easily fixed. Commitment issues and time availability of participants to use the resource were more difficult to resolve and continued to surface during the actual study.

Overall, it should be noted the findings from these regression analyses could not be generalised. Due to the small sample size the findings could not be considered completely reliable. However, some of the key findings from this analysis included: variance within the model; correlation between the covariates (with the exception of self-directed learning readiness) and the dependent variable; and consistency of some of the findings with the literature on the CoI framework.

Summary

In this chapter, the methodology for this sequential explanatory mixed methods study was described. In the first phase, quantitative data were collected and analysed to answer the research questions. In the second, supplementary phase of the study, interview questions were devised based on results from the quantitative analyses. Data gathered from the interviews were then used to explain the quantitative results in more detail.

In addition, results from the pilot study were presented. The purpose of which was to test an initial prototype of the RDLR and determine the strength of the correlations between the elements of the CoI framework and also between the control variables and cognitive presence (DV). Correlations of all the variables considered for the study were reported. Moreover, results from the quantitative content analysis of the online discussion transcripts were presented.

Chapter 4

Quantitative Analysis

Methods and Procedure

Variables in the quantitative analysis. There were a number of predetermined variables in this study. These variables were the elements of the CoI framework: social presence, teaching presence, and cognitive presence. Several other variables identified through the online learning literature were also chosen as variables for this study: prior online learning experience, prior collaborative learning experience, and readiness for self-directed learning. Table 4.1 presents the relationship between the factors and variables, in addition to the survey items that measure each variable.

Prior research has indicated that the three elements of the CoI framework are integral to creating an online learning community to support collaborative learning and critical discourse (Arbaugh et al., 2008; Shea & Bidjerano, 2009). These elements influence each other and are related to the online learning experience. For the purpose of answering the first research question, the mean scores for each of the CoI elements or constructs were calculated, as well as an overall learning experience score, which is an average of all three mean scores. The mean cognitive presence scores were selected as the dependent variable in the analyses to answer research questions two through six. Social and teaching presences were treated as independent or indicator variables, as they could predict the development of the cognitive presence. Prior online learning experience, prior collaborative learning experience, and readiness for self-directed learning were treated as control variables to determine their effects on predicting cognitive presence.

Table 4.1

Variables in the Quantitative Analysis

Variables	Factors	Survey Items
Teaching Presence	Design and organisation	CoI - Q1-4
	Facilitation	CoI – Q5-10
	Direct instruction	CoI – Q11-13
Social Presence	Affective expression	CoI – Q14-16
	Open communication	CoI – Q17-19
	Group cohesion	CoI – Q20-22
Cognitive Presence	Triggering event	CoI – Q23-25
	Exploration	CoI – Q26-28
	Integration	CoI – Q29-31
	Resolution	CoI – Q32-34
Readiness for SDL		LPA – Q1-58
Prior online learning experience		DEMO – Q9-12
Prior collaborative learning experience		DEMO – Q13-15

Standard Multiple regression was used to determine the extent to which teaching and social presence contributed to the development of cognitive presence; CHAID analysis (an additional multivariate method of analysis) was conducted to shed light on which items of teaching and social presence most influenced the development of cognitive presence, and

through conducting hierarchical regression analysis it determined whether the independent variables (social and teaching presences) continued to make a significant contribution to the development of cognitive presence after including the control variables in the regression model. Hierarchical regression was used to determine if the independent variables still significantly contributed to the prediction of cognitive presence development after the chosen covariates were controlled. Finally, to answer the seventh research question quantitative content analysis was used to explore the online discussion transcripts. This technique is a form of deductive coding based on predetermined codes and descriptors.

CoI survey instrument. The predictor variables, social and teaching presence, and the dependent variable, cognitive presence were collected through the CoI survey (Arbaugh et al., 2008). The 34 item survey consists of factors that determine each element of the framework. This data was first collected for the pilot study in March/April 2008 and later during the study from May 2008 until April 2009. It should be noted that at the time of the pilot study the CoI survey was published under (Ice et al., 2007). The CoI survey was used as a post evaluation of the RDLR and online discussions. It took participants on average between 5 and 10 minutes to complete. The survey was completed online at the participants' leisure toward the end of the course/workshop.

Demographic questionnaire. The control variables: prior online learning experience, prior collaborative learning experience, along with additional demographic data were collected via the demographic questionnaire. The demographic questionnaire was available online and completed prior to using the RDLR. It took participants on average between 2 and 5 minutes to complete.

Learning Preference Assessment (LPA). The online version of the LPA (Guglielmino & Guglielmino, 1991), the most commonly used quantitative instrument for measuring the attitudes, values, and abilities of participants relating to their readiness to engage in SDL was used in this study. The third control variable, readiness for SDL was collected from this instrument. Participants completed this survey prior to using the RDLR and took on average between 10 and 20 minutes to complete. Participants accessed the survey via a link on virtual campus to the LPA website (http://www.lpasdlrs.com/login.html). Participants entered their username or student identification number along with a password to access the survey. In addition to the LPA scores some demographic data such as gender, age, country of origin, highest education level attained, and occupation were also collected.

Practical Inquiry Model. Predetermined codes and descriptors from previous research (Garrison et al., 2001) were used to organise the online transcripts according to the phases of cognitive presence development.

Quantitative Data Collection

Sampling. For the purpose of the first phase of this study the convenience sample was selected, encompassing 275 possible participants. Participants were recruited at the beginning of each course/workshop. All participants were given an introductory letter and consent form explaining the study and the participant's expectations. Out of the 275 possible participants, 189 consented to participate which constituted a response rate of 68.7%. The breakdown of consented participants per intervention site is shown in Table 4.2 of Appendix H-1. The breakdown of consented participants that completed each survey per intervention site is presented in Table 4.3 of Appendix H-2.

Data collection took place between May 2, 2008 and April 30, 2009. All data were collected online, with the exception of a few participants in site G that preferred to complete hard copies of the surveys. Data were then transferred into a data set. There were no technical glitches reported that prevented participants from completing the surveys. There were several participants that did have trouble accessing the surveys. However through email correspondence with the researcher these problems were corrected. In each intervention site a series of email reminders were sent to participants to solicit high response rates. Each of the emails contained survey access information, an explanation of the importance of completing the surveys, and the researcher's contact information. These email reminders proved beneficial as a number of the surveys were completed after participants were prompted.

Quantitative Data Analysis

Descriptive and univariate analyses. To answer the first research question, descriptive statistics and frequency counts were used to analyse the demographic, LPA scores, and CoI survey data completed by the participants. In addition, independent samples t-tests, and ANOVAs were used to answer the first research question. All statistical data analyses were conducted with the Statistical Package for Social Sciences software (SPSS), version 18.

Multivariate analysis plan. The remaining research questions predetermined the choice of statistical tests and analyses to be used in this study. Since the purpose of this phase was to determine which variables in an online community of inquiry predict the development of critical thinking and discourse (cognitive presence) multiple regression techniques and CHAID analysis were used. Multiple regression is not a single technique but rather a group of techniques that can be used to explore the relationship between one continuous dependent variable and a number of predictor variables (Tabachnick & Fidell, 2007). Multiple regression is based upon correlation

and allows a sophisticated exploration of the interrelationship among a set of variables making it ideal for complex, real-life research questions (Pallant, 2007).

Data screening. The underlying assumptions of the analyses (Tabachnick & Fidell, 2007) are sample size, absence of multicollinearity and singularity, absence of outliers, normality, linearity, and homoscedasticity of residuals (including the independence of errors). Multiple regression is not forgiving if these assumptions are violated, nor is it a technique to be used on small samples, where the distribution of scores is skewed.

Sample size. According to Tabachnick and Fidell (2007) the minimum number of participants required for conducting multiple regression can be calculated using the equation, $N \geq 50 + 8m$ (where m is the number of independent or predictor variables, including the covariates). Most of the analyses required three predictor variables, therefore the sample size was to be a minimum 74 participants. One hundred-seven participants completed the CoI survey, thus the sample size was adequate to be generalisable.

Multicollinearity and singularity. Multicollinearity exists when the predictor variables are highly correlated (r = .9 and above, Pallant, 2007). Singularity occurs when one predictor variable is a combination of other predictor variables. The bivariate correlations for the predictor and dependent variables in the regression model can be seen in Table 4.4. Both teaching presence and social presence correlated with cognitive presence (. 75 and .76 respectively). In addition the Tolerance value and Variance Inflation Factor (VIF) were useful in identifying problems with multicollinearity. The Tolerance value for both teaching presence and social presence is .583, indicated no violation of the multicollinearity assumption. Moreover, the VIF of 1.717 is well below the cut-off value of 10.

Table. 4.4

Intercorrelations for Cognitive Presence and Predictor Variables

Measure	1	2	3
1. Cognitive Presence	--		
2. Teaching Presence	.75**	--	
3. Social Presence	.76**	.65**	--

** $p < .01$.

Outliers, normality, linearity, and homoscedasticity of residuals. The Normal Probability Plot (P-P) of the Regression Standardised Residual (Figure 4.1, SPSS version 18) and scatter plot (Figure 4.2, SPSS version 18) indicated that there were no violations of assumptions. The points on the Normal P-P lay in a reasonably straight line which suggested no major deviations from normality. The scatter plot showed that the assumptions of normality, linearity, and homoscedacity. The scatter plot showed that a few points may be considered outliers. However, none of the cases exceed the critical value for evaluating Mahalanobis distance (13.82). The maximum value in the data set was 10.12. The data screening detected that case number 52 had a residual value of -3.70. After checking the maximum value for Cook's Distance of .322 it was apparent that case number 52 had no undue influence on the regression model as a whole. Tabachnick and Fidell (2007) consider values of 1 or higher as potential problems and suggest they be removed from the data set.

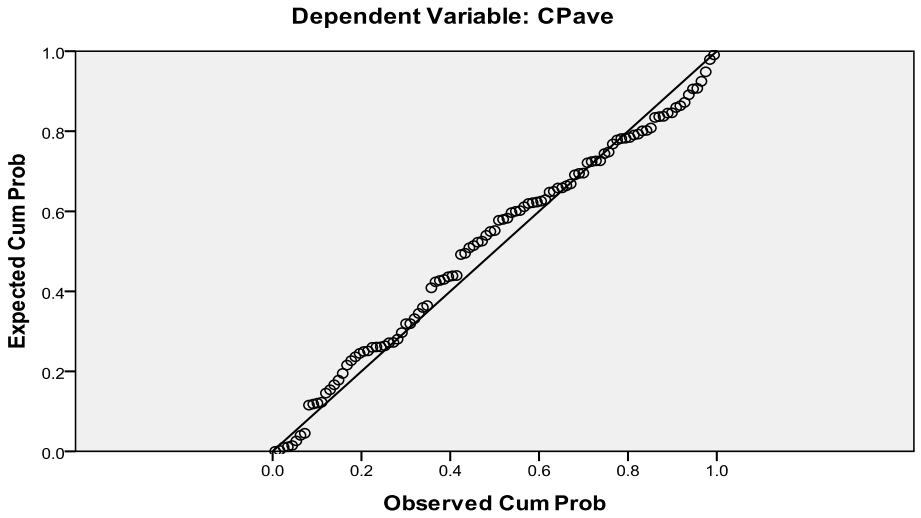

Figure 4.1. The normal probability plot (P-P) of the regression standardised residual.

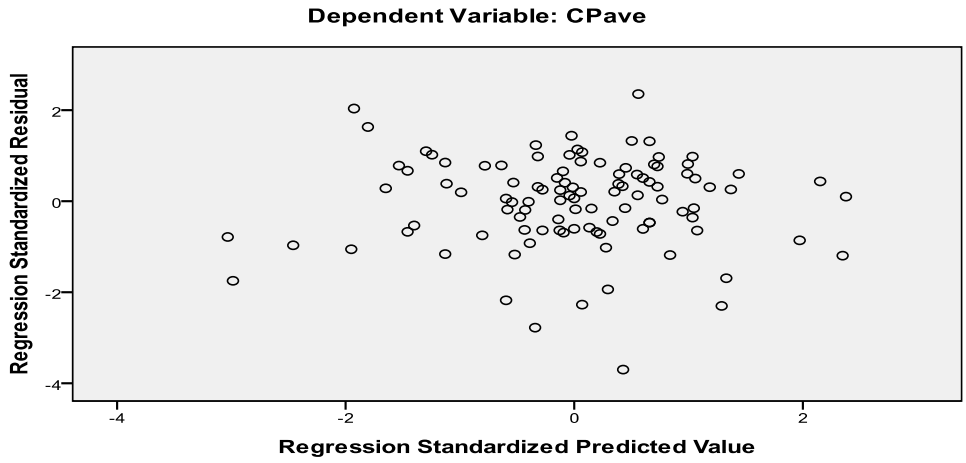

Figure 4.2. Scatter plot of the multiple regression analysis.

Missing data. There was very little missing data on the completed surveys (specifically, three cases were missing data). Pairwise exclusion of missing data was used which excludes the cases only if they are missing data required for the specific analysis.

Descriptive statistics and frequency distributions. Descriptives were run for all items of the surveys used in the multivariate analyses. None of the variables had unreasonable means or values. The descriptive statistics and frequency distributions are presented in Tables 4.5, 4.6, and 4.7.

Table 4.5

Descriptive Statistics for Composite Variables Obtained from the Demographic Questionnaire

	N	Mean	Std. deviation	Skewness		Kurtosis	
	Stat.	Stat.	Stat.	Stat.	Std. Error	Stat.	Std. Error
Online learning exp.	156	3.2596	.70818	.126	.194	-.643	.386
Collaborative learning exp.	156	3.2607	.68918	-.076	.194	.088	.386
Valid N (listwise)	156						

Table 4.6

Descriptive Statistics for Composite Variable: Readiness for Self-Directed Learning

	N	Mean	Std. deviation	Skewness		Kurtosis	
	Stat.	Stat.	Stat.	Stat.	Std. Error	Stat.	Std. Error
LPA Score	117	229.97	24.442	-.366	.224	-.293	.444
Valid N (listwise)	117						

Table 4.7

Descriptive Statistics for Composite Variables Obtained from the CoI Survey Instrument

	N	Mean	Std. deviation	Skewness		Kurtosis	
	Stat.	Stat.	Stat.	Stat.	Std. Error	Stat.	Std. Error
Soc. Pres.	106	3.4623	.64171	-.532	.235	.839	.465
Teach. Pres.	106	3.7975	.59198	-.466	.235	.417	.465
Cog. Pres.	107	3.4766	.66694	-.757	.234	1.205	.463
Valid N (listwise)	105						

Reliability and Validity

In Chapter 3 the reliability and validity of the CoI survey instrument and the LPA were discussed based on analyses from other studies. In this section the researcher comments on some of the reliability and validity analyses that were conducted in this study. The rationale for reporting on these additional aspects of reliability and validity was derived from general principles of "cleaning" the data before conducting statistical analyses. These analyses were conducted for the purposes of decreasing errors that may have arisen from measurement issues.

Reliability analysis. Reliability refers to the consistency of measurement, so that a particular procedure can be reproduced (McMillan & Schumacher, 2001). The reliability analysis of the scale items for both the LPA and CoI survey instrument have been reported previously in Chapter 3, as they are instruments that are widely used in SDL research and online learning. To confirm the reliability of the scale items for the demographic questionnaire, and CoI survey instrument the researcher examined item descriptive statistics and frequency distributions. Overall descriptive statistics for the LPA were provided by Guglielmino and Guglielmino (1991)

and incorporated with the results. However, the researcher was not able to obtain scale item frequency distributions.

Descriptive statistics and frequency distributions. The descriptive statistics for each item of the demographic, CoI survey instrument were obtained. Each item mean, standard deviation, skewness, and kurtosis values and histograms for each item were examined. Frequency distributions of each item showed variation in the responses. Distributions for many of the items were negatively skewed; however, the standard deviations showed there was variation in the responses across the intervention sites as presented in Tables 4.5, 4.6, and 4.7.

Validity. Validity refers to the degree to which a study accurately reflects or assesses what the researcher is attempting to measure; specifically, reporting content, criterion-referenced, and construct validity (Creswell, 2008). Content validity of the questionnaire was established during the pilot study and in EDU 7395 (Selected Topics in Advanced Statistics in Education) at the University of Ottawa, as classmates and volunteers in the study did not have any questions about the items or suggest that they were not relevant. Content, criterion-referenced and construct validity of the LPA and CoI survey instrument were discussed in the previous chapter. It should be noted that the self-constructed measures of prior online learning experience and prior collaborative learning experience showed less than desirable validity. There were only three items on the demographic questionnaire to measure prior online learning experience and they were not highly correlated with each other (.154 to .352). The correlations among the prior collaborative learning items were slightly stronger (.224 to .537).

Quantitative Results

Participant demographic information. Participants were compared on the following demographic characteristics: gender, age, country of residence, highest education level, and

occupation. This demographic information is presented for each intervention site is presented in Table 4.8 of Appendix H-3 and Table 4.9 of Appendix H-4.

Gender. In total 157 participants reported their gender on the demographic survey. There were more female participants than male (88.5% vs. 11.5%). Female participants dominated in all intervention sites, in fact in three intervention sites there were no male participants.

Age. In total 114 participants reported their age on the LPA. The study participants fell into five age categories pre-determined by the LPA; (1) under 25 years of age, (2) 25-34, (3) 35-46, (4) 46-55, (5) 56-65. 40% of the participants were under the age of 25 years. The 25-34 age group ranked second at 32%, followed by the 36-45 age group (16%) and the 46-55 age group (11%). The least represented age group was the 56-65 age group at 1%. The under 25 and 25- 34 age groups were presented in 8 of the 10 intervention sites. The 36-45 and 46-55 age groups were presented in 7 of the 10 intervention sites.

Country of residence. In total 114 participants reported their country of residence on the LPA. There were 112 of the study participants who reside in Canada. The remaining two participants indicated they resided in the Middle East.

Highest level of education completed. In total, 114 participants reported their highest level of education attained. 40% of participants had indicated their highest level of education was high school, followed by those who had obtained a bachelor's degree as their highest level of education at 38%. About 13% and 4% of the participants had obtained a Master's or Doctoral degree respectively. Those participants holding a bachelor's degree as their highest level of education completed were presented in nine of the 10 intervention sites. In site E all participants held a Master's level as their highest level of education completed.

Occupation. 114 participants indicated their occupation on the LPA. About 11% were K-12 or college educators, 3% were government employees, 38% were healthcare professionals, and 48% indicated they were students. In sites G and H all participants indicated they were healthcare professionals.

Internet usage. All 157 study participants reported their Internet usage for informal learning. All 157 participants indicated using the Internet to some extent for learning. Moreover, 84% reported using the Internet "often" or "always" to help answer questions about life, personal interest and/or essential needs.

Online courses. All 157 participants reported the number of online courses they had taken in their lifetime. About 47% of participants had never taken an online course and 22% had taken four or more online courses. Participants having taken 1, 2 or 3 courses previously presented 12%, 10% and 10% of the sample respectively.

Online learning tools. All 157 study participants reported the types of online learning tools they had used prior to using the RDLR, such as participating in online discussions, chat rooms, listening to podcasts, creating wikis, using simulations, and participating in audio or video conferencing. About 10 % of participants had never used any of these tools, 38% had used a few, and 2% had used all of them.

Online learning experience. All 157 study participants reported on their online learning experience. About 61% considered their learning experience to be positive, 8% considered it not to be a positive and 32% were neutral.

Collaborative learning experiences. All 157 study participants reported on their collaborative learning experiences. About 98% of participants indicated having experienced learning in small group situations towards a common goal through discussion and sharing to

some extent; 60 % considered their collaborative learning experiences to be positive and 9% did not. About 31% were neutral. When asked about some types of collaborative learning experiences they had participated in, such as problem-based learning, team-based learning and participating in online collaborative projects; 5.1% of participants indicated they never experienced any of them and 8.9 % had experienced all of them. The majority of participants had experienced one or two of these types of collaborative learning.

LPA scores. The average score for adults who complete the LPA/SDLRS was 214 points out of a total of 290 possible points, with a standard deviation of 25.59. Guglielmino's (1977) research indicated that individuals who developed high SDL skills tend to perform well in situations requiring high levels of problem solving ability and creativity. According to Guglielmino, people with high SDLRS/LPA scores tend to prefer determining their own learning needs and plan their own learning. People with average SDLRS/LPA scores tend to be successful in independent situations but are not comfortable with the process of SDL (i.e. identification, planning, and implementing learning on their own). People who score below average tend to prefer structured learning environments. Participants in this study who completed the SDLRS/LPA tended to score above the average adult who takes this assessment (mean score of 230 with a standard deviation of 24.44). The results of the LPA are found in Table 4.8 of Appendix H-3. About 38% of participants that completed the LPA had scores in the top 16% (84th percentile) of people who take the LPA. However, overall 27% of the participants who completed the LPA were in the 50^{th} percentile or below of people who have taken the LPA.

Scale items frequencies analysis of the CoI Survey Instrument. The results of the items measuring the participants' teaching presence (design and organisation, facilitation, and direct instruction), social presence (affective expression, open communication, and group cohesion),

and cognitive presence (triggering event, exploration, integration, and resolution) are presented in this section. Details are presented in Table 4.10 of Appendix H-5. The items were measured on a 5-point Likert type scale from "Strongly disagree" to "Strongly agree". There were two cases of the completed surveys with missing data.

Teaching presence. This scale contained 13 items which was further divided into three subscales relating to design and organisation, facilitation, and direct instruction. To reiterate it was stressed to the participants that when completing the survey the "course" referred to the RDLR and associated activities and "instructor" referred to the researcher and his involvement with facilitating the RDLR and associated online discussions.

The first four items focused on the design and organisation of the course. The majority of participants agreed that the researcher had clearly communicated the content of the RDLR (79.7%). The group in most agreement was site H (91.7%). Only 4% of participants did not feel that the researcher had clearly communicated the content of the RDLR. This pattern of agreement was reflected in the participants' responses for the other items related to design and organisation. About 73.2% felt that the researcher had clearly communicated goals; 85.2% felt that the researcher had provided clear instructions, and 79.6% felt that the researcher communicated important due dates for the learning activities (viewing of videos and completion of online discussions). Negative responses ("strongly disagree" or "disagree") on these items ranged from 3.8% - 9.3%.

Six items on the survey were related to facilitation. Positive responses from the participants were generally fewer than the design and facilitation items. About 73.1% of participants felt that the researcher was helpful in guiding the class towards an understanding of educational research in a way that clarified their thinking. Participants also felt that the

researcher was helpful in identifying areas of agreement and disagreement, keeping everyone engaged in productive dialogue, staying on task, and encouraging participants to explore new concepts (57.4%, 70.1%, 63.9%, and 72.2% respectively).

Only 53.7% of respondents indicated that the researcher's actions reinforced the development of a sense of community among them: 38.0% were undecided. Negative responses on this item came from sites A, C, H, and I. Negative responses for these six items measuring facilitation ranged from 4.6% - 9.3%.

The final three items measuring teaching presence were related to direct instruction. About 67.3% of participants felt the researcher helped to focus discussion on relevant issues that helped them learn and 75.6% of felt that the researcher provided feedback in a timely fashion. However, only 50.0 % agreed that the researcher provided feedback the helped them to understand their strengths and weaknesses. Negative responses on this item were reported from sites G, H, and I.

Social presence. There were nine items on the survey used to measure social presence: three items for each subscale of affective expression, open communication, and group cohesion. The items measuring affective expression received some of the lowest positive responses from the participants: getting to know other course participants gave me a sense of belonging (48.2%); the researcher was able to form distinct impressions of other participants (46.3%), and online communication is an excellent medium for social interaction (39.8%).

In fact 25.9% of participants disagreed with the statement that online communication is an excellent medium for social interaction. The most negative responses on this item were reported from sites B, C, G, H, and I. This item also had the lowest mean score of all items on the CoI survey (3.13).

Regarding open communication, participants generally felt comfortable conversing through an online medium, participating in online discussions, and interacting with other participants (62.6%, 63.9%, and 69.1% respectively). Group A provided the least number of positive responses (25% for each response). About 17.8% of all participants who completed the survey did not feel comfortable conversing through the online medium. The most negative responses on this item came from sites, A, B, C, G, H, and I.

The final three items measuring social presence were related to group cohesion. 55.6% felt comfortable disagreeing with other participants and 63.9% felt their point of view was acknowledged by others (sites B, E, and I had negative responses ranging from 3.6%-16.7%). All groups with the exception of site D disagreed that discussions helped to develop a sense of collaboration (16.7%-41.7%). Average positive responses for this item were 45.3%.

Cognitive presence. Twelve items on the survey were used to measure cognitive presence; 3 items for each of the subscales (triggering events, exploration, integration, and resolution). Generally, positive responses to the cognitive presence items were less than for teaching presence and social presence. The first three items were related to the triggering events. About 44.4 % of respondents indicated that questions posed by the researcher or others increased their interest in educational research. Generally, responses were either positive or neutral that RDLR activities piqued their curiosity (87.0%). About 36.4% of respondents in site I did not feel motivated to explore content related questions.

The next phase of cognitive presence related to exploration. Many participants either agreed or were neutral with regard to online discussions being valuable in helping them appreciate different perspectives (79.6%). None of the participants in sites E, G, and H rated this item negatively. About 50.9 % of participants indicated they utilised a variety of information

sources to explore problems posed in the RDLR activities. Another 31.0% of site I disagreed with this statement. A slim majority of participants (56.4%) found brainstorming and finding relevant information helped resolve content related questions. Overall 12% disagreed with this statement. These participants were in sites B, E, and I.

The majority of participants were either neutral or in agreement regarding the items relating to integration. Only 13% felt that combining new information did not help them answer questions raised in RDLR activities. Sites G and H had no negative responses. Similarly only 10% did not believe the learning activities helped construct explanations or solutions. Sites B, D, and G did not indicate any negative responses. About 60.7% of all respondents indicated that reflection on RDLR content and discussions helped them understand the fundamental concepts of educational research. Four sites (C, D, E, and G) did not indicate any negative responses.

Finally, the majority of respondents responded positively to two of the three items regarding resolution. About 62.1% indicated they could describe ways to test and apply the knowledge created in the course (RDLR activities and discussions). Furthermore, 63.9% indicated they could apply the knowledge learned to their work or other non-class related activities. However, only 48.1% indicated they developed solutions to problems that can be applied in practice. Many of the participants (42.6%) were neutral regarding this question.

In summary, overall the majority of participants responded positively to most of the items of the CoI survey. Teaching presence items presented the highest percentage of positive responses followed by social presence and cognitive presence items. There was a relatively high percentage of participants who disagreed that online communication was an excellent medium for social interaction (25.9%), and online discussions helped develop a sense of collaboration (25.9%) compared to other items on the CoI survey instrument.

RDLR and discussion usage. Table 4.11 of Appendix H-6 shows the statistics regarding the participants' use of the RDLR and online discussions. The average length of time participants spent viewing the RDLR per session varied among intervention sites ranging from 2-12 minutes per visit. The column total time refers the amount of time the class as a whole spent using the resource. These figures can be misleading as the number of participants in each class varied. Another interesting statistic is that participants spent from 2-29 minutes on average for each discussion session, meaning that they took this time to either read or write postings. Even in sites where there were few postings, they were being read by many participants in the group. Unfortunately, the researcher has not been able to access much of the RDLR usage and discussion data for sites G and I. The reason for this access limitation was that the learning management system used at these sites did not have student tracking options.

Comparing scores of the CoI survey instrument across intervention sites. The following section describes the results of the various ANOVAs and t-tests conducted for this study.

One-way between groups analysis of variance (ANOVA). To better answer the second part of the first research question several ANOVAs were conducted. Participants were divided into groups according to intervention site in order to create a new categorical variable. Intervention sites F and J were not included in this analysis as there were no participants that completed the CoI survey. There was a statistically significant difference at the $p < .05$ level in the mean scores of the cognitive presence scale for the new variable SITES: $F(7, 99) = 2.72$, $p = .01$. Details of the ANOVA conducted on cognitive presence scores are presented in Table 4.12. The effect size, calculated using the eta squared was .16, which is considered to be large. Post-hoc comparisons using the Tukey HSD test indicated the cognitive presence mean score for site

B (M = 3.89, SD = .57) was significantly different from site I (M= 3.26, SD = .72). However, there was not a statistically significant difference at the p< .05 level in the mean scores of teaching presence and social presence. Details of the ANOVAs conducted on teaching presence and social presence scores are presented in Tables 4.13 and 4.14 respectively. Mean scores and standard deviations for each of the three presences are presented in Tables 4.15, 4.16, and 4.17.

Table 4.12

One-Way Analysis of Variance Summary for Cognitive Presence

Source	df	SS	MS	F
Between groups	7	7.61	1.09	2.72*
Within group	99	39.55	.40	
Total	106	47.15		

*p<.05.

Table 4.13

One-Way Analysis of Variance Summary for Teaching Presence

Source	df	SS	MS	F
Between groups	7	4.05	.58	1.73
Within group	98	32.74	.33	
Total	105	36.80		

*p<.05.

Table 4.14

One-Way Analysis of Variance Summary for Social Presence

Source	df	SS	MS	F
Between groups	7	3.37	.48	1.83
Within group	100	39.87	.41	
Total	107	43.24		

*p<.05.

Table 4.15

Mean Scores and Standard Deviations of Cognitive Presence by Intervention Site

Intervention Site	Sample Size	Mean score	Standard deviation
A	4	3.56	.41
B	12	3.89	.57
C	4	3.23	.38
D	4	3.75	.60
E	6	3.40	.43
G	10	3.76	.53
H	12	3.83	.45
I	55	3.26	.72
Total	107	3.48	.67

Table 4.16

Mean Scores and Standard Deviations of Teaching Presence by Intervention Site

Intervention Site	Sample Size	Mean score	Standard deviation
A	4	3.63	.58
B	12	4.21	.52
C	4	3.46	.50
D	4	3.77	.31
E	6	3.72	.41
G	10	3.90	.65
H	12	4.02	.49
I	55	3.69	.62
Total	106	3.80	.59

Table 4.17

Mean Scores and Standard Deviations of Social Presence by Intervention Site

Intervention Site	Sample Size	Mean score	Standard deviation
A	4	3.17	.58
B	12	3.64	.79
C	4	3.30	.33
D	4	3.72	.53
E	6	3.56	.34
G	10	3.81	.69
H	12	3.56	.40
I	55	3.34	.68
Total	106	3.46	.64

Independent-samples t-tests. Another interesting comparison was made by dividing the intervention sites into two groups to create a new categorical variable: those courses in which the instructor required individuals to use the RDLR as part of the syllabus; and those in which using the use of RDLR was not part of program. The researcher indicated to all learners in each class during recruitment whether the RDLR was part of the syllabus, or was not a required activity. This was done both in person during the face to face meeting and in writing on the consent form. The instructor, at sites requiring learners to the use of the RDLR, also made this clear during the review of the course syllabus.

Independent-samples t-tests were conducted on the LPA scores, mean scores of the three CoI elements, and also all individual items of the Demographic questionnaire and CoI survey instrument. The results are as follows.

There was a significant difference in LPA scores for intervention sites that required the use of the RDLR (M = 239.03, SD = 20.86) and intervention sites that did not require the use of the RDLR (M= 227.45, SD = 24.38). Details of the analysis of are found in Table 4.18

Table 4.18

Group Differences between Matched Groups Who Were or Were Not Required to Use the RDLR

	Required		Not Required			
Mean Score	M	SD	M	SD	df	t
LPA	227.45	24.83	239.03	20.86	58.67	-2.50*
Cognitive Presence	3.48	.70	3.50	.46	106	-.16
Teaching Presence	3.83	.62	3.70	.48	105	.91
Social Presence	3.46	.68	3.47	.45	105	.97
DQ 14	3.46	.87	3.87	.73	155	-2.74*

*p<.05

There was a significant difference between groups who were required to use the RDLR by their course instructors and those groups in which it was not, for two variables: LPA or self-directed readiness scores and positive collaborative learning experiences (DQ 14). For these two

variables the group whose course instructors required them to use the RDLR or participate in discussions, scored significantly higher.

In summary, as evidence presented by the results of the CoI survey and the comparison analyses, the first hypothesis, "Participants will have a positive learning experience using the resource but there may be differences among intervention sites" was accepted.

Description of the regression analyses and CHAID analysis. In order to explore the effects of the learning experience as instantiated by the RDLR on the cognitive presence (DV), standard multiple regression and hierarchical multiple regression were employed. Social presence and teaching presence were used as the independent variables, and SDL readiness, prior online experience, and prior collaborative learning experience were included as control variables. The relative effect of each of these indicators for predicting cognitive presence was evaluated from this regression analysis. These analyses were used to help answer research questions two through to six.

Standard multiple regression analysis. SPSS REGRESSION was used to compute a standard multiple regression to predict cognitive presence (DV), from teaching presence (IV) and social presence (IV).

Analysis was performed using SPSS REGRESSION and SPSS EXPLORE for evaluation of the assumptions. As reported earlier in this chapter no violation of the assumptions of normality, linearity, multicollinearity and homoscedacity were found. Three cases had missing data.

Table 4.19 displays the correlations between the variables, the unstandardised regression coefficients (B), the standardised regression coefficients (β), the semi-partial correlations (sr^2),

the amount of variability accounted for by the predictor variables (R^2), and the adjusted R^2. The adjusted R^2 value of .69 indicated that almost 70% of the variability in the cognitive presence is predicted by social and teaching presence. Data from Table 4.19 has been previously published (Archibald, 2010).

Table 4.19

Summary of Standard Regression Analysis of Social and Teaching Presences on Predicting Cognitive Presence Development in an Online Community of Inquiry

Variable	Cog. Pres.	Soc. Pres.	Teach. Pres.	*B*	*β*	sr^2
Social Pres.	.76			0.49	0.47**	.13
Teaching Pres.	.75	.65		0.50	0.45**	.11
Mean	3.48	3.46	3.80			
Standard Dev.	0.67	0.64	0.59			
				$R^2 = .69$[a]		
				adjusted $R^2 = .69$		
				$R = .83$**		

** $p<.01$

[a]Unique variability = .25; shared variability = .45

Note. The CoI instrument is on a Likert-type scale: 1 (strongly disagree) – 5 (strongly agree)

The standardised Beta values in the regression analysis were very much of interest in this study, as they compared the relative contribution of social and teaching presence, in predicting cognitive presence. Social presence and teaching presence made very strong unique contributions to explaining cognitive presence; both of which were statistically significant (.47 and .45 respectively). The semi-partial correlation coefficients squared (sr^2) gave an indication of the

relative contribution of each independent variable to the total R^2. In other words it indicated how much total variance in the cognitive presence was uniquely explained by each of social presence and teaching presence and how much the R^2 would drop if either social presence or teaching presence were not included in the model. It should be noted that the R^2 value includes the unique variance and the shared variance explained by both social and teaching presence. In this model social presence and teaching presence are very strongly correlated (r =.65). Therefore there is a significant amount of shared variance (.45) that is statistically removed when both are included in the regression model.

In summary, it appeared there was a positive relationship between both social presence and teaching presence with cognitive presence. Therefore, hypotheses two and three of this study, "social presence (IV) will be positively related to cognitive presence (DV)" and "teaching presence (IV) will be positively related to cognitive presence (DV)" were accepted. These results are supported with evidence in the literature that effective online learning is a function of the interaction of the three presences, and that social and teaching presence are correlated with cognitive presence (Arbaugh, 2007; Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005; Garrison, Cleveland-Innes et al., 2010; Shea & Bidjerano, 2009) and will be discussed in Chapter 6.

Hierarchical multiple regression analysis. SPSS REGRESSION was also used to assess the ability of social presence and teaching presence to predict levels of cognitive presence, after controlling for the influence of three covariates: self-directed learning readiness; prior online learning experience, and prior collaborative learning experience. Tables 4.21, 4.22, and 4.23 display the correlations between the variables, the unstandardised regression coefficients (B), the standard error (SE B), the standardised regression coefficients (β), the amount of variability

accounted for by the predictor variables and covariates (R^2), and the R^2 change values (ΔR^2). In three separate hierarchical regression analyses, self-directed learning readiness, prior online learning experience, and prior collaborative learning experience were entered at Step 1, explaining 0.4%, 0.2%, and 1.1% respectively, of the variance in cognitive presence. After the entry of social presence and teaching presence at Step 2, the total variance explained by each model as a whole was 69.6%, $F(3, 82) = 62.50$, $p< .001$; 69.5%, $F (3, 101) = 76.72$, $p<.001$; and 69.3%, $F (3, 101) = 75.95$, $p<.001$ respectively.

Controlling for self-directed learning readiness. Correlations between cognitive presence and all the predictor variables are presented in Table 4.20 of Appendix H-7. Social presence and teaching presence explained an additional 69.2% of the variance in cognitive presence after controlling for self-directed learning readiness, $R^2 = .696$, F change $(3, 82) = 62.50$, $p<.001$ (Refer to Table 4.21). The R^2 value for self-directed learning readiness by itself explained about .004 of the variance in cognitive presence. In the final model social presence and teaching presence are statistically significant recording standardised beta values of .44 and .48 respectively. These findings indicate that social presence and teaching presence continued to significantly and substantially contribute to the prediction of cognitive presence after controlling for self-directed learning readiness. Therefore, the fourth hypothesis, “After controlling for self-directed learning readiness (CV), social presence (IV) and teaching presence (IV) will not significantly contribute to the prediction of cognitive presence (DV)” was not accepted.

Table 4.21

Summary of Hierarchical Regression Analysis of Social and Teaching Presence on Predicting Cognitive Presence in a CoI after Controlling for SDL Readiness

Variable	B	SE B	β
Step 1			
SDL Readiness	0.10	0.18	.06
Step 2			
SDL Readiness	0.09	0.10	.06
Social Presence	0.49	0.08	.44***
Teaching Presence	0.50	0.09	.48***

Note. R^2 = .004 for Step 1; Δ R^2 = .692 for Step 2 (ps<.05)
***p<.001

Controlling for prior online learning experience. Social Presence and teaching presence explained an additional 69.3% of the variance in cognitive presence after controlling for prior online learning experience, R^2 = .695, F change (3, 101) = 76.72, p<.001. Details of this analysis are presented in Table. 4.22. The R^2 value for prior online learning experience by itself explained about .002 of the variance in cognitive presence. In the final model social presence and teaching presence record statistically significant standardised beta values of .48 and .45 respectively. This finding indicated that social presence and teaching presence continued to significantly and substantially contribute to cognitive presence after controlling for prior online learning experience. Therefore, the fifth hypothesis, "After controlling for prior online learning experience (CV), social presence (IV) and teaching presence (IV) will not significantly contribute to the prediction of cognitive presence (DV)" was not accepted.

Table 4.22

Summary of Hierarchical Regression Analysis of Social and Teaching Presence on Predicting Cognitive Presence in a CoI after Controlling for Prior Online Learning Experience

Variable	B	SE B	β
Step 1			
Prior online learning experience	0.10	0.10	.11
Step 2			
Prior online learning experience	-0.01	0.05	-.01
Social Presence	0.50	0.08	.48***
Teaching Presence	0.50	0.08	.45***

Note. R^2 = .002 for Step 1; ΔR^2 = .693 for Step 2 (ps<.05)
***p<.001

Controlling for prior collaborative learning experience. Social Presence and teaching presence explained an additional 68.2% of the variance in cognitive presence after controlling for prior collaborative learning experience, R^2 = .693, F change (3, 101) = 75.95, p<.001. Details of this analysis are presented in Table 4.23. The R^2 value for prior collaborative learning experience by itself explained about .011 of the variance in cognitive presence. In the final model social presence and teaching presence recorded statistically significant standardised beta values of .48 and .45 respectively. This finding indicated that social presence and teaching presence continued to significantly and substantially contribute to cognitive presence after controlling for prior online learning experience. Therefore, the sixth hypothesis, “After controlling for prior

collaborative learning experiences (CV), social presence (IV) and teaching presence (IV) will not significantly contribute to the prediction of cognitive presence (DV)" was not accepted.

Table 4.23

Summary of Hierarchical Regression Analysis of Social and Teaching Presence on Predicting Cognitive Presence in a CoI after Controlling for Prior Collaborative Learning Experience

Variable	B	SE B	β
Step 1			
Prior collaborative learning experience	0.05	0.09	.05
Step 2			
Prior collaborative learning experience	-0.05	0.05	-.05
Social Presence	0.50	0.08	.48***
Teaching Presence	0.50	0.08	.45***

Note. R^2 = .011 for Step 1; Δ R^2 = .682 for Step 2 (ps<.05)
***p<.001

Chi-square Automatic Interaction Detector Analysis (CHAID). The CHAID technique (Kass, 1980) was first used as a multivariate method of analysis in research on the CoI framework by Shea and Bidjerano (2009). This technique is most commonly used in marketing research and rarely in empirical educational research. CHAID analysis produces a regression or decision tree that indicates the most significant breaks in responses to items of the CoI survey instrument that predict responses to another item or construct (Shea & Bidjerano). The method is a logical next step in determining the extent of the relationships in the CoI framework. The standard regression analysis determined there was a positive relationship between cognitive

presence, and teaching and social presence. CHAID analysis explores this relationship in more detail as it examines the relationship of individual items which can lead to further insight into the development of cognitive presence. In other words the CHAID analysis will allow the researcher to "unpack the factors to examine the specific item level relationships that predict variance in reports of cognitive presence" (Shea & Bidjerano, p. 549). Figure 4.3 shows that the social teaching presence indicator, "Online discussions help me develop a sense of collaboration" is the highest level item that sorts the respondents on the factor of cognitive presence. Thirty-nine respondents who agreed with this statement reported significantly higher levels of cognitive presence than those who were neutral or disagreed.

Within this high scoring group, the teaching presence item "The instructor helped keep the course participants on task in a way that helped me to learn", respondents reported significantly higher average cognitive presence scores when they also agreed more strongly with this teaching presence item as compared to those who rated the instructor not helping to keep the course participants on task in a way to help their learning.

At the third level of categorisation, within this high scoring group, respondents who agreed strongly to the social presence item "I felt my point of view was acknowledged by other course participants" were also significantly more likely to report higher cognitive presence scores. The results of the CHAID analysis will be discussed and connected to the results of the standard regression analysis in chapter 6.

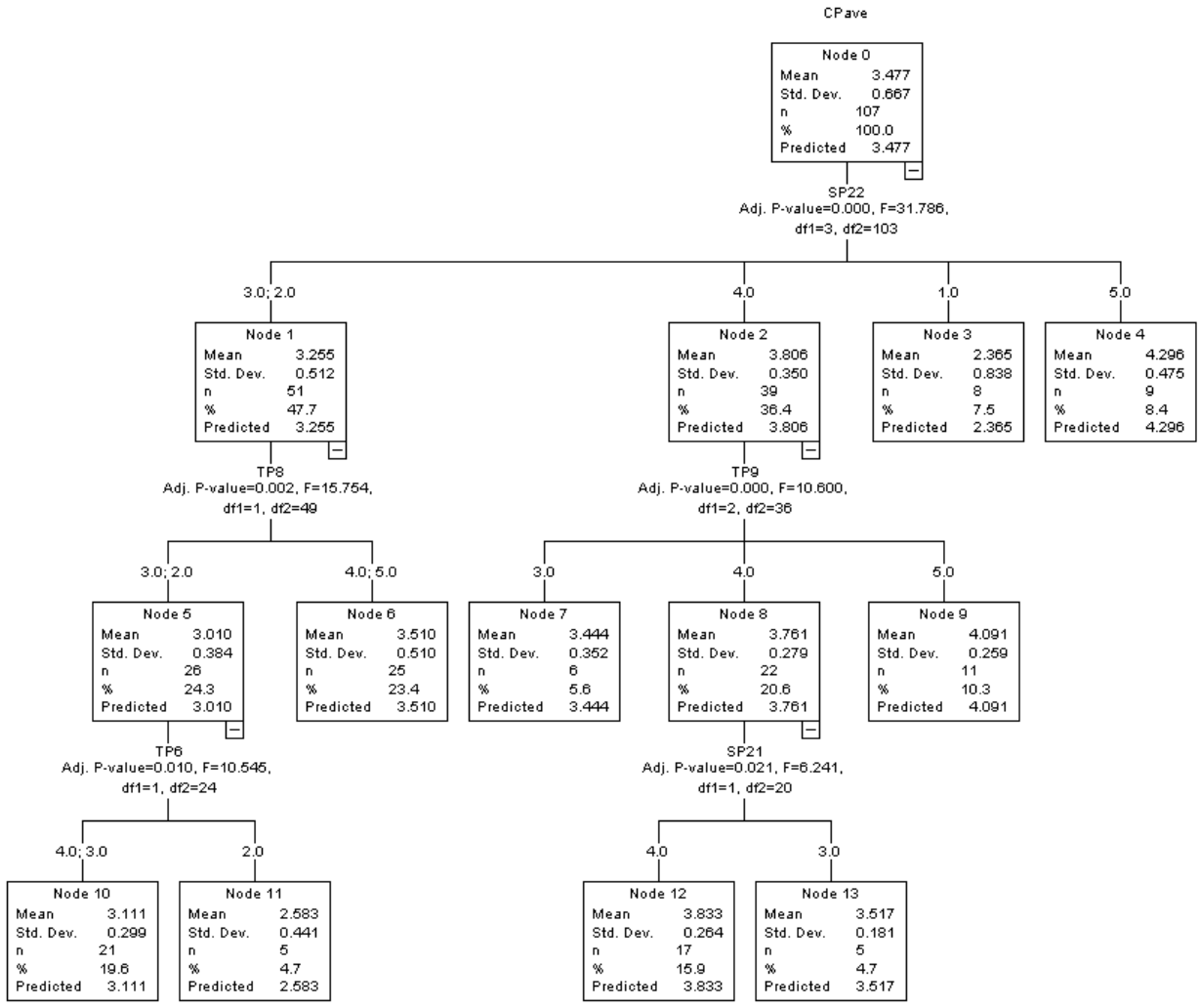

Figure 4.3. CHAID analysis of cognitive presence scores – levels 1, 2, and 3.

Quantitative content analysis of the online discussions. To help answer the seventh research question the researcher needed to analyse the online discussions. This analysis required the researcher to highlight and print the transcripts of the participants in the study. The method of transcript analysis that the researcher used for this study was from Garrison et al., (2001) and is described in the following section. Their method is considered a form of deductive, quantitative content analysis.

The researcher made an assumption during this analysis. He was part of the online discussions and played an integral role in facilitating the direction of conversations. Therefore, due to the subjective nature of the discussions he cannot guarantee that the analysis would be completely unbiased. Thus to support the reliability of this analysis the researcher had a colleague code the discussion text using the same codes and descriptors. She was given the same codes and descriptors used by the researcher who coded the text from a sample intervention site using QSR NVivo8. Then using QSR NVivo8 the researcher ran a coding comparison query. Consensus was approximately 84.41%, which is considered to be trustworthy; above the 80% recommended by Miles and Huberman (1994).

This transcript analysis of the RDLR online discussions involved the adoption of Garrison, Anderson, and Archer's (2001) quantitative content analysis instrument to assess critical discourse and reflection. This instrument is framed by the Practical Inquiry Model (Garrison & Archer, 2000). Transcript analysis is used to determine the presence of certain words or concepts within a text and is a technique often used to analyse transcripts of asynchronous, computer mediated discussion groups in formal educational settings (de Weaver, Schellens, Valke, & van Keer, 2006). For transcript analysis, the authors (Garrison et al., 2001) developed a set of categories into which messages/postings were coded. The Practical Inquiry Model provided the substance for the categories and a set of descriptors, indicators, and examples were then developed. The categories of the Practical Inquiry Model: triggering events, exploration, integration, and resolution also form the subscales of the CoI survey instrument which was administered in the first phase of this study. Results from the transcript analysis and the CoI survey were connected during the integration/discussion section of this study.

The Practical Inquiry Model (Garrison, et al., 2000, Figure 2.1) provided an ideal framework for assessing critical discourse and reflection in an online discussion forum (a computer-conference environment), as it operationalises cognitive presence.
The model was based on Dewey's work (1933) on experience and practice. The key concept being there is a strong connection between a learner's private and shared worlds.

In the first phase of critical inquiry participants are presented with a question, issue or problem, often by the facilitator of the discussion but sometimes by participants themselves. The triggering event is supposed to "spark" a discussion that will lead to critical discourse and attainment of the educational outcomes. The second phase of the model involves the process of exploration, "Participants shift between the private reflective world of the individual and the social exploration of ideas" (Garrison et al., 2001, p. 10). This is an inquisitive phase and is often characterised by brainstorming, questioning, and exchanging ideas. Ideas are not necessarily supported by experience or evidence from other sources. The third phase refers to integration or constructing meaning of the ideas generated previously. Garrison et al., indicate that this is the most difficult phase to assess as participants move continually between reflection and discourse. The resolution of the problem or question represents the fourth and final phase of the model. In educational settings this phase is usually reached through consensus building with the community of inquiry (Garrison et al.). The end of this phase may require moving to a new problem or question assuming that participants have acquired and applied useful knowledge.

Assessing the process of cognitive development is difficult and online transcripts can only reveal the cognitive presence that participants choose to reveal in the discussion forum. Therefore, it is important to triangulate the data from the discussion transcripts with the CoI

instruments results, and the data from the individual interviews to get a more complete picture of cognitive presence development.

The content analysis procedure involved using a predetermined set of descriptors, indicators and examples for each of the practical inquiry categories (Refer to Tables 4.24 – 4.27). It should be noted that messages coded as "other" indicated not showing evidence of cognitive presence, or were unrelated to the discussion. The researcher provided examples of each phase of the model from the online discussions.

Table 4.24

Triggering Events (based on Garrison et al., 2001)

Descriptor	Indicators	Sociocognitive Processes
Evocative	Recognising the problem	Presenting background information that culminates in a question
	Sense of puzzlement	Asking questions Messages that take a discussion in a new direction

Example: Do you think Dr. Cowley's decision to visit the top four schools was a good one? Explain.

Table 4.25

Exploration (based on Garrison et al., 2001)

Descriptor	Indicators	Sociocognitive Processes
Inquisitive	Divergence-within the online community	Unsubstantiated contradiction of previous ideas
	Divergence – within a single message	Many different ideas/themes presented in one message
	Information exchange	Personal narratives/descriptions/facts (not used as evidence to support a conclusion)
	Suggestions for consideration	Author explicitly characterises a message as exploration
	Brainstorming	Adds to the established points but does not defend/justify/develop
	Leaps to conclusions	Offers unsupported opinions

Example: I don't think using the top 4 schools for the research was a good idea.

Table 4.26

Integration (based on Garrison et al., 2001)

Descriptor	Indicators	Sociocognitive Processes
Tentative	Convergence – among group members	Reference to a particular message followed by a substantiated agreement
	Convergence – within a single message	Justified, developed, or defensible
	Connecting ideas – synthesis	Integrating information from various sources
	Creating solutions	Explicit characterisation of message as a solution by participant.

Example: I agree with Jocelyn and Irma that choosing only 4 schools was not the best way to go...Though it would have been very timely and costly, I think he should have randomised the 40 schools after the questionnaire and taken at least 10-20 of them to be more representative of the population, therefore making his study much more powerful.

Table 4.27

Resolution (based on Garrison et al., 2001)

Descriptor	Indicators	Sociocognitive Processes
Committed	Vicarious application to the real world	None
	Testing Solutions	Coded
	Defending Solutions	

Example: A good test of Dr. Cowley's decision to choose only 4 schools would be to...and then assess how...

Coding of the online transcripts from site B. The RDLR was used by the participants in a graduate level education course over the Fall 2008 semester. Data was collected in two one-week exchanges from the course. In total there were 72 messages, including 14 threaded discussions (each discussion contained two to sixteen threads). Fifteen participants contributed to the discussions, including the researcher. The main focus of the discussions was on developing research questions and research paradigms. The first transcript (week 5) focused on designing research questions. The second transcript (week 7) focused on research paradigms. The researcher's role was providing the triggering questions. In addition, each week two course participants were responsible for monitoring the discussions. The coding results of the discussions are presented in Figure 4.4.

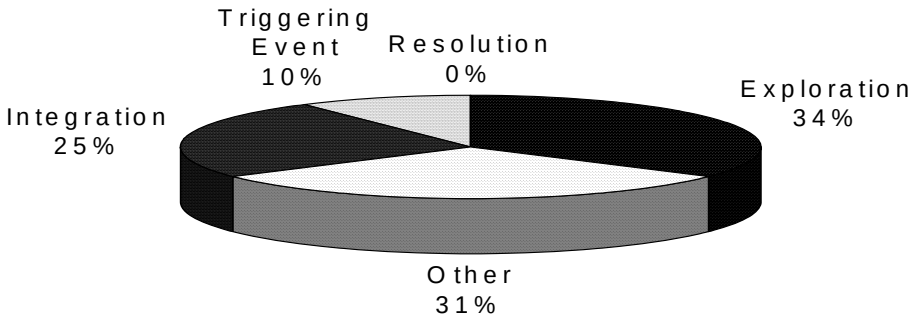

Figure 4.4. Percentage of postings that represented the phases of critical thinking from site B.

Triggering events for all three transcripts were provided by the facilitator which helped the participants to think critically about the discussion topics and helped keep the discussions focused.

None of the postings were coded to the resolution phase; many of the postings were coded to the exploration and integration phases, and a large portion of the messages (30.6%) were coded as not showing evidence of cognitive presence. For example in an exchange with one participant the researcher indicated, "Interesting...soon (within the next couple of weeks) Dr. A from the Ed. Faculty will be sharing his story on ethnographic performance. I think you will find it interesting." The participant replied, "Yes, I am sort of familiar with Dr. A's research. ...I'm looking forward to reading more about it". This discussion did not contribute to cognitive presence and is an example of a message coded as *other*.

The postings coded as being at the exploration and integration phases showed evidence of information exchange, suggestions for consideration, and brainstorming. The following exchange suggested progression from the exploration to integration phases as two participants discuss Dr. A's research.

> I was actually lucky enough to have Dr. A come in person and present his topic in one of my classes- it was extremely interesting! Anyhow, he used, what he calls an ethnography of performance in studying language and identity in a group of immigrant students coming from Africa- therefore he used an interpretivist methodology. What was interesting about these immigrants is that when coming to Canada, they suddenly found that they were a racial minority (so they did not identify themselves with their country of origin), therefore they "became" black and started adopting North American "black" culture and language- as opposed to a more standardised English which they did not identify with. (Rob, Oct. 24)

Another participant responded:

> Your comment, [Rob], about African immigrant students and their shifting identity reinforces one of the main lessons I learned while doing work on my thesis in Canadian history, and that is the importance of time and place. I find it is so important to ground research in the specific context or else it becomes lost in abstraction. ... I am concerned that using academic language with its multi-syllabic words and jargon is one of the barriers for many people to participate in so-called "higher" education. I do not find that this type of language is useful at all for understanding. It seems to separate and exclude, distance the reader from the direct meaningful application of the article. It raises the question: "What is the point?" and "How does this point, if one can find it, impact on the quality of individual people living everyday lives?" Having a paradigm may provide a framework from which to begin - however, it seems important to offer connections and inclusive communication that bridges differences in time and place. In other words, to

build community, we need to be welcoming neighbours and global citizens. Thanks for stimulating more thought for me. (Linda, Oct. 25)

Coding of the online transcripts from sites C, D, and E. The RDLR was used by participants in three graduate level education courses. It was offered to students in these courses as a supplementary resource. No grades were given for participation. Participants had access to the RDLR for most of the Fall 2008 semester and into the Winter Break. Consenting participation rates were lower than anticipated for these courses, so participants were grouped together and discussion forums were open to everyone. Thus a student in site C could communicate with another in site D. Data were collected from the beginning of October to the beginning of January. In total there were 37 messages, including 13 threaded discussions (each discussion contained two to eleven threads). Eleven participants contributed to the discussions, including the researcher. The coding results of the discussions are presented in Figure 4.5.

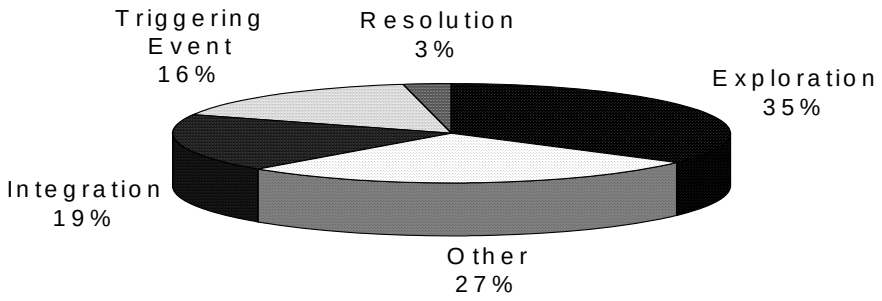

Figure 4.5. Percentage of postings that represented the phases of critical thinking from sites C, D, and E.

The postings coded as being at the exploration and integration phases showed evidence of information exchange, suggestions for consideration, and brainstorming. The exchanges in this site were different than the previous site discussions because they included more dialogue about their own projects, not just comments and analysis of the videos. Below are some examples.

> I do not have a conceptual or theoretical framework yet. I think that is why I am having difficulty moving forward with my research question. I think once I am more familiar with the literature in my area of study, I will know a bit more on what mine will look like and how it is going to develop. How did you start your conceptual framework? (Arthur, Nov. 30)

Another student posed a similar exploratory question,

> Your experience sharing is very helpful to me personally, who has also been struggling with forming my research questions. I am always too reluctant to get rid of some things I already have but don't need at this moment. The result ends up to be several important concepts that cannot fit in to an organized, enunciated, purposeful statement for my research question. Your experience does provide insights for me. (Andrea, Nov. 11)

However, as in many of the previous discussions resolution was rarely reached. The following is an example of one student who was able to apply what he learned to create a research question.

> ... I moved on to "shave" down or "whittle" my way to the core of what was driving my curiosity and fuelling my purpose for studying what I wanted to study. ...in doing so, identified the "core" concepts that I really wanted to study. Then it was just a matter of finding out a way to link the concepts and express the whole thing in an appropriately worded way so that my question was clearly expressed. Although my research question now is different from what it originally was, it still contains the core concepts I want to

look at. At first I was unwilling to stray too far from my original question, but I am certainly glad that I did. Now I have a clearer, more researchable and purposeful question. I am sure it will evolve as the research process continues. (Arthur, Nov. 1)

Triggering events for all three transcripts were provided by the facilitator which helped the participants to think critically about the topics and keep the discussions focused. In summary the few participants that did engage in discussion focused more on their own projects than the videos. There were however, numerous examples of questions participants raised as a result of viewing the videos which enabled them to further explore their ideas.

Coding of the online transcripts from site G. The RDLR was used by the participants in a graduate nursing course over the Fall 2008 semester. Data was collected in three one-week exchanges from the course. In total there were 116 messages, including 40 threaded discussions (each discussion contained two to six threads). Eleven people participated in the discussions, including myself as facilitator. The main focus of the discussions was on a research story about palliative care. The first transcript (week 1) focused on the goals, research questions, and methodology of the palliative care study. The second transcript (week 2) focused on the findings and the third transcript the next steps. The researcher's/facilitator's role was providing the triggering questions, monitoring the discussions, occasionally summarising the participants' ideas with support, sometimes offering advice, and asking questions. The coding results are presented in Figure 4.6.

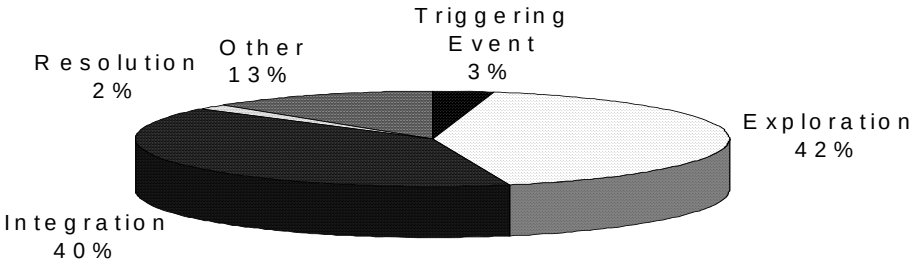

Figure 4.6. Percentage of postings that represented the phases of critical thinking from site G.

Triggering events for all three transcripts were provided by the facilitator which helped participants think critically about aspects of the research and helped keep the discussions focused. Most of the postings were coded to the exploration and integration phases. There were many examples of information exchange, suggestions for consideration, and brainstorming. For example a learner had mentioned the idea of making a mandatory end of life course early in the undergraduate nursing programs. The researcher then prompted others to respond. The following example illustrates a learner's search for ideas as to why nursing students did not feel confident and competent to care for end of life patients.

> The end of life course needs to be given in the first year. I wonder if the students are still taking their first clinical in the nursing homes; that may account for the early exposure to dying patients. Perhaps the pharmacology course that the students receive from this nursing program also needs to be reviewed if graduating students do not know the uses of morphine. (Nadine, Oct. 3)

Another student responded, "I remember feeling so overwhelmed in my pharmacology class in third year as we learned about so many different types of drugs and it was hard to keep track. A

focus on morphine and other such drugs used in the end of life care is absolutely necessary" (Cate, Oct. 3). The exchange began with evidence of a learner moving to the next phase of inquiry – integration. Also the discourse is still tentative in nature there are further connections of ideas and integration of information from other sources.

> I think that reviewing the curriculum (course outline) and adding a new class at an earlier stage during the course of their study would help the students and better prepare them to care for terminally ill patients and their families. It could also be included in existing classes. Having to have a work experience with terminally ill patients could also improve their understanding of both pharmacology and social ground and this, maybe more than once during their program. One cannot only rely on past personal experience to increase their capacity and knowledge to care for those special needs persons. Also, since about 1/4 of the students responded that they had cared for a terminally ill person in their first year but only received the education in their 3rd year, maybe the 3rd year class should be moved to 1st or 2nd year to help them to have the tools and be better prepared. ...I would say that the pharmacology of terminal ill patient will have to be reviewed and added on, especially morphine since it is the drug of choice. Maybe having a special section just for that particular group could be helpful. (Marlene, Oct. 2)

Many of the online discussions in this course did move past the integration phase of inquiry. However, there were a few examples that reached the resolution phase of inquiry. In order for discussion to reach resolution there needs to be a sense of commitment; either making an application in the workplace or defending the idea/problem at hand. For this group of nurses "resolution" seemed to be connecting the issue being discussed to years of nursing experience, even applying it to their case study projects.

> Dr. B after many years of nursing at the bedside and as an educator realised that there was a knowledge deficit with nursing students in the area of end of life care. I have been a RN for 27 years and during that time I have had to care for the dying adult and the family dealing with the loss of a life yet to be. As a student of two different levels of nursing education, my recollection of palliative care was minimal. We were taught the physical signs, but the emotional and psychological effects were missing. I have found that life experience, whether it is a family member or a workplace event with a terminally ill person will dictate our own responses and comfort level. ...Imagine you are a new grad on an oncology unit. During your clinical experience you never had a situation where you cared for someone who is dying. Now you are faced with not only the client, but the family all trying to come to terms with the impending death. What do you say to these people? Although you would offer them support, what resources could you offer? A compulsory comprehensive course for all nursing students would teach them not only the physical but the psychosocial aspects of care. A clinical placement would also benefit them in getting comfortable with seeing people at the end of their lives and the care they require. It would give a new nurse a foundation to build from. ....Being aware of a student's weaknesses will create a course that will empower a new nurse and a resource of knowledge to draw from in that situation. [Jocelyn] and I have chosen mastectomy as our surgical case... both of our mothers died from breast cancer. (Carrie, September 29)

Coding of the online transcripts from site H. Thirteen out of 13 students consented to participate in this study. All students in the course were required to use the RDLR and participate in the online discussions. Online discussions were conducted over three one week periods. There were 312 messages by the students, the researcher, and the course instructor, consisting of 88

threaded discussions. Although the instructor participated in the discussions she was not privy to which students in the class were participating in the study. It was also mentioned on numerous times to the students that the researcher was the facilitator of the discussions.

Each of the 88 threaded discussions contained two to 13 messages. Students were divided into three groups of four or five. As with the other intervention sites, the majority of discussions were coded into the exploration and integration phases (Refer to figure 4.7).

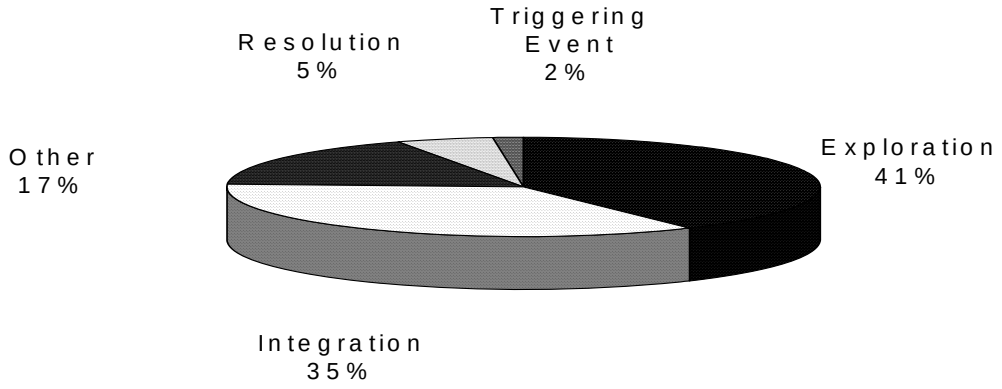

Figure 4.7. Percentage of postings that represented the phases of critical thinking from site H.

Although only about 5% of the discussions reached what the researcher considered to be at the phase of resolution, many of the discussions were very rich. All participants in this site were very motivated, spent a great deal of time viewing the videos and creating postings. Participants were very articulate and were able to gain insight into the development of the projects through discussion with each other and using the RDLR. The following example shows this development process.

> My limited grasp of the creation of conceptual framework was indeed highlighted by the C-FLO exercise and by reading and engaging in discussion with [Lilli] two weeks ago.

> This week, after revisiting the exercise, I am starting to grasp a clearer sense of the concept...of creating our own conceptual frameworks...Although I find the islands and pirate ships somewhat distracting it is a nice break for the serious intensity that I, and perhaps others are experiencing while trying to nail down our topics and questions. I have been teetering and dancing around so many different ways to approach my interest survivorship and surgical oncology that this direct format is refreshing and basic. Initially I thought it was perhaps too basic but considering the tasks that we have before us – something none of us have faced before – whether that be intervention design or a thesis I think direct and straight forward is rather comforting. One last thought ...this has helped me to talk my thoughts out loud so that others can understand me so that I can run my thoughts by others not necessarily situated in nursing. (Lynn, February 4)

The participants also contributed resources they found on their own to contribute to the discussions.

> I'd like to share a research article that I found entitled "a mixed methods study of refugee families engaged in multiple-family groups" (Weine et al. 2005, Family Relations Journal). ... the researchers explain the combing quantitative and qualitative methods may provide a broader understanding of the family factors and processes involved in refugee families engaging in multiple family groups...I think it gives me a good illustration of how I can use a mixed methods approach with my population of interest which similar to the study i.e. refugees. (Wendy, March 24)

Another participant contributed to the discussion on mixed methods and weighed its value with regard to her project.

> Thanks for sharing your research project and its approach using mixed methods. I think using mixed methods is very interesting, but I have to admit it is very intimidating. It appears to be a methodology best suited for those with a lot of research experience! In a nutshell my research aim is to assess change within a school environment towards promoting healthy weights, by using appreciative inquiry to engage and empower teachers and parent to take action. This change process will be assessed mainly through collection from key informant interviews, focus groups, and storytelling, etc. However, evaluating the change could also be assessed through quantitative methods such as measuring action plan outcomes and thorough participant surveys....anyways, lots to think about in the next couple weeks. (Roselyn, March 20)

Coding of the online transcripts from site I. Eighty-four out of 103 students consented to participate in this study. However, all students in the course were required to use the RDLR and participate in the online discussions. Online discussions were conducted over six one week periods. There were 512 threaded discussions comprising of 1617 messages by the students and myself. Each threaded discussion contained one to nine messages. 1406 messages were included in the analysis (87%). Students were divided into groups of eight or nine totalling 12 discussion sections.

The participants in site I were undergraduate nursing students of an introductory research methods course. Students in this course were not working on a research project per se: they were learning about quantitative and qualitative research methods. As can been seen in Figure 4.8 most of the discussions reached the exploration and integration phases of cognitive presence development. However, a number did reach resolution.

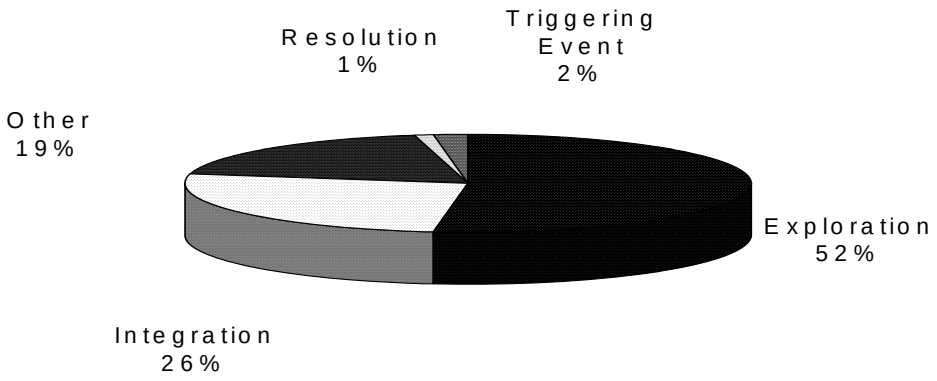

Figure 4.8. Percentage of postings that represented the phases of critical thinking from site I.

The researcher felt that if a student was to investigate a topic of conversation outside of the discussion and the scope of the RDLR that constituted an application of knowledge. The following quote is an example.

> I became really interested in this near miss phenomena so I decided to do a little research on my own to fine out more information about it. In the process, I came across some publications online but one that really caught my eye was a book called *The Long-Term Care Legal Desk Reference* by Barbara Acello. In a page 195-196 of the book, she talks about falls and near miss. I thought I share this with you since we will be going into nursing homes for our practicum in about three weeks. Since the Institute of Medicine report *To Err Is Human* was published in 1999, improving patient safety has become a major initiative for nurses working in all care settings. A near miss is an occurrence with potentially important safety-related effects which, in the end, was prevented from developing into actual consequences (Van der Schaaf, 1992). (Jill, February 1)

Throughout the discussions there were many exchanges (between student and facilitator; and between students that represented the transition from exploration to integration phases.

> Hi Natasha. You may see a clearer relationship between Lara's goals and research questions in her article which is found in the repository. Interesting that you say bringing bias is not acceptable in valid research. This is very true in from a post-positivist approach (i.e. the researcher must be objective. However, in qualitative research views can be more subjective and it is important to recognise biases. Thanks for sharing. (Facilitator, February 1)

Followed by a reply, "Yes, because based on what I have learned and worked on, we are not allowed to change the objective of our study and anything else after we started our study. Otherwise it will not be ethical. Especially because the research that was conducted could mislead other researchers who want to follow the same study" (Natasha, February 2).

Participation was most active during the first week of discussions (128 threaded discussions) and gradually decreased until the sixth week which had a total of 72 threaded discussions. As anticipated, most of the discussions focused on the nursing related studies and interdisciplinary healthcare studies. However, many participants were interested in program evaluation and recognised its value in nursing.

Summary of the content analysis. In summary, the online discussions were coded according to the Practical Inquiry Model. Sites A and F did not have enough discussions to warrant a content analysis, and therefore more intervention sites were added to the study. Although most of the text messages were considered exploration, many did reach the phase of integration. Reasons will be discussed in Chapter 6. Unfortunately very few messages reached the highest phase of cognitive presence development. Resolution messages only represented 0-5%. Therefore, the seventh hypothesis, "Participants will be able to achieve the highest phases of cognitive presence development – integration and resolution" was not accepted. A summary of

the distribution of the online transcripts is presented in Table. 4.28. The column labelled "other" refers to messages that did not relate to cognitive presence.

Table 4.28

Distribution of Messages According to the Practical Inquiry Model Categories

Site	# of participant messages	Distribution over categories (%)				
		Trigger	Exploration	Integration	Resolution	Other
B	72	10	34	25	0	31
C, D, E	37	16	35	19	3	27
G	116	3	42	40	2	13
H	312	2	41	35	5	17
I	1617	2	52	26	1	19
Total	2154					
Average		6.6	40.8	29.0	2.2	21.4

Summary of the Quantitative Results

Research Question One. *How did participants perceive their learning experiences?*

a. How did participants experience the RDLR?

b. Were there differences among the intervention sites?

The mean scores of the CoI survey instrument, which was used in this study as a post-test evaluation of the RDLR, and the percentage of positive responses (those participants that indicated they either "agree" or "strongly agree" with the statements of the CoI survey instrument) were used to determine if participants had a positive learning experience using the RDLR. Overall, participants rated teaching presence in a positive light. Participant responses ranged from 50.0-85.2%, compared to only 3.8-18.5% negative responses (those participants that indicated they either "disagree" or "strongly disagree" with the statements of the CoI survey instrument).

Similarly, participants responded favourably to social presence items. Positive responses ranged from 39.8-69.1%. Negative responses ranged from 3.7-25.9%. Items with high negative responses included: *online or web-based communication is an excellent medium for social interaction* and *online discussion help me to develop a sense of collaboration*.

Positive responses for cognitive presence ranged from 44.4-63.9%. Negative responses ranged from 9.3-20.4%. Items with high negative responses included: *online discussions were valuable in helping me appreciate different perspectives*; *I felt motivated to explore content related questions;* and *I utilised a variety of information sources to explore problems posed in this course.*

Overall, based on four one-way between groups analyses of variance (ANOVA) tests there was a statistically significant difference in mean scores of the cognitive presence scale between two intervention sites (site B and site I). There was no significant statistical difference between groups with regard to the mean scores of social presence and teaching presence.

Independent samples t-tests were also calculated to determine if there was a significant difference among intervention sites in which the use of the RDLR was optional and those that

required participants to use it as part of the program. There was no statistically significant difference in the mean scores of teaching presence, cognitive presence, or social presence between intervention sites in which the use of the RDLR was required and those that did not. However there was a significant difference on mean LPA scores between the two groups. Furthermore there was a significant difference between item 14 on the demographic questionnaire and items 2, 23, and 32 on the CoI survey instrument.

In summary, the learning experience using the RDLR was generally positive. However there were participants that responded neutrally or negatively to numerous CoI survey questions. In addition, programs did differ significantly in their perception of the online learning experience. The corresponding hypothesis to this question was accepted.

Research Questions two and three. *What is the relationship between social and cognitive presence, as instantiated by the RDLR and online discussions?*

What is the relationship between teaching and cognitive presence, as instantiated by the RDLR and online discussions?

A standard regression analysis was conducted using the mean scores of the CoI constructs to determine the relationship between teaching presence and social presence with cognitive presence development, through the use of the RDLR.

In summary, it appeared there was a positive relationship between both social presence and teaching presence with the cognitive presence in the Community of Inquiry model. Therefore, the second and third hypotheses corresponding to the second and third research questions were accepted.

Research questions four, five, and six. *Do social presence and teaching presence improve the prediction of cognitive presence after controlling for self-directed learning readiness?*

Do social presence and teaching presence improve the prediction of cognitive presence after controlling for prior online learning experience?

Do social presence and teaching presence improve the prediction of cognitive presence after controlling for prior collaborative learning experience?

Hierarchical regression analyses were conducted to determine if teaching presence and social presence would continue to contribute significantly to predicting cognitive presence after controlling for three covariates: self-directed learning readiness, prior online learning experience, and prior collaborative learning experience. The analyses indicated that none of the covariates explained the relationship between teaching presence and social presence with cognitive presence, nor did they contribute significantly to predicting cognitive presence. Therefore, the three hypotheses associated with these research questions were not accepted.

Research Question Seven. What phases of cognitive presence did the participants demonstrate?

Quantitative content analysis was used to code the online transcripts of the course discussions into phases of cognitive presence development. Many discussions reached phases of exploration and integration, however very few were considered to be at the phase of resolution. Therefore, the seventh hypothesis was not accepted. Although many messages showed evidence of attaining integration, the researcher did not feel enough of the discussions reached the application stage of resolution to accept the hypothesis.

Chapter 5

Qualitative Analysis

Methods and Procedure

Connecting qualitative and quantitative data in mixed methods designs. Typically, in the second phase of a sequential explanatory research design, the results from the statistical tests in the first phase of the study are explained (Creswell & Plano Clark, 2010). Data is usually connected between phases of the study while selecting participants for the qualitative follow-up analysis based on the quantitative results (Creswell & Plano-Clark). In this research study, the quantitative and qualitative methods were first connected at this intermediate phase while selecting participants for interviews and developing interview questions for qualitative data collection. The findings from the first and second phases were also integrated during the interpretation/discussion stage (refer to the visual model of research design; Figure 3.1 of Appendix B).

Connecting the qualitative and quantitative methods in this study was not a straightforward process. As sample size numbers were not adequate for all the statistical procedures during the anticipated data collection period, additional intervention sites were added after the initial interview questions were developed and qualitative data collection had started. In order that participants would remember the online discussions, videos, and resources, the interviews needed to be conducted within a two week window upon completion of using the RDLR. In hindsight this did prove beneficial to the development of the study for two reasons. First, it allowed for adequate participants to carry-out all the statistical procedures; and second it allowed for the interview questions to be modified, enabling the researcher to better explain the quantitative results.

Purposeful sampling of the participants for interviews. Purposeful sampling is the technique researchers use to intentionally select "information rich" individuals in order to attain more information and a better understanding about the central phenomenon (Creswell, 2008). In this study the phenomenon of interest was explaining the significant results of the first phase. Specifically, the researcher used a maximum variation sampling as the strategy to select participants (Creswell, 2008). The reason for using this strategy was to select participants that had varying degrees of satisfaction from using the RDLR and participating in online discussions. This selection process was determined by examining the scores of the CoI survey instrument. Essentially, the researcher wanted to interview participants that had positive experiences (higher rating scores) on the CoI survey instrument and those that had negative experiences (lower rating scores). Moreover, it was important to sample participants from each intervention site, since the context of using the RDLR varied. In total 25 interviews were conducted over the course of this study.

There were two reasons for conducting so many interviews. First, it was determined after a number of interviews were conducted that the interview questions were not enabling the researcher to accurately explain the statistical results of the first phase of the study. In other words, the questions did not allow the participants to reflect upon their cognitive presence. The questions were revised after the first semester (January, 2009). About 10 interviews had been conducted by this time. After the questions were revised, additional interviews were conducted during the second semester (January – April 2009). Participants who were interviewed with the prior set of interviews were not interviewed a second time with the revised questions. Second, participants were solicited by the researcher via email to determine if they were interested in participating in a face-face or telephone interview. In several instances participants were late

replying to the request to participate in a follow-up interview, forcing the researcher to select other participants. In most cases participants did eventually reply favourably to participating in an interview and the researcher felt it was unethical not to follow-through with the interview. As the questions were revised mid-way through the study it is difficult to determine exactly when saturation occurred.

Interview protocol development. As this study was a mixed methods explanatory sequential design the interview protocol was developed to explore the results of the first, quantitative phase in more detail. Therefore the content of the interview questions was based on the results of the statistical tests in the first phase of the study with a particular emphasis on the relationship between teaching and social presence with cognitive presence. The protocol consisted of twelve open –ended questions which are presented in Appendix D. The first two interview questions were very broad, to get the participants to talk about their overall experience using the RDLR and participating in the discussions. The purpose of these questions was to get more information from the participants about their experience using the RDLR in order to better answer the first research question.

The third and fourth interview questions were related to teaching presence and its relation to cognitive presence. There were probing questions added to the interview questions, which included descriptors of the Practical Inquiry Model, to ensure all aspects of cognitive presence were discussed. Questions five and six were related to social presence and its relation to cognitive presence. Again there were probing questions added to the interview questions, which included descriptors of the Practical Inquiry Model. The purpose of these four questions was to gain further insight into why teaching presence and social presence significantly contribute to the prediction of cognitive presence.

Questions seven through to nine focused on the covariates, prior online learning experience, prior collaborative learning experience, and self-directed learning readiness. The aim of these questions was two-fold: to get details about why the covariates did not significantly affect the prediction of cognitive presence, and to gain insight into why positive collaborative learning experiences seem to have correlated with higher order critical thinking levels.

The final four questions related to the RDLR in particular and were asked only if time allowed. The researcher wanted to know whether the RDLR helped participants meet their learning objectives, what they like best about it, and how it could be improved. The purpose for asking these questions was to improve the resource for future use. These questions were not related to quantitative results per se but gave the participants an opportunity to talk about anything that may not have been mentioned previously and could provide insight into cognitive presence.

Qualitative Data Collection and Analysis

Qualitative transcript analysis. Qualitative research is an eclectic process (Creswell, 2008). There is no single approach to analyse qualitative data however, generally it involves developing a general sense of the data and then coding the text (Creswell). During the analysis, the researcher was coding the text for themes to get a deeper understanding of the quantitative results.

Each interview was audio-taped and then transcribed verbatim. Then the transcripts were checked for accuracy by the researcher listening to the audio recording (mp3 file) and comparing it to the transcribed text. Open coding of the text was first performed by hand. This procedure required the researcher to read through all of the text to get a general sense of the data and key words, ideas, and notes were written on the margins. There were a total of 114 single-spaced

pages of verbatim in the transcripts. Then sections of text were highlighted on several of the interviews and codes were assigned. After a preliminary list of codes was developed the transcripts were imported into a qualitative research analysis software program (QSR NVivo8) and coded a second time. The coding process consisted of grouping the common codes together to form themes and subthemes (NVivo8 refers to these terms as parent and child nodes). The coding was reviewed several more times to ensure that no new codes emerged from the data. When the researcher was satisfied that all the text was coded correctly, seven main themes emerged: making connections; multiple perspectives; resource design; being a self-directed learner; learning strategies; learning preferences; and barriers to cognitive presence. A visual model of the coding process used for this phase of the study and borrowed from Creswell (2008) and is presented in Figure 5.1 of Appendix I.

Verification of the Findings. Qualitative studies undergo different criteria for judging the credibility or accuracy of the findings than quantitative studies. Instead of using traditional verification procedures for reliability and validity so the study can be replicated in other contexts, qualitative researchers use alternative means. Many of the strategies used for the verification of the findings in this study come from Maxwell (2005).

Triangulation. As a verification process, triangulation refers to converging multiple data sources. It is a common technique used by qualitative researchers to verify or confirm findings. Researchers use triangulation among data sources, data collection methods, time periods, and theoretical schemes (MacMillan & Schumacher, 2001). A researcher will then compare different sources of data to see whether the same patterns or themes keep reoccurring. In this study the researcher triangulated the qualitative findings with the quantitative results.

Intensive, long term involvement. The researcher was the discussion facilitator for each of the intervention sites. In many cases, the researcher met the participants during their first class and had the opportunity to get to know them. Thus, participants were comfortable during the interviews. As the researcher had time to develop a trusting relationship with them, their interview responses were candid and authentic.

Rich data. Most interviews lasted about 30 minutes allowing participants time to reflect and give detailed responses, resulting in rich data upon which the researcher could use to develop emerging themes.

Member checking. All participants were emailed a summary of the qualitative findings and were asked to review them and indicate if they did not feel the themes reflected their voices in the interviews. Numerous participants responded indicating they felt the developed themes captured their views the RDLR and cognitive presence.

Searching for discrepant evidence. Miles and Huberman (1994) have indicated that after an initial set of codes or themes has been established the research should search the text again for any confirming or discrepant evidence. For this study the text was read and coded several times.

Inter-coder reliability. As with the quantitative content analysis, the researcher asked a colleague to code selected passages of text to determine inter-coder reliability. The two researchers coded messages from a complete discussion forum topic. QSR NVivo 8 qualitative analysis software was used to run a coding comparison. Consensus among the coders was approximately 88.67% and considered trustworthy. Miles and Huberman (1994) consider adequate and trustworthy inter-coder agreement to be in the 80%-90% range.

Auditing (Creswell & Miller, 2000). The researcher's supervisor is experienced in evaluating online learning communities (MacDonald et al., 2008; MacDonald & Thompson,

2005; MacDonald et al., 2002). She has provided advice and guidance during the development of the interview protocol and analysis of the interview transcripts.

Qualitative Findings

All the themes presented have enabled the researcher to gain further insight into why various factors, as identified in the first phase of the study, seemed to contribute, or not contribute to the prediction of cognitive presence.

Making connections. All participants interviewed made some connections with components the RDLR, classmates, and the researcher in relation to promoting cognitive presence. This theme had the most references by far of any of the themes and it helped to explain many significant findings from the first phase of the study (refer to Table 5.1).

Table 5.1

*Number of Text Units by Theme**

Theme	Sources	Text Unit Count
Barriers	22 (88%)	61
Learning Preferences	23 (92%)	56
Learning Strategies	12 (48%)	24
Making Connections	24 (96%)	185
Multiple Perspectives	17 (68%)	26
Resource Design	18 (72%)	35
Being a Self-Directed Learner	14 (58%)	24

*a text unit is a sentence or paragraph coded by the researcher to a theme.

The researcher deconstructed this theme into four subthemes: connections with classmates; connections with the facilitator/researcher; connections to the researchers in the

videos; and connections with the repository. Participants found the resource in general to be helpful with regard to their learning about educational research and to a certain extent further their research projects/papers. “It helped me a lot... how to connect the ideas, find the resources I wanted. Without it I would not be able to do well with the other two courses I have...” (Rob, site B). Another student had a similar response.

> The first thing I did with them was I went back to the professor who was my facilitator when I did my thesis [to ask if she] knew about the articles and questions. I told her about a few of the articles through you [from the RDLR repository] and that they sounded interesting and they might help with her teaching. She actually thought they were great. ...I will base some of my procedure and theory from what I read from those because they were great articles. They were pertinent to the whole idea of ethnography and how it works and when you write a paper and talk a little bit about your research method, and if I was to do another ethnography, which I hope to do in the future, those are two perfect resources which are now sitting there ready to go. (Ralph, site C)

Connections with classmates. There were 45 references to the connections participants made with each other. In many of the interviews participants commented on how they were able to build on each other’s ideas or were enlightened on a particular topic through another’s posting. One participant commented:

> The discussions were great too because it really puts a human perspective and it makes it more personal which is really something that I feel I can connect with. I am not very good at the abstract so I find in discussion it makes it more real for me. I am the kind of person that needs real life examples just speaking in academic terms with abstract

> vocabulary is sometimes hard for me to grasp but with the discussion I could really ground what I knew. (Cathy, site B)

This idea of the discussions making the learning personal and that others had the same questions were echoed by other participants too, "...experiencing the same thing that other people are. I think Ned was really good at reframing what was going on and making that a little more accessible" (Jacob, site B).

Participants also enjoyed sharing ideas with each other. This correlates with the exploration phase of cognitive presence and potentially leads to the integration phase. "Yes and she would bounce ideas off me and she was sharing her question and I would share mine" (Libby, site H). Participants appreciated hearing the perspectives of their classmates, me, and the researchers on the videos. Some of their comments were grouped under the multiple perspectives theme which will be discussed later, others under this theme.

Connections with the facilitator/researcher. Many of the participants interviewed expressed their appreciation for the support and guidance the researcher provided through the discussions. In particular the triggering questions that were proposed; the role the researcher played in keeping the discussions moving forward and keeping people on task; and the feedback provided. "I like that you were there at the beginning and not responding to everything that everybody asks. But you are there to give a sense of direction and to stimulate discussion and reflection, that was good" (Wendy, site H). Triggering questions are a key component to cognitive presence. It was important that I received this feedback from the participants so that I could get an indication of whether the questions that I provided were thought provoking enough.

> It gave me an idea of how to put together my research question. I find that often when I start a research question it is really too broad, but I guess by looking at the different kinds

> of discussion questions I can do something like that or change it, giving me examples of what I could do. (Cathy, site B)

The feedback that the researcher provided was very important for participants to feel connected to the discussions and reassurance that they interpreting the information from the video research stories correctly. “I waited for your comments to come back so I knew that I was on the right track” (Annette, site G). Another participant expressed a similar sentiment:

> I found your insight was very, very helpful...I liked your responses to me. On more than one occasion it gave me some specific direction and some very credible things to think about with what I was doing. I found your role very important. ...I was very interested in your experience and I also liked your reflections on what my thoughts were and what I was considering doing. (Kelly, site H)

However, even though all participants expressed how important it was for the researcher to be present, not everyone felt that it was done well.

> I found that it was strong in the beginning and there was a certain period or point in time near the end of the course where it kind of lagged. I felt your absence. It could have been for any reason, too much work or personal issues but I did notice that there was a point where I didn't feel that your participation in the online discussions was as involved as it was earlier on. (Linda, site B)

Connection with the researchers in the videos. Many of the participants reported they felt a connection with the researchers through the videos. In particular, the videos were able to put a face to the research. One participant commented:

> You do feel their passion. It’s interesting...they stumble over words, they stutter. When you read a piece of literature its scholarly, its beautifully written, grammatically

> perfect...It's not they way they talk in real life – they are regular people. So that was really interesting for me. That was something that really stood out for me. That was very important. (Kelly, site H)

Another participant put it this way. "It was her own words so you knew who she was. You sort of developed a sense of whom she was and what she was trying to do..." (Karla, site G). Many participants commented on how much the researchers enjoyed the research that they do – it was very evident that they conveyed their passion towards research. This was an important point because much of the literature on cognitive presence indicates that the topic of discussion must be engaging for all learners.

However, it should be noted that not everyone found the videos to be engaging and this will be presented later under the learning preferences theme. "For me personally I don't like videos because I find them too slow for me, I am a very fast reader so I would much rather read something rather than sitting and watching" (Jocelyn, site E).

Another aspect of the videos that helped the participants connect to the researchers was that the stories were edited into short five minute segments.

> I don't think I would have sat and watched the whole video in one sitting. I think I would have not gotten as much out of it and I wouldn't have given as much if it had been in a bigger chunk of time. It was enjoyable just to have these segments where I knew I could spend a certain amount of time and get them done. (Annette, site G)

Many of the participants noted that the timing between the segments was critical for reflection purposes and was paramount for fostering cognitive presence. "I like the way it progressed, like it sort of went to different sections and you processed that one particular area, take a pause to think about it and then move on to see how it [is] really developed...[otherwise] you wouldn't

have had the same response" (Karla, site G). Another participant expressed, "I think I would have lost interest in its entirety because I needed to take a moment and let it all sink in, think about it and take notes" (Ralph, site C). There was also a feeling among participants that short segments allowed them to absorb the new information without feeling overwhelmed, "I liked that it was in segments as opposed to a whole video. It was easy to handle in bits. I didn't feel it was an information overload (Wendy, site H).

***Connection with the online repository*.** Finally, it was evident from reviewing the transcripts that some participants appreciated the scholarly articles that the researchers had written about their projects, the methodology articles and links. A number of participants commented on how the resources in the repository helped foster cognitive presence, "I was pleasantly surprised at the resources, how they did help me think through" (Jane, site B). Another student commented, "I thought it was good, I really liked the interface with the books. I thought that was smart... I found the lists very helpful. I printed those all off" (Jocelyn, site E). Also, "The repository because there were lots of different perspectives on how to do research and types of research and it provides a really good exemplar at least for me" (Polly, site D).

One resource in the repository was particular helpful in creating critical discourse. This was C-FLO (MacDonald et al., 2005). There was a direct connection to this learning object in the resource, http://innovation.dc-uoit.ca/cloe/lo/cf/CF_LO_content.html. One participant commented:

> The conceptual framework issue I am still trying to figure out how that fits with my work, if it does even fit with my work. I do remember finding it very helpful and I printed everything out and listened to [Tracy] a couple of times. I sat in the library and just went

> through every single step. It took me a really long time and I did actually spend sometime with the conceptual framework part of it but I did find it helpful. (Lilly, site H)

Participants really connected with one of the researchers in the video section of the resource and identified with her struggles to develop a conceptual framework. For example:

> So when I listened to [Tracy], I found it quite helpful because she broke it down into parts and she talked about her feelings about it, including the fact that she felt overwhelmed and that at times she was confused. I think that knowing this made the whole exercise more human and it made me relax a little bit from the internal pressure and demand that I produce is a perfect thing, that I know ahead of time how to do something. She talked about the process of learning and revising, coming back and trying it out. Also there were pictures of her different drafts that she did. You could see a progression from the very initial scratching on the paper to the final product. That was also helpful to have that visual along with the audio that she did. (Linda, site B)

Multiple perspectives. A popular theme that emerged from the interview data was an interest that participants had with the opinions of others. Many learners were interested in hearing the views of other classmates. One person noted,

> I liked the fact that there were different points of view and people from different areas explaining what it is they are doing because it really gave me a broad view of what research design is really about... I guess some people write in a very direct fashion and some people are more indirect so when there is such a contrast between my ideas and theirs I really pay attention. I like reading different opinions than mine. I don't know if it is the anthropologist in me, but I just want to know more. Also it gave me an idea where everyone was coming from because it seems like everyone in the course came from such

different backgrounds. (Cathy, site B)

Another learner at the same intervention site said,

> ...I come from the Middle East with a different background and education system and when I was posting something … they were always interested in hearing from me. When they posted back, I was always taking into consideration their point of view and that helped me a lot. It developed my ideas and my points. (Rob, site B)

Participants also commented that they appreciated hearing the perspectives of the researchers featured in the videos and in the repository.

> The fact that I could sit and read it and print stuff off and go over it more than once was more than good for me. It was really helpful, and just the depth of the topics or what was discussed in the papers and the videos and stuff was really helpful, all the different perspectives. (Jane, site B)

Another student commented, “I liked listening to the different experts talk about their research. Particularly the one I liked was the psychiatrist ...It was interesting how he approached research and how research was part of his career” (Lilli, site H).

Furthermore, some learners were interested in hearing the researcher’s perspective on various topics of discussion. “I found your insight was very, very helpful as I would come up with my questions” (Kathy, site B).

Resource design. Resource design, according to the participants interviewed, was an important factor in predicting cognitive presence. It was evident from the results of the CoI survey that teaching presence, of which design and organisation are part, significantly contributes to the prediction of cognitive presence. This theme was subdivided into three subthemes; *convenient, easy to navigate,* and *logical*.

Convenient. Participants really appreciated that the RDLR was completely online. It allowed the participants to access the videos and repository at their convenience. “I could do it from home, on my timetable...I liked the fact that I could start stop whenever I felt the need, redo it when I wanted to...” (Kate, site G). Many participants expressed they were either studying part-time and working part-time or had families at home and liked the convenience of online learning. Full-time students also indicated they had very busy schedules and appreciated that the resource was easy to access. “I liked that it was not structured that you had to do this or use everything every week. So you could choose to participate more in the discussion depending on the topics there so it gives variety” (Wendy, site H).

Easy to navigate. Most participants indicated they found the RDLR easy to navigate and use. “It was informative and it was fairly easy to navigate through; it wasn't overly complicated” (Marie, site H). However, there were a few who had difficulty, “The first time I tried to find those videos I couldn't find it on Blackboard. It took me half an hour to find the button to find where the videos are... sometimes I would move the mouse and it would go back and highlight a name...kind of annoying” (Edward, site I).

Logical. Many participants commented on how logical the RDLR was and that made it easier to learn about research. “...how you organized it was that each individual and what their videos were, you had an index that said introduction, methodology etc. so depending on what I needed to focus on I could actually pick just that” (Linda, site B). Another student remarked, “It was just having everything around me that I needed and could go to and from my ideas and connect with that information which connected with the information that I was pulling for research to use for my paper. Everything just melted together and was very efficient. (Jake, site B). However, some students did find it difficult to use and the feedback they provided will be

used to improve the resource. For example one participant commented that it would have been helpful for the researcher to label the methodology as well the project title beside each video, “I think the electronic patient record is more of an example of how she uses her methodology. ... The fact that it has that title for someone who doesn't know or isn't interested... they could miss out...” (Margaret, site A).

Being a self-directed learner. Above average scores on the LPA indicated that many of the participants were ready for self-directed learning. Many participants interviewed considered themselves self-directed learners but there was not much indication that this was a factor in cognitive presence. One participant commented, “It is up to us to listen to the videos and answer the questions and look for other information...if you are not a self-directed learner you are not going to go ahead and seek the information” (Lindy, site I). Another student said, “I enjoyed listening to it and seeing what happened...I have just poked around a little bit to see what was there, I find it interesting” (Sally, site I). Many of the participants’ comments related to their personal motivation. However, they were not able to extend this to the class discussions. This student described her motivation to learn:

> I found that something was not actually understood and was concerned about the nursing part not just the medical part. I went and I searched online to find out what it was and then I wrote back and said it is not just the nurse practitioner it is more than that... I think this resource was different. If it was something else I probably wouldn't have done it. It was just interesting to me. Especially because it was about research so I was really encouraged to learn more. It might not be the same as if it was another course that I didn't like or just wanted to get it over with but I liked it so I just wanted to do more. (Nadine, site I)

Other students were very frank and indicated that the discussions were a mandatory part of the course and that was the only reason they participated, “I have to do it...I never had incentive to go into research. It is not as interesting to me as to other people” (Edward, site I).”

Learning strategies. In the interviews participants revealed strategies they used to foster critical discourse. Many of the participants described in detail how they transitioned from their personal worlds (reflection) to their shared worlds (online discourse). One participant stated:

> I learned them pretty fast and when I was doing the discussion I was curious because I didn't know some of the words of things that the researcher used so I had to go through the online search and find out what they meant. ... I went to the [discussion] groups and they were exactly the same idea I was thinking about but they expressed it in different ways and it was good to hear someone else also thinking the same thing. Also if I was not agreeing with them I would reply and ask why they thought this. ... (Nadine, site I)

Another student described his approach to the discussions. It was clear that this student was able to build upon the ideas of others which is a critical step in the cognitive presence development process.

> I didn't make many comments to other people but here is what I did. I read theirs before I posted mine. ... I wanted to find out what other people were saying and I chose not to respond, I didn't feel the need to. I found it was valuable to read what they were writing. ...I did base what I put down in my discussion after reading what other people wrote; especially I think one other person wrote something about the same video I wrote about. I took theirs and kind of worked off of them in my own discrete way. (Ralph, site C)

Learning preferences. Participants alluded to their learning styles and preferences throughout the interviews. It became apparent that learning preferences were important to participants and contributed to how they felt about using the RDLR and participating in the discussions. However, it was not apparent that learning preferences contributed to cognitive presence. I have subdivided learning preferences into two subthemes: *collaborative learning* and *online learning.*

Collaborative learning. The preference for collaborative learning surfaced a number of times during the interviews. In particular, how discussions helped to develop a sense of collaboration. One participant noted, "I found that really interesting and useful...particularity in research when you are doing research that involves other people. Now the big push is to do collaborative research and with this push the idea that we are all thinking on the same page" (Margaret, site A). Another participant expressed that collaboration was an important aspect of her job which had an affect on how she explored ideas:

> I think it did although I think for me it is more the fact that collaboratively we are together... you are open to the ideas of others so even when you are giving your own opinion you are aware that someone might have a different opinion... the fact that you work with them and that there is really no right and wrong answers. (Wendy, site H)

Online learning. Many participants indicated that either they preferred online learning to traditional classroom experiences or they expressed a preference to traditional face-to-face learning. There did not appear to be any middle ground around this issue. One participant commented:

> As I said I like to have that time when I know I can just sit down and do it, the classroom setting is harder. It means travel time, it means finding a location. I was in the nursing

> program before and finding a room was always difficult, or finding a room with a temperature that was suitable was an issue, or the technology working. When it comes to the online learning I know its there so for the most part it is reliable for me. I never have a problem getting into it or using it. That would be my benefit, to do it that way. (Alice, site G)

However, another student expressed that she was not a fan of online approaches.

> The other reality for me is that I am not really techno savvy. I think there is a generational thing around that, certainly when I look at my younger colleagues here they are much more apt. They are used to chat-rooms and discussion forums on the computer, whereas I've never used that. I am not apt to. For me still my best way of learning is either the very specific directed question and for me I just go down the hall to get that. (Carrie, site A)

A number of students considered their dislike of online discussions to be one of the reasons they did not participate very much, if at all, in the discussion forums, thus becoming a barrier to cognitive presence. This concept of barriers to cognitive presence is presented below.

Barriers to cognitive presence. The barriers to cognitive presence have been subdivided into three overlapping areas*: inaccessibility to high-speed Internet*; *lack of participation in the online discussions*; and *lack of time to engage in the learning activities*.

Inaccessibility to high-speed Internet. A factor that seemed to impede using the RDLR and participating in the online discussions, and therefore inhibiting cognitive presence was accessibility to high-speed Internet. Many of the videos in the RDLR and resources in the repository are very large files, requiring high-speed Internet to view properly. For those that did not have access to high-speed Internet using the RDLR and participating in the online

discussions was a frustrating experience. One participant commented:

> The biggest challenge is having this resource available. I live outside of North Bay and I don't have access to high-speed Internet. I was challenged to get to a place where I could access the resource and I sometimes felt a little bit behind. ... I had to go elsewhere...even something as simple as finding out if I had completed the surveys. It took me four tries to send one of them from home. I'm not terribly technology literate but if I'm working on the Internet I can't be working on something else – the computer shuts down. I just have tech. issues and continue to but I live in paradise (Kathy, site H).

Another participant commented, "It wasn't such a simple thing to sit at home and do it. I had to go elsewhere to use it. I had to have encouragement to do it" (Nadine, site I).

Lack of participation in the online discussions. A common remark by participants was the lack of online discussion. "It was too bad that not more people participated from our class because you couldn't have much of a dialogue... I like having debate and discussion about things so it would have been better if there were more points of view" (Jocelyn, site E). Other students were reluctant to engage in the online discussions for different reasons. One student noted that she did not feel confident about making online postings. It should also be noted that there was not enough discussion in sites A and F to warrant a content analysis. Lack of participation in the online discussions was a very important finding that requires discussion in Chapter 6 and may have implications for the development of cognitive presence and the overall learning experiences for some participants.

> The thing about online is that when you write something opposed to saying something, everyone can read it and it is there to dissect. People don't have their words right in front of their face when saying something and I find especially in academic settings people are

> more inclined to really dissect what you are saying. Sometimes I am not the most articulate person and I was always afraid that what I was saying would be conveyed in a different way. (Cathy, site B)

Other participants felt like they did not want to repeat what another person had written, so they were reluctant to contribute. Others felt like they did not want to dominate a conversation.

> I don't think that we should have been divided into groups. I know that we weren't restricted to staying within our group for our discussions but I happened to be in a group that didn't talk too much...I felt like I was talking too much and that was what I think the message that was sent out. ... (Kathy, site H)

Lack of time to engage in the learning activities. Another factor that seemed to inhibit cognitive presence was the lack of time. Sometimes this was expressed as the lack of time: to view the videos, participate in the online discussions, or to reflect.

> I think maybe most of it is extenuating circumstances that have nothing to do with the resource, but maybe it is applicable for other people. I go to the medical education conferences and workshops and I love doing that kind of stuff. I get all keen and hyped up about it and then I come back and reality sinks in and I get caught up in clinical and administrative stuff; for me anyway because the majority of my academic time is spent on the hands on teaching administrative stuff. The research always gets pushed back so although I get keen at the workshops, then what I think I am going to get accomplished when I get home doesn't happen because of that (Carrie, site A).

A number of participants mentioned that they liked the RDLR but because of course work or job constraints they could not devote the time needed to achieve the higher levels of cognitive presence, "I only regret that I couldn't use it more because of time constraints" (Linda, site B).

Another participant commented, “Most of the people that were in our one day seminar... slotted that one day to think and talk about these things. They are professionals who have a medical practice ...and it takes a lot of time to look at these things and make a comment” (Margaret, site A).

Summary of the Qualitative Findings

Seven themes emerged from the analysis of interview transcripts: *making connections; multiple perspectives; resource design; being a self-directed learner; learning strategies; learning preferences;* and *barriers to cognitive presence.* All the themes presented have enabled further insight into why various factors, as identified in the first phase of the study, seemed to contribute to the prediction of cognitive presence.

Making connections. Many participants interviewed made connections -- with the learning resource, their classmates, and the facilitator -- that promoted cognitive presence. Making connections had many more references than any of the other themes. The researcher further divided making connections into four subthemes: connections with classmates, the facilitator, the researchers, and the repository.

Participants found the resource to be helpful with regard to their learning about educational research and to a certain extent with their research projects/papers. In many of the interviews participants commented on how they were able to build on one another’s ideas or were enlightened on a particular topic through one another’s postings. Many of the participants interviewed expressed their appreciation for the support and guidance the facilitator provided through the discussions, in particular the triggering questions the facilitator proposed; the role the facilitators played in keeping the discussions moving forward and keeping people on task; and feedback the facilitator provided. In many cases participants felt a connection with the

researchers through the videos. In particular, the videos were able to put a face to the research. Finally, it was evident from reviewing the transcripts that some participants appreciated the scholarly articles that the researchers had written about their projects, the methodology articles, and links.

Multiple perspectives. Another theme that emerged from the interview data was an interest that participants had with the views of others. Many participants were interested in hearing the perspectives of other classmates. Participants also commented that they appreciated hearing the perspectives of the researchers featured in the videos and in the repository.

Resource design. According to the participants interviewed, resource design was an important factor in predicting cognitive presence. Participants generally found the learning resource convenient, easy to navigate, and logical. Many could use the learning resource at home at their own convenience, found it easy to use, and well organised. However, some did not find it accessible and that proved to be a barrier to cognitive presence.

Being a self-directed learner. Many of the participants interviewed considered themselves self-directed learners. Some participants expressed their use of the RDLR and participation in the online discussions was due to a desire to learn more about research design. However, others indicated they participated only because it was required.

Learning strategies. A theme that emerged from the interviews was the strategies that individuals used to foster cognitive presence. Many of the participants described in detail how they transitioned from their personal worlds (reflection) to their shared worlds (online discourse).

Learning preferences. Participants alluded to their learning styles and preferences throughout their interviews. It became apparent that learning preferences were important to participants and contributed to how they felt about using the learning resource and participating

in the discussions. Many participants indicated either that they preferred online learning to traditional classroom experiences or they expressed a preference for traditional face-to-face learning. As well, in some cases participants expressed how discussions helped to develop a sense of collaboration.

Barriers to cognitive presence. The barriers to cognitive presence were subdivided into three overlapping areas*:* inaccessibility to high-speed Internet; lack of participation in the online discussions; and lack of time. Many of the videos in the learning resource in the repository were very large files, requiring high-speed Internet. For those that did not have access to high-speed Internet, using the learning resource and participating in the online discussions was a frustrating experience. A common remark by participants was the lack of online discussion. Some participants reported they did not want to repeat what another person had written, so they did not contribute. Another factor that seemed to inhibit cognitive presence was the lack of time. Sometimes this was expressed as the lack of time to view the videos, to participate in the online discussions, or to reflect.

Chapter 6

Discussion

The purpose of this mixed methods sequential explanatory study was to explore cognitive presence and the learning experiences of participants using an online learning resource in higher education research methods courses and workshops. The CoI framework (Garrison et al., 2000) was used to guide this exploration. In the first quantitative phase of the study, data were collected from 189 consenting participants via three online surveys and course discussion transcripts. Various relational and comparative statistical techniques were used to analyse the survey data, including multiple regression, t-tests, ANOVAs, and CHAID analysis. Quantitative content analysis was used to analyse the online discussion transcripts. Based on the results of the first phase, the interview protocol was developed and participants were selected for the interviews. In the second, qualitative phase of the study, 25 participants from the various research method courses and workshops (invention sites) were selected to explore the results from the quantitative phase in more detail. Seven themes emerged from the qualitative analysis.

Since the inception of the CoI survey instrument in 2008, a number of quantitative studies have explored the relationships among the elements of the CoI framework. There has also been at least one mixed methods study that has explored critical thinking in an online community. However, this is the first known study to use both quantitative and qualitative data to explore the relationships of the CoI elements through the implementation of an emerging technology (i.e., digital storytelling).

The two phases of the study first overlapped during the development of the interview protocol where the quantitative findings were used to guide the development of the interview protocol for the qualitative phase. The quantitative and qualitative data were next mixed in the

interpretation of the findings. In the next sections, the results that addressed the quantitative questions are explained and then discussed in relation to the recent literature on online learning. Next, the findings from the qualitative phase are interpreted. This process allowed for the findings of the second phase to further explain and elaborate the statistical results from the first phase. The interpretations of the data from the qualitative phase are grouped according to the themes that emerged from the content analysis. Recent literature, including related studies using the CoI framework, is used facilitate the understanding of the findings. The interpretations of the findings are followed by the implications of the study, recommendations, and suggestions for future research.

Interpretation of the Results from Phase One

1. How did participants perceive their learning experiences?

a. How did participants experience the RDLR?

b. Were there differences among the intervention sites?

Overall, the majority of participants had positive learning experiences using the RDLR and participating in the online discussions. This was determined by the number of positive responses to the items on the CoI survey instrument. Items related to teaching presence had the highest percentage of positive responses, followed by those items related to social presence and cognitive presence. It is not surprising that teaching presence had more positive responses than the other two presences as research has shown that it is significant in determining student satisfaction, perceived learning, and sense of community (Garrison & Arbaugh, 2007; Garrison et al., 2010).

The mean scores and standard deviations on teaching, social, and cognitive presence were as follows: teaching presence 3.80 (0.59); social presence 3.46 (0.64); and cognitive presence

3.48 (.67). Other recent studies that have used the CoI instrument have found similar mean scores of three presences. Arbaugh et al., 2008 found that the mean score and standard deviation for teaching presence was 3.34 (0.61); social presence 3.18 (0.65); and cognitive presence 3.31 (0.60). Mean scores were lower, however the scale was from 0 (strongly disagree) to 4 (strongly agree). Bangert (2009) used the same 34 item CoI survey but with a six-point scale (1 = strongly disagree) to (6 = strongly agree). He found teaching presence to have a mean score and standard deviation of 4.83(.97); social presence 4.53 (.93); and cognitive presence 4.69 (0.89). Interestingly all three studies showed teaching presence with the highest mean scores followed by cognitive presence and then social presence. This may suggest that teaching presence plays a very important role in CoI.

Another interesting result was that 88.5% of the participants in this study were female. To a certain extent this is a reflection of the demographics in each of the intervention sites. However, it could also suggest that females may be more likely to participate in a research study of this nature than males. Another possibility might be that females are more willing to share their online learning experiences. This explanation may be supported by Gilligan's (1982) work on women's psychology, such as her finding that women define their identities through relationships of intimacy and care.

It was interesting to note that 84% of participants in the study indicated that they used the Internet either often or always to help answer general information questions. This seemed to be a very high rate of response and speaks to the role the Internet plays in learning among the participants. However, the results from the CoI survey instrument also showed a relatively high percentage of participants who disagreed that online communication is an excellent medium for social interaction (25.9%) and that online discussions help to develop a sense of collaboration

(25.9%). These results suggested that participating in online discussions is not for everyone and, more importantly, that an individual's perception of social presence may in turn affect cognitive presence and their overall learning experience. MacDonald and Thompson (2005) also recognised that online learning might not be for everyone:

> M's experience invites further research into what prevents learners from reaching out for help when they find themselves in an online course that does not seem to suit their learning style and whether it is possible to turnaround a negative e-Learning experience. Alternatively, perhaps we have to resolve our thinking to the fact that e-Learning may not be for everyone. (p. 12)

These results corresponded with some of the findings from the interview data analysis. A common comment by some participants was the lack of online discussion. This lack of participation was a subtheme of the theme *Barriers to Cognitive Presence*. There were several reasons mentioned in Chapter 5, however it is important to note that a lack of discussion would explain why there was a perception by some participants that online communication is not an effective medium for social interaction and that online discussions do not help foster a sense of collaboration. It may also help to explain why the mean scores of social presence were slightly lower than the other presences.

Of particular interest is that the CHAID analysis showed that participants who agreed that online discussions helped foster a sense of collaboration were more likely to rate their experiences of cognitive presence as high. Moreover, these results suggest that one's perception of working together to answer a common problem in an online discussion is an important predictor for cognitive presence. The importance of collaboration as a contributing factor to cognitive presence is discussed later in this chapter.

The results of the CHAID analysis were supported by some of the findings from the interview analysis. As indicated in the previous chapter it was very apparent that learning preferences were important to participants and influenced how much they participated in the online discussions. Some participants noted their preferences for collaborative learning activities and described how discussions helped to develop a sense of collaboration. Some participants also indicated that they preferred online learning to traditional classroom experiences. Therefore it seems that one's learning preferences may influence cognitive presence.

To determine if there were any differences in participants' scores on the surveys across the intervention sites, several one-way between-groups ANOVAs with post-hoc tests were conducted. It was found that participants from site B had significantly higher cognitive presence scores compared to participants at site I. The characteristics of the participants were considered in order to interpret this finding. Site B was a fully online graduate level course whereas site I was a blended undergraduate course. This result may suggest there is less critical thinking or cognitive presence occurring in the undergraduate course than in graduate course or it may be due to one being fully online and the other blended. As there was not a significant difference in scores between site I and the other graduate courses, this finding cannot apply to differences in critical thinking between graduate and undergraduate courses. Although the ANOVAs showed there were no statistically significant differences between social presence and teaching presence scores across sites, there certainly was a discrepancy amongst the scores for sites B and I. Site B reported mean scores and standard deviations of 3.64 (.79) and 4.21 (.52) for social presence and teaching presence respectively, compared to 3.34 (.68) and 3.69 (.62) for site I. These differences in teaching and social presence scores may have contributed to the differences in cognitive presence scores between the two sites.

So what may be causing these differences in scores between the two sites? Site I was a very large undergraduate class of over 100 learners. Site B was a much smaller graduate level class of about 20 learners, many of whom were professionals with work experience. Is it possible that the size of the class could have affected the learners' perceptions of teaching and social presence? Possibly, however the difference may be related to how the RDLR was used. Taylor, Evans, and Abasi (2007) found that in collaborative learning environments the roles of both the instructor or facilitator and the learner change: a change from the learner being guided in learning to being more self-directed.

In site B the learners had some experience working, in triads or small groups, on collaborative online assignments before using the RDLR. Moreover, the learners had already started to learn and think about their own research. In fact learners had already written research questions for their topic of interest and were thinking and discussing with others about how they would write an introduction for a research report. The RDLR was used as a resource to guide their thinking and discussions in order to help them develop their own introductory research paragraphs, which included research questions and statement of the problem. It may be possible that the learners were transitioning from a position of being guided to independence and autonomy and had already developed more social, teaching, and cognitive presence. Upon reviewing the course transcripts many of the messages seemed more related to their own ideas of research and experiences, and less about the research done by the researchers on the videos, as in this example: "Bringing theory into practice is always a challenge. With my public relations training, one of the first considerations is how to evaluate whatever communications plan was initiated and to build that into the plan" (Linda, site B). This finding seemed to correspond to that

of Taylor, Abasi, et al. (2007) in which there is a movement by learners to independent learning in a collaborative learning environment

In site I, the context of using the RDLR was different than site B. Learners were not expected to develop their own research questions or write a research report. The RDLR was a resource to help learn about research in general, and the triggering questions corresponded to a particular unit of study. Learners seemed to have difficulty making the transition to independent learning, which needs to be supported by teamwork development. Perhaps learners did not benefit enough from their peers nor become comfortable enough with posting messages to transition to independent learning. Feedback from the facilitator was very important to the learners on an ongoing basis and whether or not learners found the feedback helpful may have affected how they perceived teaching presence and ultimately their online learning experience. For instance,

> I believe so in the second half. We would answer a question and you (the facilitator) would ask a question about another perspective of the answer or continue on to elaborate more. In the first half you would just say good answer. I think obviously if you are saying good answer we are doing it right but it doesn't help us expand our scope. (Lisa, site I)

In order to explore other differences the intervention sites were divided into two groups: those in which the instructor required the learners to use the RDLR as part of the syllabus and those who did not. Independent samples t-tests were conducted on the total LPA scores, mean scores of the three CoI elements. Independent samples t-tests were also conducted on individual items of the CoI survey and the demographic questionnaire. It was found that those participants who were not required to use the RDLR scored significantly higher on the LPA than those participants who were required to use the RDLR. This finding makes sense as one would expect

that a person who is intrinsically motivated to learn about educational research would be more ready for SDL than a person who had to participate in order to get a grade. This finding provides more evidence of the validity and reliability of the LPA as an instrument to measure a person's readiness for SDL.

There was also a significant difference between the scores of the two groups on the following question in the demographic questionnaire: *Would you consider your collaborative learning experiences to be positive?* Participants in the study who were not required to use the RDLR (i.e., those who tended to be more ready for self-directed learning) rated their collaborative learning experiences more favourably than those who were required to use it. This finding is consistent with the literature. MacLachlan (2004) explored the effectiveness of online learning in fostering lifelong learning skills. Of particular interest were the critical thinking skills and collaboration skills of self-directed learners. He found that self-motivation, learner ownership, and teaching presence were key elements in the online learning experience. Moreover, self-directed learners needed to have opportunities in an online course design for collaborative learning experiences. Thus, there seems to be a connection with those who are prepared for SDL and those who have positive collaborative learning experiences. This connection corresponds to the findings from Taylor, Evans, et al. (2007) who found that in collaborative learning environments there is a change from the learner being guided in learning to being more self-directed.

In another study, Bloomberg (2008) explored the learning experiences of 22 adult learners participating in a Jewish education Master's degree program delivered using videoconferencing technology. She found that the online community fostered openness to new perspectives and an appreciation for collaborative learning and critical reflective thinking. Based

on the findings of this study, as well as the three studies described above, it appears that there may be a relationship between readiness for SDL and collaborative learning.

2. What is the relationship between social and cognitive presence, as instantiated by the RDLR and online discussions?

Results from the standard regression analysis suggest that social presence and teaching presence make strong and statistically significant contributions to explaining cognitive presence. Social presence made a very strong unique and significant contribution to explaining cognitive presence ($\beta = .47$). Social and teaching presence accounted for about 69% of the variance in cognitive presence. Moreover, social presence and teaching presence were very strongly correlated ($r = .65$) and therefore contributed to the shared variance (.45) in the model. These results are similar to those of a number of recent studies that have used the CoI survey instrument.

Shea and Bidjerano (2009) found that social and teaching presence accounted for 70% of the variance in cognitive presence among a group of 2159 online participants. Similarly, Garrison, Cleveland-Innes, and Fung (2010) found that perceptions of teaching presence and social presence significantly predicted the perception of cognitive presence. In addition, they found that teaching presence was paramount to maintaining social and cognitive presence. In both studies social presence significantly and positively contributed to cognitive presence. Thus, social presence is important to cognitive presence.

The relationship between social presence and cognitive presence was also apparent from the qualitative interviews. As indicated in chapter 5, there were 45 references to the connections participants made with each other that were found in the interview transcripts. Participants commented on how they were able to build on each other's ideas or were enlightened on a

particular topic through another's posting. Being able to build on someone else's idea is an indicator of the integration phase of cognitive presence.

However, despite the importance of social presence in explaining cognitive presence, the mean scores on individual items of social presence were slightly lower than the other presences. The items related to affective expression had the lowest positive responses. These low scores may be reflective of the idea that online learning is not for everyone. Some learners miss the personal interactions and non-verbal cues found in a traditional face–to–face learning environment.

3. What is the relationship between teaching and cognitive presence, as instantiated by the RDLR and online discussions?

Results from the standard regression analysis suggested that teaching presence made strong and statistically significant contributions to explaining cognitive presence ($\beta = .45$). The notion that teaching presence has a strong influence on cognitive presence is well supported in the literature (Garrison & Cleveland-Innes, 2005; Garrison, Cleveland-Innes, et al., 2010; Shea & Bidjerano, 2009).

Arbaugh and Hwang (2006) used a sample of 191 MBA students to test an early model of teaching presence using structural equation modeling. Their findings validated the earlier work of Garrison et al. (2000) that suggested teaching presence is comprised of three components: resource design, direct instruction, and facilitation. Arbaugh and Hwang's work suggested that the facilitator needed to be more active in directing learning in an online discussion forum. At the same time, Shea, Li, and Picket (2006) suggested that teaching presence was instrumental in sustaining a community of inquiry:

> Gaining insight into how to support the development of learners' sense of connectedness and learning will allow us to make intelligent decisions about online course design, pedagogy and faculty development in the service of enhancing the quality of online learning environments. (p. 185)

These two studies followed work previously done by Meyer (2003) and Garrison and Cleveland-Innes (2005) that suggested online course structure and leadership are instrumental in fostering cognitive presence: "Teaching presence must be available, either from the facilitator or other students to transition from social to cognitive presence" (Garrison & Cleveland-Innes, p. 143). Although results from the regression analyses show that both social and teaching presence each contribute variance in cognitive presence, combined they contributed .45 in shared variability.

Evidence from the interview transcripts from this study further supported the importance of teaching presence in developing cognitive presence. Many of the participants interviewed expressed their appreciation for the support and guidance the researcher provided through the discussions. In fact there were 20 references made to the connection learners made with the facilitator. Learners appreciated the triggering questions that were proposed, and the role the researcher played in keeping the discussions moving forward and keeping people on task; in other words, how the researcher provided opportunities for cognitive presence.

However, an interesting finding from the CoI survey was that 38% of participants were undecided about whether or not the researcher's actions reinforced the development of a sense of community among them; despite almost 54% indicating that the researcher's action did reinforce a sense of community. Why would such a high number of participants be undecided or neutral in their response? It seems contradictory to the qualitative data and to many other items related to teaching presence. Possibly, participants may have felt that their classmates were more important

than the researcher's actions in shaping a sense of community. Another explanation might be that these participants did not participate or had limited participation in the online discussions and did not see the role of the researcher/facilitator as important in developing a sense of community.

Another low positive response item was that only 50.0 % agreed that the researcher provided feedback that helped them to understand their strengths and weaknesses. This low response does make sense given some of the comments participants made in the interviews. For example one participant noted, "I don't think we interacted a ton…with Kathy I noticed that you would pull out a specific thing from her and that helped me to see the things that she said and then that you said" (Lilly, site H). Again, if some participants did not participate or had limited participation in the online discussions they would not have been given feedback about their strengths and weaknesses.

4. Do social and teaching presence improve the prediction of cognitive presence after controlling for SDL readiness?

Results from the hierarchical regression analysis indicated that social presence and teaching presence continued to significantly and substantially contribute to the prediction of cognitive presence after controlling for SDL readiness. Why did SDL readiness not have more of an influence on the ability of social and teaching presence to predict cognitive presence? There are a number of possible inferences that can be made. First, a consideration would have been to use the Oddi Continuing Learning Inventory (OCLI; Oddi, 1986), which assesses self-directedness as a personality trait rather than as a process of instruction, by measuring variables such as self-efficacy, personal responsibility, and on-the-job learning. Oddi notes that the relationship between self-directed learning and the personality of learners, "…could be studied regardless of the mode of learning preferred or available to the self-directed learner" (p. 28).

Perhaps exploring SDL as a personality trait using the OCLI may have rendered a stronger correlation with cognitive presence.

Second, participants' scores on the LPA were higher than average, indicating that many of the participants were ready to engage in SDL. The mean scores and standard deviation for the LPA were 230 out of 290 possible points (24.44). According to Guglielmino and Guglielmino (1991) the average adult who takes the test scores 214 points (25.59). However, evidence from the interview transcripts suggested that although there were many messages coded to being a self-directed learner (24), none were connected to the discussions and therefore could not be associated with cognitive presence. Moreover, some participants were very frank and indicated that they had to post messages and it had nothing to do with SDL.

Third, although the LPA is the most widely used instrument for assessing SDL (Merriam et al., 2007), it may not have been the best tool to assess readiness to engage in online learning. When Caffarella (1993) indicated that SDL is critical to cope in a world of change, she may not have been thinking about the Internet per se but rather how we adjust to a changing environment. The Internet is certainly an area of ever increasing change and presents many challenges to the self-directed learner: addressing the technology gap; developing skills to use the Internet; and dealing with a plethora of information and discerning what is credible and what is not (Rager, 2006). Rager explained that anyone with a computer, Internet access and the appropriate skills can tap in the vast sources of online resources available, which can have an impact on the SDL process. In a previous study (Rager, 2003; 2004) she examined the experiences of women who have been diagnosed with breast cancer and found that they were reacting to learning challenges as they had a new experience in the breast cancer development. The participants made use of the

resources available to them – mainly the Internet. However, sometimes this was overwhelming because of the vast amount of resources that could be accessed.

Thus, for the LPA to be more relevant to online learning, perhaps it needs to be modified to identify the challenges and issues identified by Rager (2006). It may be that there should be less focus on the individual learner and more on the process of developing skills to be more self-directed with regard to using the Internet.

Finally, a possible reason that SDL readiness may not have had more of an influence on the ability of social and teaching presence to predict cognitive presence may be the challenge of conceptualising SDL in a collaborative learning environment, in which the focus is on shared regulation rather than self regulation.

5. Do social and teaching presence improve the prediction of cognitive presence after controlling for prior online learning experiences?

Results from a hierarchical regression analysis indicated that social presence and teaching presence continued to significantly and substantially contribute to the prediction of cognitive presence after controlling for prior online learning experiences. Why did prior online learning experience not have more of an influence in affecting the ability of social and teaching presence to predict cognitive presence? Research indicates that it should (Cleveland-Innes et al, 2007; Garrison et al., 2004).

Cleveland-Innes et al. (2007) conducted a study involving 217 participants in two graduate programs at Athabasca University. Much like this study, some of the courses required online discussion participation while in others, participation was voluntary. Their study used an earlier version of the CoI instrument (Garrison et al., 2004), to measure the extent to which learners adjust to online learning. For 46% of the participants, this was their first experience in a

formal online learning environment, similar demographics to the participants in this study. Cleveland-Innes et al. found learners had to adjust to learning online. They organised five themes around where they felt this change took place: interaction, instructor role, self-identify, course design, and technology. These themes were common across teaching, social, and cognitive presence. They concluded that "competent online learners are essential for creating an online community and contributing to higher-order learning activities" (p. 12).

So, why did the measure of prior online experience not affect the ability of social and teaching to predict cognitive presence in this study? There may be two possible reasons. First, there were only three items on the demographic questionnaire to measure prior online experience and they were not highly correlated with each other (.154 to .352). Perhaps there needed to be more items to improve the validity and reliability of the measure.

Second, there is a possibility that the researcher should have developed items that corresponded with the themes identified by Cleveland-Innes et al., (2007): interaction, instructor role, self-identify, course design, and technology. The CoI survey instrument items were based on the results of studies such as this over the last ten years, so perhaps if the researcher had made this connection when developing the demographic questionnaire there may have been more correlation between the prior online learning mean scores and the cognitive presence mean scores. The means and standard deviations of the prior online experience scores (out of 5) were: 2.48 (1.66); 2.71 (1.00); and 3.64 (.81).

Although two reasons as to why prior online learning experience did not seem to affect the ability of social and teaching presence to predict cognitive were offered, there may have been evidence from the interview transcripts to suggest that it should. In chapter 5 the researcher found the theme of *learning strategies* emerged. These were strategies that the participants used

to foster cognitive presence. Some experienced online participants indicated that a strategy they used was to wait to read postings of others before making a contribution. By waiting and reading others' postings they were able to reflect upon what was written and weigh it against their own thoughts on the topic of discussion. This example shows how experienced online participants have devised strategies over time to possibly improve cognitive presence and ultimately their learning experience.

6. Do social and teaching presence improve the prediction of cognitive presence after controlling for prior collaborative learning experiences?

Results from a third hierarchical regression analysis indicated that social presence and teaching presence continued to significantly and substantially contribute to the prediction of cognitive presence after controlling for prior collaborative learning experiences. As with the two previous covariates, there was a weak correlation between prior collaborative learning experience and cognitive presence ($r = .11$). The CoI framework was grounded in collaborative constructivism. The tenet of this perspective being that learning is constructed through interactions, the sharing of knowledge with others, and personal reflection. It seems logical that experiences in other collaborative activities, such as PBL and TBL, may help an online learner achieve higher order phases of critical thinking. However, participants' prior experiences with face-to-face PBL and TBL did not appear to facilitate cognitive presence in the online courses. Perhaps if the questions related to prior collaborative learning experience were more specific to working collaboratively online it may have correlated stronger with cognitive presence. Perhaps prior collaborative experience is not critical at all. More important factors likely include setting up an environment conducive to collaborative learning (MacDonald et al., 2009); the facilitator's

teaching and learning philosophy, and leadership style that fosters collaboration (Taylor, Abasi et al., 2007); and the roles of peers (O'Donnell, 2006a).

Evidence from the interview transcripts seemed to show that providing an environment conducive to collaborative learning was most important for cognitive presence. The themes that seemed to support this idea included: the connections participants made with the facilitator through guidance and support; connections participants made with each other trying to collaboratively answer thought provoking questions; and comments participants made about appreciating the multiple perspectives others offered.

7. What phases of cognitive presence did the participants demonstrate?

Quantitative content analysis was used to code the transcripts from the online course discussion forums into the four phases of critical thinking as described by the Practical Model of Inquiry (Garrison et al., 2001). Many of the discussion postings demonstrated exploration and integration; however, few were considered to be at the level of resolution. These results are disappointing as it was hoped that the RDLR would have been more successful in promoting cognitive presence or critical thinking. However, the results are in-line with other studies that have used the same framework to analyse online transcripts.

deLeng et al. (2009) developed an e-Learning module designed to promote critical thinking about science topics for higher education learners during work placement programs. Their model, like the RDLR, promoted interaction through online discussions (social presence) and also required teaching presence. The findings from deLeng et al.'s study and those from this study had a similar distribution of messages across the exploration and integration stages of critical thinking (exploration: 40.9% vs. 40.8%; integration: 27.0% vs. 29.0% respectively). However, deLeng et al. reported a higher percentage of messages rated as resolution (7.5% vs.

2.2%). Other studies using the same framework to conduct quantitative content analysis of discussion postings have found similar results (Garrison et al., 2001; Kanuka et al., 2007; Meyer, 2003; Schrire, 2004).

Interestingly however, the means and standard deviations from the CoI survey would indicate the learners did perceive high levels of cognitive presence. For example the means (out of 5) and standard deviations of the items on the CoI survey associated with resolution were: 3.61 (.80); 3.47 (.80); and 3.68 (.88). This may suggest that the higher levels of cognitive presence are perceived by the participants to be possible but are not present in the online discussions. For example, it may be possible that through using the RDLR and participating in the discussions participants had been able to develop solutions that they could apply in practice.

Evidence from the transcripts seemed to indicate that for some the online discussions occurred before the stage of resolution could be reached and that application does need to happen outside of the online discussion forum. For example, one participant noted, "we are at this point where we are writing these proposals and it almost seems too soon for me" (Kathy, site H). Another participant commented, "…I am still trying to figure out how that fits with my work" (Lilly, site H).

Explanatory Follow-up of the Statistical Results

The second, explanatory follow-up phase of this study involved interviewing select participants to gain insight into the following findings from phase one:

1. Many participants had positive learning experiences using the RDLR and participating in online discussions.
2. Some participants did not have positive learning experiences using the RDLR and participating in online discussions.

3. Social and teaching presence made a significant and positive contribution to the prediction of cognitive presence.
4. The covariates (SDL readiness, prior online learning experience, and prior collaborative learning experience) did not significantly affect the ability of teaching and social presence to predict cognitive presence.
5. Positive collaborative learning experiences seemed to be correlated with higher order critical thinking.

In mixed methods studies the quantitative and qualitative data are often mixed during the interpretation or discussion phase of the study. The data can be merged, embedded, or connected (Creswell & Plano Clark, 2010). Often in mixed methods studies the data are connected. In this study the first connection point was during the development of the interview questions. The next connection point was connecting the five findings above with the seven themes that emerged from the qualitative data: making connections; multiple perspectives; resource design; being a self-directed learner; learning strategies; learning preferences; and barriers to cognitive presence development. To a certain extent these connections were made in the previous section, however, they are elaborated upon further in the ensuing sections.

Making connections. The participants who were interviewed made some connections with components of the RDLR, their classmates, and the facilitator that promoted cognitive presence. Four subthemes emerged: connections with classmates, connections with the researchers who shared their stories; connections with the repository and; connections with the facilitator/researcher. It was apparent that those participants who were able to make connections with their classmates, the facilitator, and the content of RDLR, had positive learning experiences.

Those unable to make these connections were not able to engage in an online community of inquiry and have a positive learning experience.

The items on the CoI survey instrument that made reference to connection related to teaching and social presence, specifically facilitation, direct instruction, affective expression, and open communication. Words and phrases such as "feeling comfortable", "helped me to develop", "sense of belonging", and "getting to know others" represented connection. The sheer number of references to connections in the interviews (185 out of 411 [45%] references from 96% of the participants) indicated that a sense of connection was vital for cognitive presence and reinforced the relationships among teaching, social, and cognitive presence.

Connection with classmates. In many of the interviews, participants commented on how they were able to build on each other's ideas, were enlightened about a particular topic as a result of reading other postings, and generally enjoyed sharing information. The comments strengthened the argument that social presence supports cognitive presence.

Research on social presence in the 1990s saw social presence as a "one dimensional construct associated with an emotional sense of belonging" (Garrison, Anderson, et al., 2010). However, this view of social presence has changed and the special role it plays between teaching and cognitive presence has been recognised (Garrison, 2009; Garrison, Anderson, et al.; Shea & Bidjerano, 2009). The findings from this study are congruent with the notion that social presence is a shared social identity rather a personal identity. Both the quantitative and qualitative findings from this study contribute to the literature by affirming the role social presence plays in the development of cognitive presence and that the essence of social presence is a shared phenomenon.

Making connections with the researchers who shared their stories and with the repository. These two subthemes were related to the RDLR. Data related to the connections with the researchers who shared their research stories, and the repository provides support for the importance of teaching presence in the development of cognitive presence. Teaching presence has been the least studied of the CoI elements (Arbaugh, 2007). Yet recent work has shown that it is critical for learner satisfaction, perceived learning, and developing a sense of community (Garrison & Arbaugh, 2007; Garrison & Cleveland-Innes, 2005; Kanuka et al., 2007; Meyer, 2003; Shea et al., 2004). Instructional design and organisation is one subscale of teaching presence. Garrison and Arbaugh (2007) noted that developing audio and video, posting lecture notes, and creating a balance of individual and group activities are all part of supporting the course structure that is important for successful online learning. The researchers' video stories and the repository in the RDLR would have contributed to this component of teaching presence and served to build the participants' connections. Indeed, in the interviews, participants made many references to the impact the researcher video stories and associated publications had on their learning. The participants indicated that the research videos were particularly valuable because they allowed them to "connect the research to the researcher". Participants were able to put a face to the research, which was meaningful to them.

Stories are powerful teaching and learning tools; they help learners make sense of the experience being presented (Bruner, 1996; Lowenthal & Dunlap, 2010; McLellan, 2006). In fact, 79.4% of the participants either strongly agreed or agreed with the design and organisation section of the CoI survey instrument. This percentage was higher than any other subscale. Thus it seems that making a connection with the RDLR was important to the participants. However, upon close examination of the four items related to instructional design and organisation on the

CoI instrument, these items have more to do with the role of the facilitator than the technology (e.g., the researcher had provided clear instructions and guidelines for using the RDLR). Items that address the design, content, and structure of an online learning resource need to be added to this subscale of teaching presence; particularly since researchers are using the CoI framework outside the context of asynchronous online discussions with resources that include new multimedia tools (Swan & Ice, 2010).

Making connections with the facilitator/researcher. The final subtheme of *makings connections* was with the facilitator. Direct instruction and facilitation constitute the remaining two subscales of teaching presence. Recent research has provided evidence that the role of the facilitator in collaborative learning activities is crucial for learners to achieve higher phases of critical thinking:

> In this context, interaction must be more structured and systematic. ... It is valuable and even necessary to create a community of inquiry where interaction is seen as communication with the intent to influence thinking in a critical and reflective manner. (Garrison & Cleveland-Innes, 2005, p. 134)

It was apparent from the participants interviewed that the researcher's role as facilitator was pivotal in moving the discussions forward, either through posing thought provoking questions, answering questions, or suggesting further reading. It was also made clear that when the facilitator was not perceived as being active during the discussions, social and cognitive presence may have dwindled: "Being a little melodramatic it felt like being abandoned...almost like [being] invisib[le]; wondering if you are still in the course or still involved" (Linda, site B).

The findings contribute to the literature by providing further support for the role teaching presence plays in the development of cognitive presence. Furthermore, this study supported

recent research that indicated teaching presence is the foundation that supports social presence and sustains the development of cognitive presence (Bangert, 2009). In summary, participants perceived *making connections* as the most important factor in the development of cognitive presence. Moreover, the subthemes of *making connections* were strongly associated with teaching and social presence, which supports the results of the regression analysis in the first phase of this study.

Multiple perspectives. A common theme that emerged from the interview data was the interest participants had in the views of others—either their classmates, the researchers in the videos, or the facilitator. In some cases, the course instructor's perspectives were also considered. Responses from the participants reinforced some of the results from the first phase of this study; in particular, the role social presence played in predicting cognitive presence. Moreover, participants who felt their perspectives were valued by others tended to rate their cognitive presence higher than those who did not feel their perspectives were valued by other participants. Collaborative learning activities helped to foster a sharing of perspectives.

There is a substantial body of literature indicating that facilitated collaborative learning strategies promote critical thinking (Garrison & Cleveland Innes, 2005; MacKnight, 2000; Wu & Hiltz, 2004). In order for learners to participate and optimise their learning in a collaborative learning environment they need to have certain skills; for instance being capable, asking the right questions, listening to each other, respecting each other's work and ideas, and building upon each other's ideas (MacKnight). All of these skills are integral to recognising and understanding multiple perspectives. These skills need to be supported by the facilitator to ensure that social and cognitive presence are supported and sustained. As with the theme *making connections*,

multiple perspectives supported the quantitative results of this study that showed social and teaching presence make a strong contribution to predicting cognitive presence.

Resource design. Participants perceived resource design to be important to cognitive presence. Participants indicated the RDLR was convenient to use, easy to navigate, and logically organised. Resource design refers to the elements of design considered by the facilitator/researcher before the course began. Comments related to *resource design* provided more insight into the first phase of the study that revealed the strong ability of teaching presence to predict cognitive presence.

Research using the W(e)Learn Framework (MacDonald et al., 2009) has shown that a well designed program with well designed learning activities is critical for cognitive presence and successful learning. According to W(e)Learn, the first step is to consider the structure of the program. These considerations include: pedagogical strategies, interactivity, community, and reusability of the learning resource, among others.

Key to resource design are considerations regarding community and pedagogical strategies. Building community online starts by taking the time to ensure that learners, through thoughtful and well designed learning activities, get to know each other and have an opportunity to develop a community of practice. Choosing pedagogical strategies is also part of the instructional design process and needs to be considered with building community, "…to maximise collaboration, dialogue, and critical inquiry" (MacDonald et al., 2009, p. 39).

The design process of the RDLR included online discussion boards. The literature on using this form of asynchronous learning has been well documented (Bliss & Lawrence, 2009; Meyer, 2005). Furthermore, they have been used to facilitate learners' "co-construction of knowledge, engagement of higher order thinking, and…development of critical thinking skills.

…a place where students negotiate meaning of course content and practice skills" (Bliss & Lawrence, p. 16).

Being a self-directed learner. Participants' scores on the LPA tended to be above the mean score of the general population. However, readiness for SDL did not help predict cognitive presence and therefore did not affect the ability of social and teaching presences to predict cognitive presence. In the interviews, participants provided some evidence to suggest they were intrinsically motivated but there was not really any connection made to the online discussions. Of interest is that in the intervention sites that did not require the use of the RDLR, participants had significantly higher scores on the LPA. However, this did not translate into higher cognitive presence scores.

A benefit to administering the LPA online was that it allowed the provision of immediate feedback, which provided participants with insight into their readiness for SDL. For example, if participants received high scores they would be presented with feedback indicating they usually prefer non-structured learning situations and determine their own learning needs. They would also be presented with the following information: "Individuals who have developed high self-directed learning skills tend to perform better in jobs requiring a high degree of problem solving ability, creativity, and change" (http://www.lpasdlrs.com/).

Learning strategies and preferences. Participants made references to their learning strategies and preferences during the interviews. Many participants detailed how they used the RDLR and participated in the discussions. Learning preferences were important to participants and contributed to how they felt about using the RDLR and participating in the discussions. Two subthemes of *learning preferences* emerged: online learning preferences and strategies and collaborative learning preferences and strategies. Each of the two subthemes is discussed below.

Online learning preferences and strategies. Cleveland-Innes et al. (2007) suggested that there is a role adjustment that learners experience when participating in an online discussion for the first time. Indeed, the participants in this study expressed similar challenges, interventions (or strategies), and results. Some participants who were new to formal online learning indicated that they were reluctant to post for fear of saying something wrong or saying too much. Others indicated that they did not have as much to contribute as their classmates and did not want to repeat what was already said.

Contrary to the novice online learners, confident online participants commented on how strategically they posted and used the RDLR. For example, some said they would view a researcher video segment and then write a response. However, they would not post it right away but rather wait to read what others posted and then submit it, in this way ensuring that they were contributing to the conversation. Therefore, the interview data seem to suggest that prior online learning does affect learning experience which was contrary to the findings from the quantitative data.

When quantitative and qualitative results conflict in a mixed methods study there are a number of strategies a researcher can use (Moffatt, White, Mackintosh, & Howel, 2006; Slonam-Nero & Nero, 2009). One is to explore the comparability of the two sets of data and another is to collect more data. In order to explore the comparability of the data, items on the demographic questionnaire need to be changed or more items need to be added. It became apparent that online learning experience does not just relate to whether a learner has taken online courses before and whether they enjoyed them but rather the strategies they employed to learn. Future questions could address areas such as how comfortable participants are with technology and their perceptions of the facilitator's role in an online discussion. Collecting more data as part of future

research is discussed later in this chapter.

Collaborative learning preferences and strategies. Bangert (2009) and Jonassen et al. (1999) suggested that constructivist approaches are well suited to online learning. Furthermore, continual teacher interactions and collaboration among learners is critical to maintaining an online community of inquiry so meaningful learning can occur (Garrison et al., 2000). During the interviews, many participants indicated their preference for collaborative learning. In particular, a few participants explained how the online discussions helped to develop a sense of collaboration.

Although results from the hierarchical regression analyses indicated that prior collaborative learning experience did not affect the ability of social and teaching presence to predict cognitive presence, results of the CHAID analysis showed that participants who felt online discussions helped to develop a sense of collaboration tended to rate cognitive presence highly. The evidence from the qualitative content analysis certainly supported the results of the CHAID analysis. Moreover, it helped to explain why higher phases of cognitive presence were not reached in many of the discussions. Just less than half the participants who completed the CoI survey either agreed or strongly agreed with the statement: "Online discussions help me to develop a sense of collaboration". This finding suggests that participants were probably unable to sustain reflective discourse.

The question that still remains unanswered is why prior collaborative learning experience did not affect the ability of social and teaching presence to predict cognitive presence. Perhaps, as was the case for prior online learning experience, the items of the demographic questionnaire did not correlate strongly enough with the CoI model. In hindsight, the items should probably have focused specifically on the participants' prior experience with online discussions as a

collaborative activity, rather than on their general experience with collaborative activities. The following section gives more insight into some of the participants' experiences with the online discussions associated with the RDLR and explanations for those that perceived there to be a lack of cognitive presence.

Barriers to cognitive presence. The barriers to cognitive presence can be categorised into three overlapping areas*: accessibility to high-speed Internet*, *lack of participation in the online discussions,* and *lack of time to engage in the learning activities*. These subthemes provide the most insight into why online participation varied across the intervention sites and why resolution, the highest level of critical thinking, was so difficult to achieve.

Inaccessibility to high-speed Internet and *lack of time to engage in the learning activities* were factors that seemed to affect cognitive presence. For some participants, not having access to high-speed Internet was an issue. A number of participants indicated that they had to complete the work on campus because they did not have the capability at home to use the RDLR and participate in the online discussions. This finding indicates that online learning is still not convenient for all learners and a lack of technology can be a hurdle to creating meaningful knowledge through sustained discourse. Video streaming requires a high bandwidth and without high-speed Internet watching the research video stories would have been a frustrating experience as the videos would freeze periodically. In addition, being unable to access the online discussions on a regular basis makes it hard to be part of a conversation. These interruptions to the access of the RDLR are the equivalent of missing class in a traditional face-to-face setting.

Lack of participation in the online discussions had a direct impact on cognitive presence as measured using the Practical Inquiry Model. Greenlaw and DeLoach (2003), and Bliss and Lawrence (2009) have indicated that meaningful discussion can be facilitated more easily by

grading discussion activity. If learners are graded then they will make the time to participate in discussions. In this researcher's study it was apparent that the number of learners participating in the discussions was associated with grades. At the sites in which the course instructors required learners to use the RDLR and participate in the online discussions, quantity of postings was much higher; participants made the time to participate. However, the quality of the postings was not necessarily higher. In some cases, the quality of discussions in the sites in which instructors did not require the use of the RDLR was very high. The researcher has also suggested that the participants from these sites may be more ready for SDL.

Research has indicated that time is critical to allow for the development of critical thinking; especially to reach resolution, as this phase requires the application of an idea or solution. Online discussions may not be the ideal forum for achieving the highest phases of critical thinking. Richardson and Ice (2010) recently explored learners' phases of critical thinking using various instructional strategies in online discussions, such as case-based discussion, debate, and open-ended discussion on a topic. Interestingly, even though learners preferred open-ended discussions, they were not engaged in the highest phases of critical thinking with this method. Richardson and Ice concluded by saying that online discussions in courses do not last long enough for learners to move through the phases of critical thinking. However, they suggested that instructors use online discussions as a gauge to judge learners' critical thinking phases. Similarly, Akyol and Garrison (2008) suggested that higher phases of critical thinking can really only be achieved outside of the online discussion, in course projects and artifacts. Archer (2010) furthered this sentiment, "Rather than putting the effort required for achieving these higher levels into their meagerly rewarded contributions to online discussions, students reserve their best thoughts for their term papers...for which they receive a larger portion

of their term grade" (p. 69).

Moreover, some participants indicated that they did not have time to view all the features of the resource such as the videos and the repository, aside from the video segments that directly applied to the triggering questions. From the interview transcripts only a few participants indicated that they had taken time to view more research videos than suggested by the facilitator.

In summary, the themes that emerged from the interview data from this study shed light on the quantitative findings. The considerations of both sets of data reveal a number of implications of this study.

Implications and Recommendations

This study contributes to the literature on online learning using the CoI framework in a number of ways. This study explored the relationships of social and teaching presence with cognitive presence and enhanced the understanding of SDL and critical thinking of adult learners who learn online. This improved understanding can be used to impact educational practice and a number of recommendations follow. This research study was one of only a few recent studies that have explored the relationships among the CoI elements and provides additional support for the findings of the other recent research. The ability of social and teaching presence to predict cognitive presence may provide insight into how online discussions should be conducted. This study also led to the development of the RDLR, which may possibly be used as a tool to promote teaching presence in research methods courses. Moreover, the RDLR may, in turn, possibly support social presence that may ultimately lead to the development of cognitive presence.

This study contributes to the literature outside the CoI. As indicated earlier, facilitators can look for the highest levels of cognitive presence outside of the online environment. Online discussions provide an effective venue for some to exchange information and to connect ideas.

However, the phase of resolution or application probably can best be seen in a project, paper, or in the case of this study, in a research proposal. Moreover, this study supports some of the literature on collaborative learning outside of the online environment. The role of the instructor/facilitator is paramount in helping learners create meaning for themselves and in some cases to become more self-directed in their learning. This finding is supported by Taylor, Abasi et al., 2007; Taylor, Evans, et al., 2007). Furthermore the role of peers is very important in the collaborative learning process. Learners appreciate and learn from the multiple perspectives of others. This finding is supported by the work of O'Donnell (2006b).

This study also has important methodological contributions. The study was deliberately structured in a fashion that would enable it to be published as a mixed methods article, as advocated by Creswell and Plano-Clark (2010). The study has the key features of a mixed methods report that make it distinct from quantitative and qualitative studies. It includes a rationale for using mixed methods; distinct mixed methods questions; and a mixed methods design that includes a visual diagram and connection of the results. It is through publishing studies using a structure that includes the features listed above that will allow mixed methods to grow and gain credibility as a distinct methodology.

The specific implications of this study are:

1. Teaching and social presence significantly contributed to the prediction of cognitive presence. Teaching presence is the foundation of an online community of inquiry and is critical to support social presence, which in turn fosters cognitive presence. Online collaborative activities involving online discussions must be continually facilitated for an online community of inquiry to thrive. Moreover, there must be clear instructions and direction given to all participants regarding learning process and

outcomes. Feedback and thought provoking questions need to be provided by the facilitator and other learners so that all online participants have an opportunity to share and build upon each other's ideas.

2. Resolution, the highest level of cognitive presence, was only reached in a small percentage of the online discussions. Factors including constraints on time to participate in the online discussions, and whether or not the discussions were graded may have impeded participants' abilities to reach resolution. However, another possibility may be that the online discussion forum in not the ideal venue for achieving the phase of resolution. Online facilitators need to realise that in order for there to be an application of an idea or solution, participants need to have an opportunity to test them outside of an online discussion and this opportunity was missing in the RDLR. Thus, facilitators should consider searching for evidence of the highest phases of critical thinking in course projects or papers and use the online discussions as a venue for developing ideas and solutions.
3. Regardless of how ready participants are for SDL, teacher presence is paramount for there to be participation in an online discussion and opportunities to develop cognitive presence. Ultimately, this translates to making the participation in online discussions worthwhile for the participants. Furthermore, the facilitator or instructor needs to be present to give the discussions credibility (MacDonald & Thompson, 2005). In this study, in the intervention sites where the instructor did not require the use of the RDLR and online discussions, participants had significantly higher scores on the LPA but participation in the online discussions was markedly lower. Therefore, assigning participation marks for online discussions is a good idea. Further, teaching

presence should be present to support social and cognitive presence. This is supported in the literature by Garrison and Cleveland-Innes (2004) and MacDonald and Thompson (2005).

4. In this study, participants who perceived that online discussions created a sense of collaboration were more likely to rate the cognitive presence in the course high. This finding suggests that facilitators of online courses should work to foster a sense of collaboration among participants to ensure there is meaningful learning. Having two to three learners moderate each discussion forum may enhance this sense of collaboration (MacDonald & Thompson, 2005). The added responsibility of moderating the discussions ensures learners get to know each other and become familiar with each other's work. Providing learners with guidelines for moderating discussions and online discussion etiquette may further help the process.
5. The RDLR was perceived by learners as a helpful tool to learn about educational research and complete their course assignments. It should be disseminated to help other learners improve their skills and knowledge in this area.

Theoretical, Practical, and Methodological Contributions

In terms of theoretical contributions, this study provided an enhanced understanding of cognitive presence from adults engaged in online learning, which may affect educational practice. Through a greater appreciation of the effects that teaching and social presence have on cognitive presence, this study provided insight into factors that influence reflection and critical discourse. Factors such as the connections learners make with each other, the technology, and the facilitator; appreciating multiple perspectives; learning strategies; learning preferences; and resource design (all of which are related to social and teaching presence) seemed to affect

cognitive presence. However, factors such as inaccessibility to high speed Internet, lack of time to engage in the learning activities, and lack of participation in the online discussions seemed to have a negative effect on cognitive presence. Furthermore, as some of the results of this study suggest, it may be inferred that online discussions may not be the best context for developing the highest levels of cognitive presence.

Moreover, the covariates of SDL readiness, prior online learning experience, and prior collaborative learning experience did not seem to have an effect on the ability of social and teaching presence to predict cognitive presence. However, the study did show the SDL readiness scores of participants were higher than those of the average person who takes the test, and that scores amongst participants who were not required to use the RDLR by their course instructor were higher than those participants who were required to use it. Furthermore, the findings from the interview transcripts showed that some participants had strategies for using online discussions that may have helped them to develop cognitive presence. Therefore, prior online learning experience may indeed have an effect on cognitive presence. As well, the findings from the interview transcripts suggested that some participants preferred collaborative learning activities, and that the role of the facilitator, design of the activities, and the connections participants made with each other (all of which are important to collaborative learning, promoting critical discourse and supporting a learning community) did seem to affect cognitive presence and learning experiences.

This research study was one of only a few studies that have explored the relationships among the CoI elements. It has provided support to other recent research using the CoI framework (Shea & Bidjerano, 2009; Garrison, Cleveland-Innes, et al., 2010). Furthermore, it is only the second known study to use digital stories to improve an online community of inquiry

and the only known investigation that has explored prior collaborative learning experience, prior online learning experience, SDL, and critical thinking in the same study. Many leading educational researchers (Boyer & Mayer, 2005; Derrick, Ponton & Carr, 2005; Hanor & Hayden, 2004; Kim, 2004; MacLachlan, 2004; Merriam, et al., 2007; Ponton, Derrick, Confessore, & Rhea, 2005; Shinkareva & Benson, 2006) have indicated that the Internet is an ideal environment for facilitating SDL and that there is a great need for research in this area. Moreover, there are few studies that have shown that SDL and critical thinking can involve participation in activities with others. The findings of this study have provided insight into how to effectively design, deliver, and evaluate online courses and programs. The findings suggested that participants in the study appreciated the research story videos, and that some participants benefited from the collaborative nature of the online discussions. However, the delivery of the RDLR was just as important as its design. The role of the facilitator was critical to ensure cognitive presence. This was very evident from the CoI survey results and the qualitative interview findings. The facilitator's feedback to learners, provision of thought provoking questions, and ability to move the discussions forward seemed to be very important for participants to develop cognitive presence.

This study made a number of practical contributions. Foremost, the RDLR supplemented many of the traditional, face-to-face courses by providing an online learning element, thus providing instructors with a conduit to technology. For some course instructors, supporting this study was their first exposure to blending online learning with face-to-face learning. For other instructors, the RDLR simply provided an interactive and engaging resource to their program. In fact, some instructors have embraced the RDLR to the extent that they continue to use it in their courses. Some participants made requests to the researcher to continue being able to access the

RDLR after their course had finished. Moreover, a number of researchers and students from Asia, Australia, and the United States who have read some of the preliminary work on the RDLR (Archibald, 2010) have asked for access to the resource.

Another practical contribution seemed to be the inclusion of videos in the RDLR. The use of story telling proved to be a significant collaborative learning activity. The researcher story videos provided a human element to research. The stories made the concept of conducting research authentic or personally meaningful for the participants. As one participant noted, the videos "put a face to the research." In some instances the researchers used humour in their narratives in describing how things can still go wrong even when a study is well designed, demonstrating the need to make the best of the situation when this occurs.

Finally, there has been a great deal of interest in the RDLR as a tool to assist learning about educational research. The researcher is currently working to make the RDLR accessible to other academic institutions. Moreover, the RDLR is currently being used in several research methods course in the Masters of Education program and in the School of Nursing at the University of Ottawa. The course instructors who are using the RDLR recognise the usefulness of the research videos and also the benefits of collaborative online discussions. Medical education scholarship is a growing field within medical training centres. The recent creation of the Academy of Innovation in Medical Education (AIME) is a testament to the value the medical community has placed on the promotion of innovation and advancement of education. AIME has been very supportive of technology supported education and it is anticipated that the RDLR will be used in future medical education related endeavours.

On a methodological level, there is also much to be learned about mixed method studies. Tashakkori and Creswell (2007) indicated, "Mixed methods is still developing and will do so for

years to come. There are important unresolved issues and unexplored aspects that need to be explored" (p. 4). This research clearly outlined a research design, defined terms related to mixed methods research, and illustrated how quantitative and qualitative data can lead to outcomes that corroborate, elaborate, complement, and even sometimes contradict each other. In this study the significant results from the first phase of the study were elaborated through qualitative methods to give further insight into factors that may affect cognitive presence. The findings from the interview transcripts provided more evidence for the roles that teaching presence and social presence have in supporting cognitive presence. Evidence from the interview transcripts also provided some possible explanations as to the effect SDL readiness, prior online learning experience, and prior collaborative learning have on the participants' learning experience; even if this qualitative data seemed to complement or at times contradict the quantitative results. Moreover, the qualitative findings shed light onto some of the barriers to cognitive presence that may help to direct future research in online learning. An interesting finding from this study that was made clear through using both quantitative and qualitative methods was that receiving participation marks made a difference in the amount of discussions. In some intervention sites in which there were no external incentives (i.e., a participation mark) there were very little or even no discussions. This finding supports the literature that participation marks should be used by instructors to encourage discussion participation (Bliss & Lawrence, 2009; Shea et al., 2003).

Social software and other Web 2.0 technologies do not necessarily make learning better – having conversations online is not for everyone. Furthermore, it was evident, especially in a few of the interviews, that the discussions were not necessary to enhance the learning experience for all learners.

Future Research

The findings presented in this study offer new opportunities for future research. Furthermore, there remain some unanswered questions that still need to be addressed. The first opportunity has to with exploring technologies in online learning. The CoI survey instrument was useful in assessing the effectiveness of the RDLR. Future research using the CoI survey instrument to explore the utility of other new teaching and learning technologies is warranted. In addition to this study, Swan and Ice (2010) cited five other studies that are in the process of using the CoI framework to explore cognitive, teaching, and social presence through the use of innovative multimedia tools. We are now in an exciting era of Web 2.0 technologies that need to be explored to determine their effectiveness in formal online education settings.

In this study, teaching and social presence accounted for almost 70% of the variance in cognitive presence. How can the remaining variance be explained? At the outset of this research it was anticipated that SDL readiness, prior online learning experience, and prior collaborative learning experience would account for much of the variance but that has proved not to be the case. Further research into the new social software technologies of Web 2.0 may allow researchers and educators to answer this question.

Collaborative learning is certainly important for sustaining an online community of inquiry. Prior collaborative learning experience may very well too. Recent research has shown that there is a role adjustment that novice online learners make in order to succeed when learning online. Thus, prior online learning experience may be an important part of how social presence is developed, which in turn affects cognitive presence. However, we need to consider what prior collaborative learning experience and prior online learning experience really mean in terms of sustaining an online community of inquiry.

SDL is an interesting area of adult education that still needs to be explored with relation to the Internet, in both formal and informal learning situations. Perhaps asynchronous online discussion boards are not the best venue for exploring this phenomenon. Other forms of social software may provide researchers with more insight into SDL, particularly in informal learning settings.

It would be interesting to explore the use of the RDLR in work placements; for example, with medical residents conducting research projects. The field of medical education is growing quickly and many medical schools in Canada are adding departments specifically for the promotion of education, both within and outside their faculties. The RDLR could be used in many educational research development projects. Some examples are given in the next section of limitations to this study. However, it is suggested that if research is to continue on the development of critical thinking skills this takes place outside of asynchronous online discussions.

The final suggestion for future research has to do with using mixed methods in educational research endeavours. Educational research is complex and therefore researchers need to look to both quantitative and qualitative methods to get a deeper understanding of the phenomena being studied. Increasingly, educational research is becoming interdisciplinary, which also adds to the complexity as researchers bring a wealth of different backgrounds and traditions to a project. The adoption of new methods and analyses can seem daunting; having an open mind is imperative for educational researchers. However, risk can have benefits. For example, the CHAID analysis is not a technique commonly used by educational researchers—it is typically used in marketing research. The CHAID analysis was very useful in helping explore how the RDLR affected the community of inquiry at a finer level than other statistical techniques.

Limitations of the Study

There were a number of limitations to this study. First, the findings were not generalisable to the greater population because the participants were all enrolled in higher education courses. It may only be possible to generalise the findings to online courses in higher education. It would be interesting, however, to use the format of the RDLR but change the content to fit other contexts. For example, instead of having digital stories from researchers, K-12 teachers with experiences in classroom management could be used. Dr. MacDonald, the researcher's academic supervisor, has a series of videos from two exemplary public school administrators that could be easily incorporated into a learning resource. Digital stories could also be incorporated in other venues such as the workplace.

Second, some participants may have had a great deal of prior exposure to collaborative team learning and also online learning, which in turn may have had an impact on the outcomes measured in this study. Despite many participants indicating that they used the Internet frequently for learning in general, many had never taken a formal online course. Likewise some participants may have been exposed to collaborative learning activities in their lifetime but may not have been exposed to the formal examples mentioned in the demographic questionnaire. Perhaps the researcher could have incorporated broader definitions of online learning and collaborative learning.

A third limitation was that not all participants had access to high-speed Internet, and that this may have affected the results of the study. Some participants became frustrated if they could not watch the videos or if they had to travel into campus to watch them.

A fourth consideration was the time required for networking and social cohesion, as well as learning about research design. The use of the RDLR was constrained by the course

parameters and that may have contributed to study results. If the courses were conducted over a longer time frame, participants may have viewed more of the videos and participated in more of the online discussions

A fifth limitation was that the researcher was the facilitator of the online discussions. If the course instructors had facilitated the discussions the participation rate may have been higher. Course instructors would inevitably have enhanced the online discussions as they would have been able to provide their expertise and experience. Moreover, learners may have been more inclined to participate as the instructors were giving them a final grade for the course.

The study was limited to participants in the departments of education, medical education, nursing, and interprofessional healthcare. It would have been interesting to incorporate the RDLR in other fields, such as law, engineering, sociology, anthropology, and other social sciences.

Finally, due to the nature of qualitative research, during the second phase of this study, and despite having taken many precautions it is possible that the researcher's biases may have influenced the analysis and interpretation of the findings (as is possible in all data analyses). As well, some participants may not have been critical of the RDLR as they knew the researcher had created it and that it was part of his Ph.D. research.

Lessons Learned

There were several lessons learned from this research study:

1. Mixed method studies are time consuming and expensive. However, they do provide richer results than either quantitative or qualitative methods alone. Researchers considering this approach should carefully consider whether mixed methods is the best approach to answer their research question(s). In addition, the research backgrounds of

researchers in multi-discipline and multi-site projects, the budget, and the timelines need to be considered.

2. The time between the pilot and the actual research study was relatively short. It would have been better to have had more time to conduct the pilot and evaluate the results before starting the research. However, due to time constraints this was not possible. Nonetheless, more time would have enabled the researcher to develop a more detailed prototype of the RDLR and a longer pilot period with more participants would have provided more reliable data. Moreover, more time between the pilot and the research would have allowed further reflection and refinement of the resource.
3. Recruiting more intervention sites from the start would have sped up the research. The researcher may have been able to recruit participants enrolled in research methods courses outside of Education, Medicine and the Health Sciences to incorporate more representation from the social sciences.

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Appendix A

Research Design Learning Resource (RDLR)

A-1: Screen Shots of the RDLR

A-2: Interactive Model of Research Design (Maxwell, 2005)

A-3: Descriptions of the RDLR Research Stories

A-1

Figure 1.1. Screen shot of the RDLR presenting a research story.

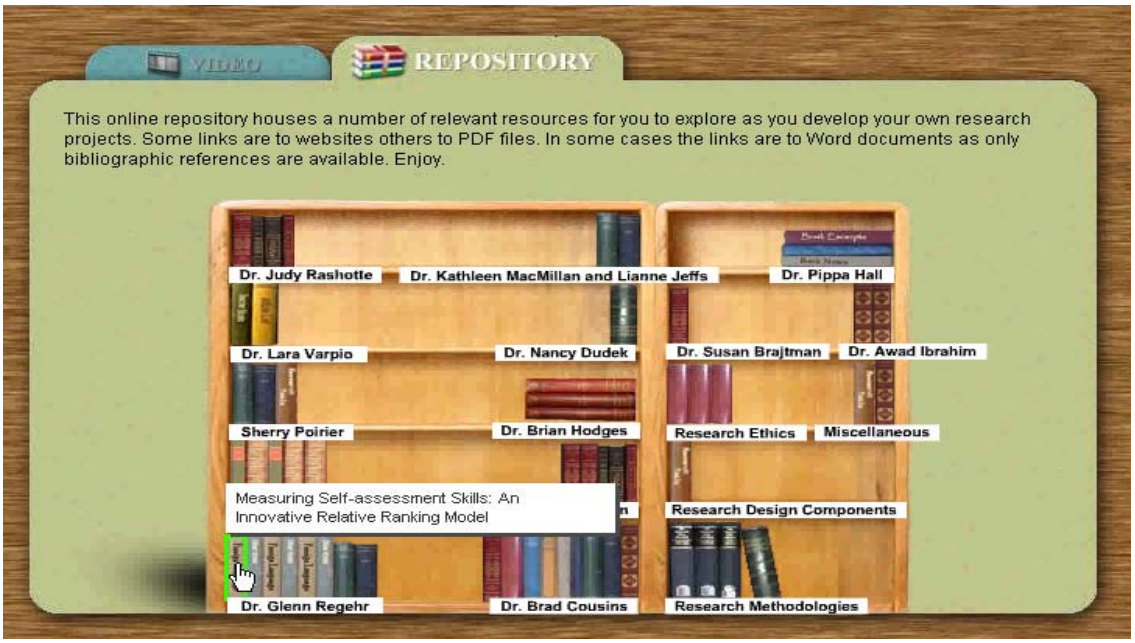

Figure 1.2. Screen shot of the RDLR presenting the online repository.

A-1

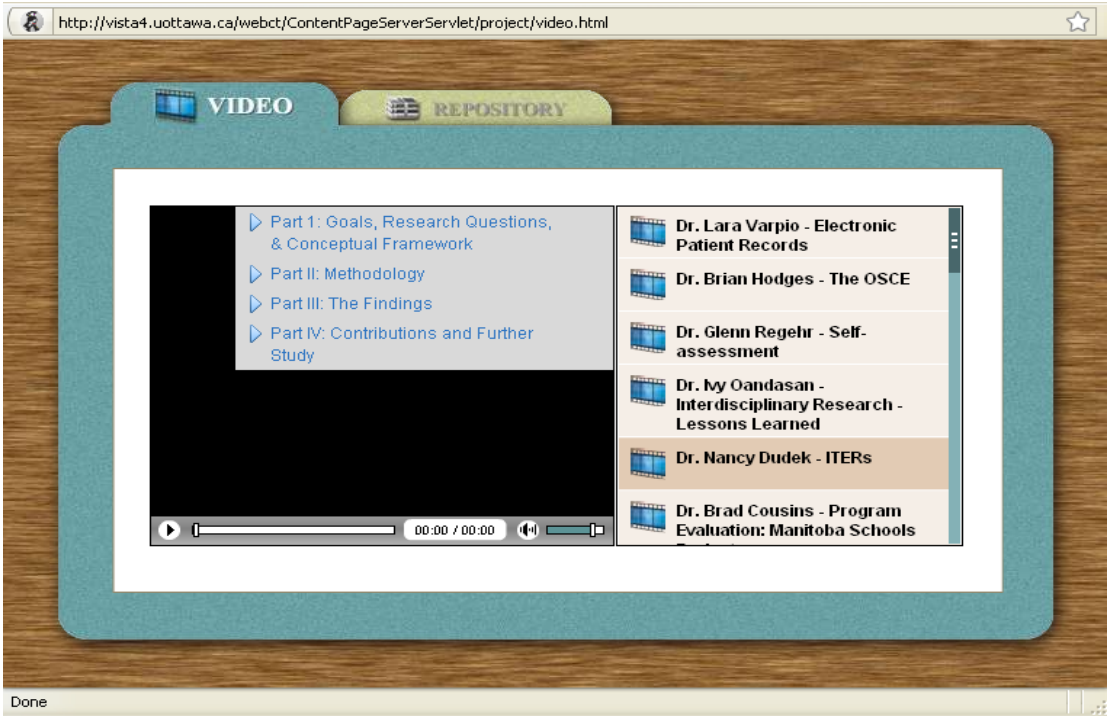

Figure 1.3. Screen shot of the RDLR presenting the video segments of a research story.

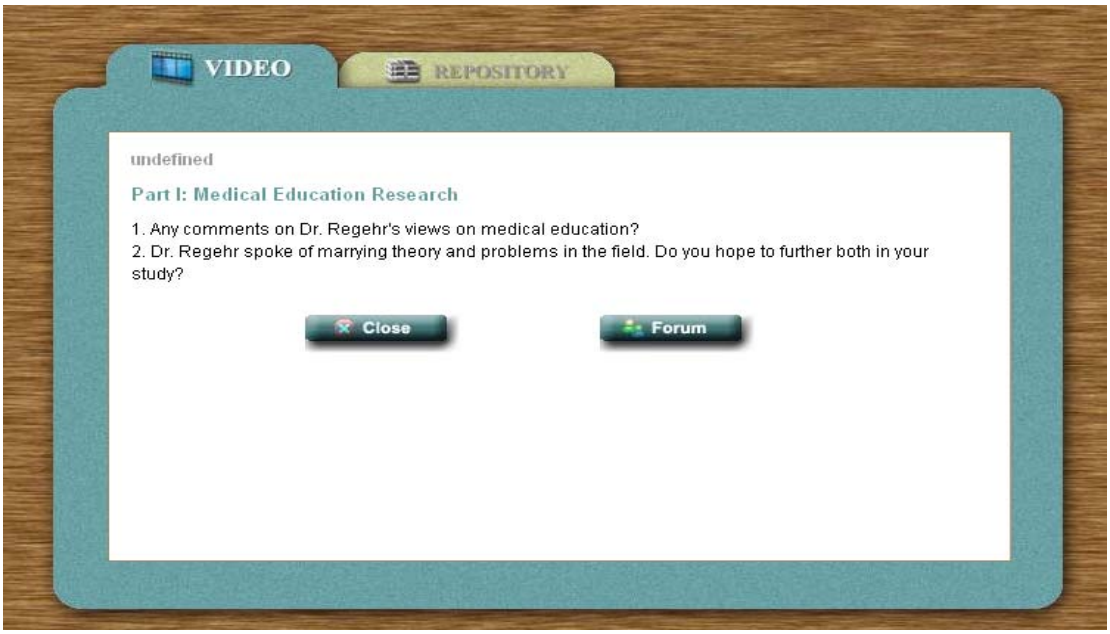

Figure 1.4. Screen shot of the RDLR presenting a triggering question and link to the discussion forum.

A-2

Guidelines for Research Stories

Thanks again for agreeing to share a research story. As mentioned in our earlier conversation, I have prepared a suggested outline for you to follow. Please consider answering the questions below as you tell your story (if they are applicable). I have included them to help guide you through your story – don't feel you need to answer all of them. Some of the questions have been modified from Maxwell, 2005.

Once the videotaping has been completed, I will edit the stories into the five components of an interactive research design: goals, research questions, conceptual framework, methods, and validity (Maxwell, 2005). The discussion questions that I will prepare for the learners at the end of each component will most likely include questions similar to the ones below.

There is flexibility with regard to the length of your research story. While I would anticipate that stories will be approximately 15-20 minutes in duration, the amount of time would be determined by how much of the research process you want to share.

Thank you for your time and consideration.

Sincerely,
Doug Archibald

Goals

Why did you want to do your study?
Why did you feel your study was worth doing?
What practices or policies did you want to change?
At the beginning of your study, did you think your research approach would be inductive or deductive in nature?

Research Questions

What did you want to learn?
Were your questions about observing or measuring data?
What were your research questions?
Did you want to consider the participants' prior behaviours, beliefs, and feelings in your study?
Were your questions related to each other? How so?
As you reflect back on your study...Do you feel your research questions had a clear relationship with the goals of your study?

Conceptual Framework

What theories and prior research informed your research?
Did you draw on any prior experiences to understand the people you studied?
Did you draw on any prior studies to understand the people you studied?
Did you situate your study within a research paradigm?
Was there any time during your study that you revisited your research questions?
As you reflect back on your study...Did your research questions reflect the theory and research paradigm associated with your study?

Methods

Were your methods able to answer your research questions?
What approaches and techniques did you use to collect and analyze the data?
How did you select participants; times and places of data collection; and data analysis, strategies and techniques?
What were some of the barriers or unforeseen difficulties you faced collecting and or analyzing your data?

Validity

What do you think were the potential threats to validity in your study? Explain.

Reference

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd ed.). Thousand Oaks, CA: Sage.

A-3

Descriptions of the RDLR Research Stories

(taken from an email sent to project participants)

The videos are of research stories told by education researchers in various disciplines. See the descriptions below for a summary of each researcher's story:

- **Dr. Lara Varpio**, a researcher at the Academy of Innovation in Medical Education, at the University of Ottawa, talks about her research experience on electronic patient records. Her story has been divided into four sections and there are possible discussion questions at the end of each section. Dr. Varpio uses a constructivist grounded theory approach to her research.

- **Dr. Nancy Dudek**, a clinician and researcher at the Faculty of Medicine, University of Ottawa, talks about her research experience exploring the factors identified by supervisors that affect their willingness to report poor clinical performance when completing In-Training Evaluation Reports (ITERs). Her story has been divided into four sections and there are possible discussion questions at the end of each section. Dr. Dudek uses both qualitative and quantitative collection methods.

- **Dr. Glenn Regehr**, associate director and research scientist, at the Wilson Centre, University of Toronto, talks about his research experiences on physician self-assessment. His story has been divided into seven sections and there are possible discussion questions at the end of each section. Dr. Regehr uses both qualitative and quantitative collection methods depending on which study you read in the repository.

- **Dr. Brian Hodges**, director and research scientist, at the Wilson Centre, University of Toronto, talks about his research experience on the development of the Objective Structured Clinical Examination (OSCE). His story has been divided into five sections and there are possible discussion questions at the end of each section. Dr. Hodges uses discourse analysis to approach his research.

- **Dr. Ivy Oandasan**, director at the Office of Interprofessional Education, University of Toronto, talks about her experiences in interdisciplinary research. Her story has been divided into six sections and there are possible discussion questions at the end of each section.

- **Dr. Brad Cousins**, professor in the Faculty of Education, University of Ottawa, talks about the field of program evaluation. He shares two research projects: The first involves the evaluation of schools and the second is an interdisciplinary study. Dr. Cousins uses both qualitative and quantitative methods for his studies. He uses an interesting technique of concept mapping to collect data.

- **Dr. Pippa Hall**, physician and associate professor in the Faculty of Medicine, University of Ottawa, talks about her experience in an interdisciplinary research project in palliative care. Her story has been divided into five sections and there are possible discussion questions at the end of each section. Dr. Hall uses both qualitative and quantitative methods to collect her data.

- **Dr. Susan Brajtman,** associate professor in the School of Nursing, University of Ottawa, talks about a study in which she investigated how end of life care was being taught in the School of Nursing at the University of Ottawa and Algonquin College. Her story has been divided into six sections and there are possible discussion questions at the end of each section. Dr. Brajtman uses both qualitative and quantitative methods to collect her data.

- **Terrie Lynn Thompson,** PhD candidate at the University of Alberta, talks about her experiences with three online learning studies in which she has been involved. She speaks about the importance of linking research questions to a methodology. Her story has been divided into three sections and there are possible discussion questions at the end of each section. Terrie Lynn uses Actor Network Theory and Phenomenology to ground two of the studies she speaks about.

- **Sherry Poirier,** instructor in the School of Nursing at Algonquin College, talks about a study she did to examine the teaching and learning styles in paramedicine. Her story has been divided into five sections and there are possible discussion questions at the end of each section. Sherry approaches her study using action research.

- **Dr. Judy Rashotte,** director of research at the Children's Hospital of Eastern Ontario, talks about a study that explored the lived experiences of Canadian nursing practitioners. Her story has been divided into four sections and there are possible discussion questions at the end of each section. Dr. Rashotte uses Hermeneutic Phenomenology to ground her study.

- **Dr. Awad Ibrahim,** assistant professor in the Faculty of Education at the University of Ottawa speaks about a study using the Ethnography of Performance. His study took place in a Southern Ontario high school.

- **Dr. Kathleen MacMillan,** Dean of Health Sciences at Humber College and **Lianne Jeffs** a nursing researcher at St. Michael’s Hospital in Toronto, speak about the near misses studies they have been involved in over the past five years. Their research design involved thematic analysis.

Appendix B

Visual Model of the Research Design

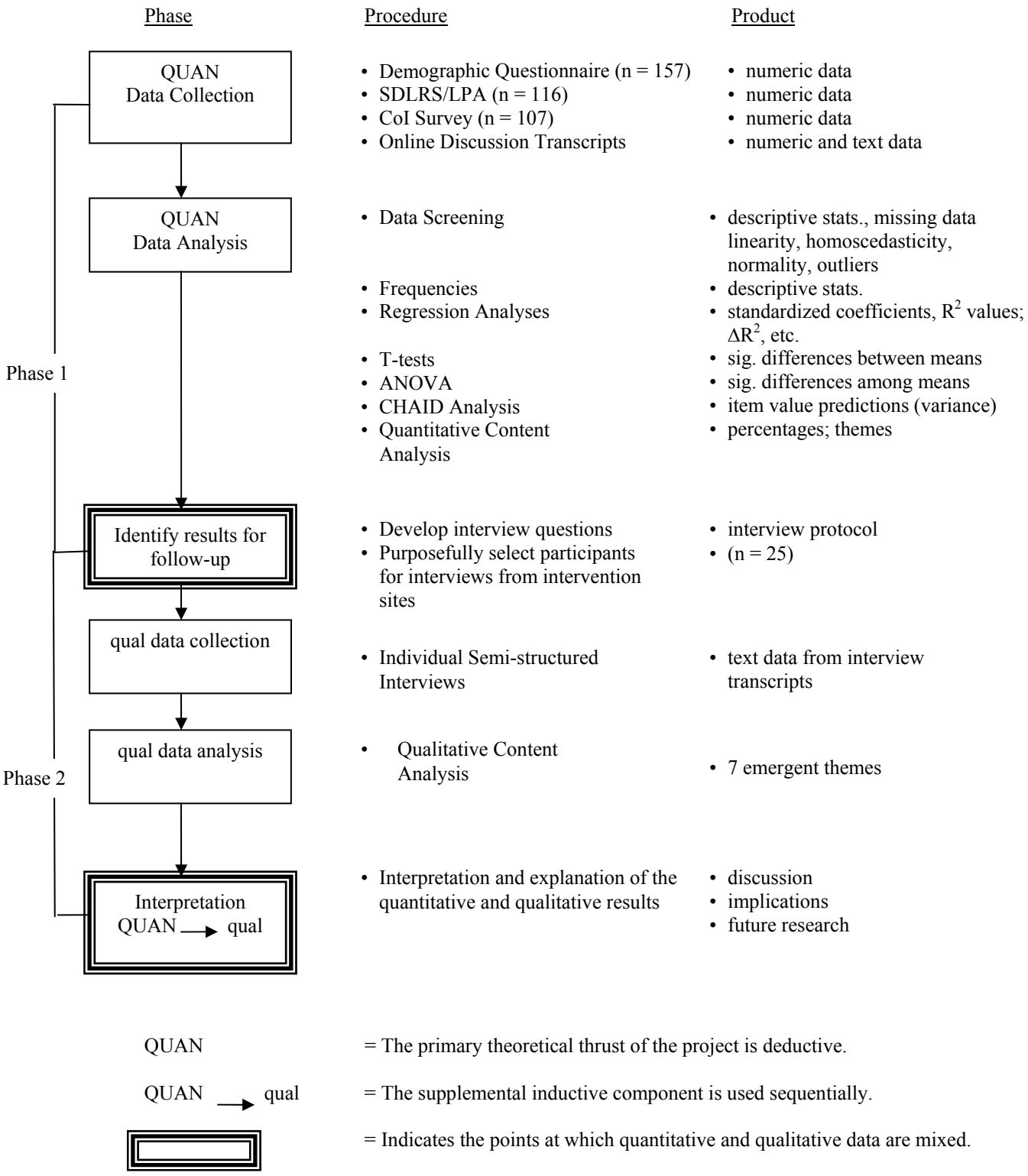

Figure 3.1. Visual model of the research design (Adapted from Ivankova, Creswell, & Stick, 2006).

Appendix C

Surveys

C-1: Demographic Questionnaire

C-2: Learner Preference Assessment

C-3: Community of Inquiry Survey Instrument

C-1

Demographic Questionnaire

Please complete the following questions. All responses will be kept confidential.

1. Student #: _____

2. Email address: _____

3. Phone Number: (_____)_____

4. Address: _____

   _____

   _____

5. Gender: Female _____ Male _____

6. Student Status: Full Time _____ Part Time _____

7. What prompted you to register for this course/workshop?

   _____

   _____

8. Rate your experience of informal learning on the Internet on a scale of 1-5.

   In other words, how often do you use the Internet to help answer questions about life, personal interest and/or essential needs? Examples could be Internet browsing, playing online games, shopping, finding medical information, finding help with hobbies etc. Please circle the most correct response.

   1= none

   2= not often

   3=sometimes

   4=often

   5=always

9. a. Is this the first online program or course you have taken? (yes/no)

   b. If you answered no, how many online courses have you taken? _____

11. What types of formal online experiences have you had? Rate your experiences on a scale of 1-5 (1= none, 2= not often, 3=sometimes, 4=often, 5=always). Please circle the most correct answer.

computer-based training	1	2	3	4	5
participated in threaded discussions	1	2	3	4	5
real-time chat	1	2	3	4	5
listened to podcasts	1	2	3	4	5
co-created wikis	1	2	3	4	5
videoconferencing	1	2	3	4	5
audioconferencing	1	2	3	4	5
simulations	1	2	3	4	5
other	1	2	3	4	5

Please explain _____

12. Would you consider your online learning experiences positive?

1 = strongly disagree

2 = disagree

3 = neutral

4 = agree

5 = strongly agree

13. Rate your experience of learning collaboratively with others on a scale of

    1-5.

    Collaborative learning refers to learning in small groups toward a common goal. In these experiences you have had an opportunity to exchange ideas and engage in discussion. Please circle the most correct answer.

    1= none

    2= not often

    3=sometimes

    4=often

    5=always

14. Would you consider your collaborative learning experiences positive?

    1 = strongly disagree

    2 = disagree

    3 = neutral

    4 = agree

    5 = strongly agree

15. What types of collaborative learning experiences have you had? Rate your experiences on a scale of 1-5 (1= none, 2= not often, 3=sometimes, 4=often, 5=always). Please circle the most correct answer.

Problem-based learning	1	2	3	4	5
Team-based learning	1	2	3	4	5
Online Collaborative Learning Projects	1	2	3	4	5
other	1	2	3	4	5

Please explain _____

(Adapted from Thompson, T-L., 2003)

C-2

Sample of the SDLRS/LPA (#1-19 of 58 items)
***Reproduced with permission from Lucy Guglielmino**

Instructions:
This is a questionnaire designed to gather data on learning preferences and attitudes towards learning. After reading each item, please indicate the degree to which you feel that statement is true of you. Please read each choice carefully and choose the response which best expresses your feeling.

There is no time limit for the questionnaire. Try not to spend too much time on any one item; however, your first reaction to the question will usually be the most accurate.

Responses

1 = Almost never true of me; I hardly ever feel this way.

2 = Not often true of me; I feel this way less than half the time.

3 = Sometimes true of me; I feel this way about half the time.

4 = Usually true of me; I feel this way more than half the time.

5 = Almost always true of me; there are very few times when I don't feel this way.

Items

1. I'm looking forward to learning as long as I'm living.

2. I know what I want to learn.

3. When I see something that I don't understand, I stay away from it.

4. If there is something I want to learn, I can figure out a way to learn it.

5. I love to learn.

6. It takes me a while to get started on new projects.

7. In a classroom situation, I expect the instructor to tell all class members exactly what to do at all times.

8. I believe that thinking about who you are, where you are, and where you are going should be a major part of every person's education.

9. I don't work very well on my own.

10. If I discover a need for information that I don't have, I know where to go to get it.

11. I can learn things on my own better than most people.

12. Even if I have a great idea, I can't seem to develop a plan for making it work.

13. In a learning experience, I prefer to take part in deciding what will be learned and how.

14. Difficult study doesn't bother me if I'm interested in something.

15. No one but me is truly responsible for what I learn.

16. I can tell whether I'm learning something well or not.

17. There are so many things I want to learn that I wish there were more hours in a day.

18. If there is something I have decided to learn, I can find time for it, no matter how busy I am.

19. Understanding what I read is a problem for me.

C-3

Survey Instrument for the Communities of Inquiry Framework

After reading each item, please indicate the degree to which you feel the statement is true

Student ID# _____

1. The instructor clearly communicated important course topics.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

2. The instructor clearly communicated important course goals.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

3. The instructor provided clear instructions on how to participate in course learning activities.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

4. The instructor clearly communicated important due dates/time frames for learning activities.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

7. The instructor helped to keep course participants engaged and participating in productive dialogue.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

8. The instructor helped keep the course participants on task in a way that helped me to learn.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

9. The instructor encouraged course participants to explore new concepts in this course.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

10. Instructor actions reinforced the development of a sense of community among course participants.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
   - ❍ 1. strongly disagree
   - ❍ 2. disagree
   - ❍ 3. neutral
   - ❍ 4. agree
   - ❍ 5. strongly agree

12. The instructor provided feedback that helped me understand my strengths and weaknesses.
    - ❍ 1. strongly disagree
    - ❍ 2. disagree
    - ❍ 3. neutral
    - ❍ 4. agree
    - ❍ 5. strongly agree

13. The instructor provided feedback in a timely fashion.
    - ❍ 1. strongly disagree
    - ❍ 2. disagree
    - ❍ 3. neutral
    - ❍ 4. agree
    - ❍ 5. strongly agree

14. Getting to know other course participants gave me a sense of belonging in the course.
    - ❍ 1. strongly disagree
    - ❍ 2. disagree
    - ❍ 3. neutral
    - ❍ 4. agree
    - ❍ 5. strongly agree

15. I was able to form distinct impressions of some course participants.
    - ❍ 1. strongly disagree
    - ❍ 2. disagree
    - ❍ 3. neutral
    - ❍ 4. agree
    - ❍ 5. strongly agree

16. Online or web-based communication is an excellent medium for social interaction.
    - ❍ 1. strongly disagree
    - ❍ 2. disagree
    - ❍ 3. neutral
    - ❍ 4. agree
    - ❍ 5. strongly agree

17. I felt comfortable conversing through the online medium.
    - ❍ 1. strongly disagree
    - ❍ 2. disagree
    - ❍ 3. neutral
    - ❍ 4. agree
    - ❍ 5. strongly agree

18. I felt comfortable participating in the course discussions.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

19. I felt comfortable interacting with other course participants.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

20. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

21. I felt that my point of view was acknowledged by other course participants.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

22. Online discussions help me to develop a sense of collaboration.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

23. Problems posed increased my interest in course issues.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

24. Course activities piqued my curiosity.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

25. I felt motivated to explore content related questions.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

26. I utilized a variety of information sources to explore problems posed in this course.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

27. Brainstorming and finding relevant information helped me resolve content related questions.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

28. Online discussions were valuable in helping me appreciate different perspectives.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

29. Combining new information helped me answer questions raised in course activities.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

30. Learning activities helped me construct explanations/solutions
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

31. Reflection on course content and discussions helped me understand fundamental concepts in this class.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

32. I can describe ways to test and apply the knowledge created in this course.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

33. I have developed solutions to course problems that can be applied in practice.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

34. I can apply the knowledge created in this course to my work or other non-class related activities.
- ❍ 1. strongly disagree
- ❍ 2. disagree
- ❍ 3. neutral
- ❍ 4. agree
- ❍ 5. strongly agree

Appendix D

Interview Protocol

Interview Questions

Instructions

Thank you for agreeing to participate in this interview. The purpose of the interview is to obtain a deeper insight into the data collected from the Learner Preference Assessment and the Community of Inquiry framework instruments and to find out more about your learning experiences using the learning resource.

I would like to audio-tape us so that I can refer back to this discussion when I write my final report. Is that okay with you? During this discussion and when I write the report we will be using pseudonyms to protect your identity. No one else but my supervisor and I will have access to the interview transcripts. Please speak in a loud clear voice so the recorder picks-up what you say.

Please note that your participation is voluntary and that there are no consequences if you choose to not participate or withdraw. The recordings of this discussion will be stored in a safe location and will only be accessible to me and my supervisor.

Interview Questions

1. What was your overall experience using the resource and participating in the discussions? Please explain.

2. Did the online learning resource help you learn about the research design process? If so, how?

3. How did you see the role of the facilitator?

   Probe if necessary…(a) Did the facilitator help you with your learning? (b) Did the facilitator help you reflect upon the videos by asking evocative questions? (c) Did the facilitator help you think more critically about research? (d) What could the facilitator have done differently to make your learning experience better?

4. Was the design of the resource conducive to helping you learn more about research? Specifically, did the design of the resource help you reflect and synthesize information? Please explain.

5. How did others in your group affect your learning?

   Probe if necessary (a) Did the learners in your group help you explore your ideas? (b) Were you able to connect or build on anyone else's ideas? (c) Were you able to apply what you have learned through viewing the videos and participating in the discussions?

6. Did you feel comfortable discussing your ideas with other members of your group? Please explain.

7. Did your prior experience with collaborative learning affect how you participated in the discussions. More specifically, did this prior experience affect how you explored your ideas? Please explain.

8. Did your prior experience of using the Internet make your learning experience easier or more difficult? Do you think your prior Internet experience has helped you become a more critical thinker? Please explain.

9. Do you think being a self-directed learner had any bearing on how you explored and reflected upon the ideas generated from the videos and discussions?

If time allows…

10. What did you like best about the resource?

11. What did you like the least about the resource?

12. How could the learning resource be improved?

13. Did the learning resource help you meet your learning objectives for the course?

Appendix E

Descriptions of Intervention Sites

Canadian Association for Medical Education (CAME) Workshop

"Research in Medical Education: From Idea to Action Plan" – May 2008

Intervention Site A

This program was intended for medical educators and teachers who wish to expand their scope of their educational scholarship to include applied research. To benefit from this workshop, participants should have a basic understanding of the principles of educational design and development as well as some practical experience as a teacher, clinical supervisor, or program developer. During the workshop, participants were encouraged to take one of their own educational questions or ideas and translate them into a research proposal. By the end of the day, participants were able to outline the elements of a detailed research proposal including the process involved in articulating a clear research question, the research methodologies most appropriate to answer specific research questions, and an appropriate time line to develop a research proposal and conduct the research.

The workshop was led by Canadian medical educators including Dr. Brian Hodges from the University of Toronto and Dr. Kevin Eva from McMaster University. Interactive large group sessions introduced the basic elements of developing a proposal, and the majority of time will be spent in small groups with an expert facilitator, working on the participants' actual projects. During the Medical Education meeting, participants had the opportunity to consider diverse research studies that will be presented during both oral and poster sessions. The follow-up session allowed participants' to reconsider their own proposals based on their new insights. All participants left with a plan to further develop their own proposals and continue their proposals using the RDLR.

Participant recruitment occurred at the end of the workshop which took place on Friday May 2, 2008. The consenting participants were to use the RDLR collaboratively to develop their research proposals. The researcher served as the facilitator of the discussions.

The physicians who participated in this workshop and the study were from all regions of the country and many did not know each other before attending the workshop.

Masters in Education Program at the University of Ottawa

Introduction to Research (EDU 5190 WB) – online version – Fall Semester 2008

Intervention Site B

This course prepared learners to consult and use research in education. Among other things, it provided learners with an understanding of how to research topics and read critically, as well as an overview of various types of applied research. The course was designed to meet the special educational needs of working adult learners who wanted to complete their course of study in a stimulating meaningful environment while experiencing the flexibility and convenience of studying anytime and anywhere. Recruitment occurred during the first class which was conducted face-to-face. Participants used the RDLR to develop their several of their assignments which include developing research questions, a conceptual framework and learning about research methods. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was required by the course instructor. Participation in the study was voluntary. The course instructor had no idea who participated in the study and who did not. This course was one of the first courses that M.Ed. students take. Most participants did not know each other.

Masters in Education Program at the University of Ottawa

Introduction to Research (EDU 5190) – Fall Semester 2008

Intervention Site C

This session of EDU 5190 was conducted face-to-face and had a different course instructor. Recruitment occurred after the course had been in session for about a month. Participants used the RDLR to learn about educational research and possibly help with their assignments. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was not required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. This course was one of the first courses that M.Ed. students take. Most participants did not know each other before taking the course.

Masters of Arts in Education Program at the University of Ottawa

Research in Education (EDU 6290) – Fall Semester 2008

Intervention Site D

EDU 6290 was the introductory educational research course for MA students. Recruitment occurred after the course had been in session for about a month. Participants used the RDLR to learn about educational research and possibly help with their assignments. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was not required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. This course was one of the first courses that M.Ed. students take. Most participants did not know each other before taking the course.

Ph.D. Program in Education at the University of Ottawa

Epistemologies and Research in Education (EDU 8106) – Fall Semester 2008

Intervention Site E

EDU 8106 was a doctoral seminar designed to expose students to a critical study of epistemologies they are encountering in the Ph.D. program. Recruitment occurred after the course had been in session for about two months. Participants used the RDLR to learn about educational research and possibly help with their assignments. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was not required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. This course was one of the first courses that Ph.D. students take.

Health Science Program at the University of Ottawa

The trans-disciplinary community health program (HSS 4324) – Fall Semester 2008

Intervention Site F

The trans-disciplinary community health program (TCHP) was designed to train students in health science programs to develop, promote, and deliver a community-based health and wellness program in interdisciplinary teams through the development of onsite projects. Use of the RDLR and participation in the online discussions was not required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. As this was an interdisciplinary course participants may have known others in their program.

Perioperative Nursing Certificate Program – Algonquin College

Nursing Considerations for Complex Surgical Patients – NSG 6737– Fall Semester, 2008

Interventions Site G

This course explored the increasingly complex health problems experienced by the acutely ill patient in the perioperative environment. The registered nurses utilized research, theory and best practice guidelines to develop knowledge in assessing, planning, implementing and evaluating care to this unique population of patients. Increasingly complex situations involving geriatric and paediatric populations, cardiovascular complications, the surgical oncology patient, trauma and shock states are some of the many issues that were explored. Learners were expected to complete a collaborative project that includes developing a case study and simulation scenario that were presented to the class.

Participant recruitment occurred during the first class. Two participants were mailed consent forms as they took the course via teleconference. Participants used the RDLR to develop their case study projects and to learn about educational research. The researcher served as the facilitator in the discussions. This course was the final part of the nursing certificate program. The participants would have known each other over the past year. Use of the RDLR and participation in the online discussions was required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not.

Masters of Science – Nursing: University of Ottawa

Research Methods– NSG 5140 –Winter Semester, 2009

Interventions Site H

The purpose of this course was for students to have the opportunity to learn about the critical appraisal of published research for use in clinical practice and design of future nursing research. Methodological issues related to research problem conceptualization; design selection; sampling; instrument development; data management and analysis. Students had the opportunity to select a problem in their area of specialization and develop a methodological critique of a group of studies or a clinical research proposal.

Recruitment occurred during the first class. Participants used the RDLR to develop their several of their assignments. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. This was a mandatory in the MSc.N. program. Some participants may have known each other.

Bachelor of Science Nursing Program – Algonquin College/University of Ottawa

Health Research: Qualitative and Quantitative Approaches –HSS 3101

Winter Semester, 2009

Interventions Site I

The purpose of the introductory research course was to give students the opportunity to learn about research methods, and critical evaluation and appraisal of research on healthcare. Concepts and principles underlying development of studies and criteria for evaluation were applied to studies using various research models.

Recruitment occurred during the first class. Participants used the RDLR to develop their several of their assignments. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. This was a mandatory second year course in the nursing program. Some participants may have known each.

Masters in Education Program at the University of Ottawa

Introduction to Research (EDU 5190) – Winter Semester 2009

Intervention Site J

This session of EDU 5190 was conducted face-to-face. Recruitment occurred after the course had been in session for one class. Participants used the RDLR to learn about educational research and possibly help with their assignments. The researcher served as the facilitator in the discussions. Use of the RDLR and participation in the online discussions was not required by the course instructor. Participation in the study was voluntary. The course instructor had no idea of who participated in the study and who did not. This course was one of the first courses that M.Ed. students take. Most participants did not know each other before taking the course.

Appendix F

IRB Approval Letter

Université d'Ottawa University of Ottawa
Service de subventions de recherche et déontologie Research Grants and Ethics Services

September 26, 2008

Object: **Fostering Critical Thinking through the Authentic Design, Delivery, and Evaluation of an Online Learning Resource: A Mixed Methods Study (File#03-08-03)**

Dear Professor MacDonald and Mr. Archibald,

You will find enclosed the Social Sciences and Humanities Research Ethics Committee ethical clearance for the abovementioned study allowing you to recruit participants at the University of Ottawa (Faculty of Education, Faculty of Medicine), at the CAME conference and at Algonquin College.

During the course of the study, any modifications to the protocol or forms may not be initiated without prior written approval from the REB. You must also promptly notify the REB of any adverse events that may occur.

This certificate of ethical clearance is **valid until September 25, 2009**. Please submit an annual status report to the Protocol Officer in September 2009 to either close the file or request a renewal of ethics approval. This document can be found at:
http://www.rges.uottawa.ca/ethics/application_dwn.asp.

A copy of this approval will be sent to research services, if necessary.

Sincerely yours,

Leslie-Anne Barber
Protocol Officer for Ethics in Research
For Peter Beyer, Chair of the Social Sciences and Humanities REB

550, rue Cumberland 550 Cumberland Street
Ottawa (Ontario) K1N 6N5 Canada Ottawa, Ontario K1N 6N5 Canada
(613) 562-5841 • Téléc./Fax (613) 562-5338
http://www.uottawa.ca/services/research/rge/index.html

Appendix G

Recruitment Letter and Consent Form

G-1: Recruitment Letter

G2: Consent Form

G-1

Université d'Ottawa · University of Ottawa
Faculté d'éducation Faculty of Education

Doug Archibald
Ph.D. candidate
Faculty of Education
University of Ottawa

Date: _____

Dear students of _____,

Re: ONLINE LEARNING RESOURCE

Please find below some information regarding the online learning resource, and a description of how it pertains to my research.

Introduction

The online learning resource, discussion forums, and chat room will provide you an opportunity:

- to further develop your ideas and research questions into a fully developed research proposal;
- to view videos of research stories told by exemplary researchers;
- to discuss the videos, as they may relate to your research projects, with other participants in the workshop, the researcher and/or the course facilitator;
- to share the development of your research project with other participants in the course and receive feedback from the researcher and/or facilitator; and
- to access an online repository with numerous resources on research design.

Access

The resource can be accessed on the University of Ottawa's virtual campus.

An Invitation to Participate in a Research Project

As a Ph.D. candidate at the University of Ottawa, I am conducting research to develop an understanding of the critical thinking of learners as they use an online learning resource to collaboratively develop their ideas into well-structured research designs. My dissertation is entitled "Fostering critical thinking through the authentic design, delivery, and evaluation of an

online learning resource: A mixed methods study". Results of this research are intended to better enable online educators to design, implement and evaluate on-line learning programs to promote higher-order/critical thinking.

Participation in this research project is voluntary and will have no bearing on how you are evaluated in this course. If you agree to participate, please sign both consent forms. One is for you and the other is to be given directly to me any time during this class.

By participating in this study, you will be invited to:

- complete three short surveys (2 before using the resource, 1 after)
- view at least one video and participate in the small group discussions
- possibly participate in a 30 minute individual face-to-face or phone interview (approx. 2 weeks after completing the resource and online discussions)
- give consent for the researcher to read and use the transcripts from the online discussions and chat room for research purposes.

If you have any questions during the class, please speak to either me or the course facilitator. Your time and consideration is very much appreciated.

Sincerely,

Doug Archibald
Ph.D. candidate
Faculty of Education
University of Ottawa

G-2

Université d'Ottawa · University of Ottawa
Faculté d'éducation Faculty of Education

Fostering Critical Thinking through the Authentic Design, Delivery, and Evaluation of an Online Learning Resource: A Mixed Methods Study

Researcher: Douglas Archibald, Faculty of Education, University of Ottawa
Supervisor: Dr. Colla J. MacDonald, Faculty of Education, University of Ottawa

I am invited to participate in the above mentioned research study conducted by Douglas Archibald under the supervision of Dr. Colla MacDonald. The purpose of the study is to develop an understanding of the critical thinking of learners as they use an online learning resource to learn more about educational research and collaboratively develop their ideas for research projects (through personal reflection and online discourse). Results of this research are intended to better enable online educators to design, implement and evaluate online learning programs to promote higher-order/critical thinking. New approaches for education will be examined and insights into the relationships between collaborative learning, self-directedness, and critical thinking will be developed. The online learning resource and discussion forum will provide learners an opportunity:

- to further develop ideas and research questions into a fully developed research project;
- to view videos of research stories told by researchers
- to discuss the videos with other participants in the program;
- to share the development of their research projects with other participants in the program and receive feedback from the online discussion facilitators; and
- to access an online repository with numerous resources on research designs.

The online learning resource is available to those participating in Doug Archibald's research. The online resource is a tool to help me develop my research ideas and is not part of the evaluation of this course. My participation in this study will consist of attending and taking part in the course (which includes participating in the online discussions), completing three brief online surveys and possibly participating in a 30 minute individual interview.

The first survey is a demographic questionnaire that will take approximately 2-5 minutes to complete. It will be available online via Blackboard Vista and will be completed before using the online learning resource. The questionnaire will garner basic demographic information as well as information about my prior online learning and collaborative learning experiences. The second survey is the *Learner Preference Assessment* which is to be completed online, via Blackboard

and will take approximately 10 minutes to complete. It will be completed before using the learning resource. This survey will garner information about my abilities, attitudes, and readiness to engage in self-directed learning. The final survey is the online *Community of Inquiry Framework Survey,* which is to be completed online, via Blackboard Vista and will take approximately 5 minutes to complete. It will be completed after using the learning resource and participating in the online discussions. This survey will measure the learning outcomes and processes associated with using the online learning resource.

The interview will be conducted face-to-face, or over the telephone, and scheduled within two weeks of completing the learning resource and associated online discussions. It will be audio-taped and transcribed verbatim. In the interview the researcher and I will explore my experiences using the learning resource. About a month after the interviews I will be given a transcript of my interview. I will be asked to verify it and add, delete, or clarify any information as I see fit.

My identity will be kept anonymous and pseudonyms will be used in any direct quotations taken from either the course transcripts or interviews. My name will not appear in the research or any publications or presentations resulting from the research. To ensure confidentiality all data will be stored in a secure manner and accessible only to the researcher and his thesis supervisor. Data will be kept locked in the researchers's office. It will be kept in this manner for five years after the completion of this study and then destroyed.

Without penalty, I may withdraw from this project at any time, refuse to participate, and choose not to answer questions. At the same time, however, my involvement in this study will enable me to reflect on my own learning. By participating in this study I will collaboratively learn about education research and develop my own research ideas. I will also gain insight into my own readiness for self-directed learning, and develop my critical/higher order thinking skills.

The University of Ottawa Research Ethics Board has approved this research. Any information requests or complaints about the ethical conduct of the project may be addressed to the Protocol Officer for Ethics in Research at the University of Ottawa.

To indicate my decision to participate in this study, I will sign this letter and hand it to the researcher. There are two copies of the consent form, one of which is mine to keep.

I, _____, agree to collaborate in the research
(participant name)
project and certify that I understand the nature of the research as described above.

_____ _____
Signature of Participant Date

_____ _____
Signature of Researcher Date

□ Please check this box if you would like to receive a summary of the findings of this research.

Appendix H

Quantitative Tables

H-1: Response Rate by Intervention Site

H-2: Survey Completion (%) by Consented Participants at per Intervention Site

H-3: Demographic Characteristics of Participants (from the LPA)

H-4: Demographic Characteristics of Participants (from the Demographic Questionnaire)

H-5: Scale Items Frequency Analysis of the CoI Survey Instrument by Intervention Site

H-6: RDLR and Discussion Statistics

H-7: Inter-correlations for Cognitive Presence and Predictor Variables

H-1

Table 4.2

Response Rate by Intervention Site

Site	Eligible Learners (N=275)	Consented Participants (N= 189)	Response Rate (68.7%)	RDLR Participation
Site A	32	17	53.1%	voluntary
Site B	19	15	78.9%	required
Site C	17	10	58.8%	voluntary
Site D	25	8	32.0%	voluntary
Site E	12	8	66.7%	voluntary
Site F	28	17	60.1%	voluntary
Site G	10	10	100%	required
Site H	14	14	100%	required
Site I	106	84	79.2%	required
Site J	12	6	50.0%	voluntary

H-2

Table 4.3

Survey Completion (%) by Consented Participants per Intervention Site

	Consenting Participants	Demographic Survey	LPA	CoI Survey	RDLR Participation
Site A	17	10 (59%)	7 (41%)	4 (24%)	voluntary
Site B	15	13 (87%)	11 (73%)	12 (80%)	required
Site C	10	8 (80%)	7 (70%)	5 (50%)	voluntary
Site D	8	5 (63%)	4 (50%)	4 (50%)	voluntary
Site E	8	7 (88%)	5 (63%)	6 (75%)	voluntary
Site F	17	12 (71%)	6 (35%)	0	voluntary
Site G	10	10 (100%)	10 (100%)	10 (100%)	required
Site H	14	13 (93%)	12 (86%)	12 (86%)	required
Site I	84	76 (90%)	54 (64%)	55 (65%)	required
Site J	6	3 (50%)	1 (17%)	0	voluntary
Total	189	157	117	108	

Table 4.8 H-3

Demographic Characteristics of Participants (from the LPA)

Count Row % Column % Total	Site A (n= 7)	Site B (n=11)	Site C (n=7)	Site D (n=4)	Site E (n=5)	Site F (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=54)	Site J (n=1)	Total
Age											
under 25	0	1	3	2	2	5	2	1	30	0	46
	0	2.2	6.5	4.3	4.3	10.9	4.3	2.2	65.2	0	100.0
	0	9.1	42.9	100.0	40.0	83.3	20.0	9.1	55.6	0	40.4
25-35	1	4	2	0	1	0	4	5	18	1	36
	2.8	11.1	5.6	0	2.8	0	11.1	13.9	50.0	2.8	100.0
	14.3	36.4	28.6	0	20.0	0	40.0	45.5	33.3	100.0.	31.8
36-45	2	3	1	0	2	0	3	2	5	0	18
	11.1	16.7	5.6	0	11.1	0	16.7	11.1	27.8	0	100.0
	28.6	27.3	14.3	0	40.0	0	30.0	18.2	9.3	0	15.8
46-55	4	2	1	0	0	1	1	3	1	0	13
	30.8	15.4	7.7	0	0	7.7	7.7	23.1	7.7	0	100.0
	57.1	18.2	14.3	0	0	16.7	10.0	27.3	1.9	0	11.4
56-65	0	1	0	0	0	0	0	0	0	0	1
	0	100.0	0	0	0	0	0	0	0	0	100.0
	0	9.1	0	0	0	0	0	0	0	0	0.9
Total	7	11	7	2	5	6	10	11	54	1	114
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Education											
High School	0	0	0	0	0	5	1	0	39	0	45
	0	0	0	0	0	11.1	2.2	0	86.7	0	100.0
	0	0	0	0	0	83.3	10.0	0	72.2	0	39.5
Bachelor's	1	9	7	1	0	1	8	8	8	1	44
	2.3	20.4	15.9	2.3	0	2.3	18.2	18.2	18.2	2.3	100.0
	14.2	81.8	100.0	50.0	0	20.0	80.0	72.3	14.8	100.0	38.6
Master's	3	2	0	1	5	0	0	3	1	0	15
	20.0	13.3	0	6.7	33.3	0	0	20.0	6.7	0	100.0
	42.9	18.2	0	50.0	100.0	0	0	27.3	1.9	0	13.2
Doctoral	3	0	0	0	0	0	0	0	1	0	4
	75.0	0	0	0	0	0	0	0	25.0	0	100.0
	42.9	0	0	0	0	0	0	0	1.9	0	3.5
Associate	0	0	0	0	0	0	1	0	5	0	6
	0	0	0	0	0	0	20.0	0	100.0	0	100.0
	0	0	0	0	0	0	10.0	0	9.3	0	5.3
Total	7	11	7	2	5	6	10	11	54	1	114
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Country of Res.											
Canada	7	11	7	1	5	6	10	10	54	1	112
	6.3	9.8	6.3	0.9	4.5	5.4	8.9	8.9	48.2	0.9	100.0
	100.0	100.0	100.0	50.0	100.0	100.0	100.0	90.1	100.0	100.0	98.2
Other	0	0	0	1	0	0	0	1	0	0	2
	0	0	0	50.0	0	0	0	50.0	0	0	100.0
	0	0	0	50.0	0	0	0	10.0	0	0	1.8
Total	7	11	7	2	5	6	10	11	54	1	114
	100.0	100.0	100.0	100.0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Occupation											
Educator	6	4	2	0	1	0	0	0	0	0	13
	46.1	30.1	15.4	0	7.7	0	0	0	0	0	100.0
	85.7	36.3	28.6	0	20.0	0	0	0	0	0	11.4
Healthcare	1	2	1	0	1	0	10	11	16	1	43
	2.3	4.7	2.3	0	2.3	0	23.3	25.6	37.2	2.3	100.0
	14.3	18.2	14.3	0	20.0	0	100.0	91.7	29.6	100.0	37.8
Government	0	1	0	0	0	1	0	0	1	0	3
	0	33.3	0	0	0	33.3	0	0	33.3	0	100.0
	0	9.1	0	0	0	16.7	0	0	1.9	0	2.6
Student	0	4	4	2	3	5	0	0	37	0	55
	0	7.3	7.3	3.6	5.5	9.1	0	0	67.3	0	100.0
	0	36.4	57.1	100.0	50.0	83.3	0	0	68.6	0	48.2
Total	7	11	7	2	5	6	10	11	54	1	114
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LPA Score											
58-176	0	1	0	0	0	0	0	0	1	0	2
	0	50.0	0	0	0	0	0	0	50.0	0	100.0
	0	9.1	0	0	0	0	0	0	1.9	0	1.7
177-201	0	0	0	0	0	0	3	1	10	0	14
	0	0	0	0	0	0	21.4	7.1	71.4	0	100.0
	0	0	0	0	0	0	30.0	8.3	18.5	0	12.0
202-226	2	2	1	4	2	2	1	1	17	0	32
	6.3	6.3	3.1	12.5	6.3	6.3	3.1	3.1	53.1	0	100.0
	28.6	18.8	14.3	100.0	40.0	33.3	10.0	8.3	31.5	0	27.4

227-251	2	5	2	0	2	3	3	8	19	1	45
	4.5	11.4	4.5	0	4.5	6.8	6.8	18.2	43.2	2.3	100.0
	28.6	45.5	28.6	0	40.0	50.0	30.0	66.7	35.2	100.0	38.5
252-290	3	3	4	0	1	1	3	2	7	0	24
	12.5	12.5	16.7	0	4.2	4.2	12.5	8.3	29.2	0	100.0
	42.9	27.3	57.1	0	20.0	16.7	30.0	16.7	13.0	0	20.5
Total	7	11	7	4	5	6	10	12	54	1	117
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.9 H-4

Demographic Characteristics of Participants (from the Demographic Questionnaire)

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Gender											
male	2	2	2	1	2	1	0	0	8	0	18
	11.1	11.1	11.1	5.6	11.1	5.6	0	0	44.4	0	100.0
	20.0	15.4	25.0	20.0	28.6	8.3	0	0	10.5	0	11.5
female	8	11	6	4	5	11	10	13	68	3	139
	5.8	7.9	4.3	2.9	3.6	7.9	7.2	9.4	48.9	2.2	100.0
	80.0	84.6	75.0	80.0	71.4	91.7	100.0	100.0	89.5	100.0	88.5
Total	10	13	8	5	7	12	10	13	76	3	157
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Informal Internet usage											
none	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
not often	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 50.0 10.0	0 0 0	1 50.0 1.3	0 0 0	2 100.0 1.3
sometimes	2 8.7 20.0	2 8.7 15.4	0 0 0	0 0 0	2 8.7 28.9	0 0 0	4 17.4 40.0	1 4.3 7.7	11 47.8 14.5	1 4.3 33.3	23 100.0 14.6
often	6 7.8 60.0	6 7.8 46.2	6 7.8 75.0	1 1.3 20.0	3 3.9 42.9	7 9.1 58.3	2 2.6 20.0	9 11.7 69.2	36 46.8 47.4	1 1.3 33.3	77 100.0 49.0
always	2 3.6 20.0	5 9.1 38.5	2 3.6 25.0	4 7.3 80.0	2 3.6 28.6	5 9.1 41.7	3 5.5 30.0	3 5.5 23.1	28 50.9 36.8	1 1.8 33.3	55 100.0 35.0
Total	10 100.0	13 100.0	8 100.0	5 100.0	7 100.0	12 100.0	10 100.0	13 100.0	76 100.0	3 100.0	157 100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Online courses taken											
none	4	6	3	2	5	8	5	4	37	0	74
	5.4	8.1	4.1	2.7	6.8	10.8	6.8	5.4	50.0	0	100.0
	40.0	46.2	37.5	40.0	71.4	66.7	50.0	3.1	48.7	0	47.1
one	2	1	2	0	1	0	1	2	8	1	18
	11.1	5.6	11.1	0	5.6	0	5.6	11.1	44.4	5.6	100.0
	20.0	7.7	25.0	0	14.3	0	10.0	15.4	10.5	33.3	11.5
two	2	1	2	2	0	1	1	1	4	1	15
	13.3	6.7	13.3	13.3	0	6.7	6.7	6.7	26.7	6.7	100.0
	20.0	7.7	25.0	40.0	0	8.3	10.0	7.7	5.3	33.3	9.6
three	1	1	0	0	0	0	0	3	10	0	15
	6.7	6.7	0	0	0	0	0	20.0	66.7	0	100.0
	10.0	7.7	0	0	0	0	0	23.1	13.2	0	9.6
four or more	1	4	1	1	1	3	3	3	17	1	35
	2.9	11.4	2.9	2.9	2.9	8.8	8.6	8.6	48.6	2.9	100.0
	10.0	30.8	12.5	20.0	14.3	25.0	30.0	23.1	22.4	33.3	22.3
Total	10	13	8	5	7	12	10	13	76	3	157
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Online learning tools used (list given)											
none	2	1	0	1	1	1	3	0	6	0	15
	13.3	6.7	0	6.7	6.7	6.7	20.0	0	40.0	0	100.0
	20.0	7.7	0	20.0	14.3	8.3	30.0	0	7.9	0	9.6
a few	2	5	4	1	2	5	2	6	30	2	59
	3.4	8.5	6.8	1.7	3.4	8.5	3.4	10.2	50.8	3.4	100.0
	20.0	38.5	50.0	20.0	28.6	41.7	20.0	46.1	39.5	66.7	37.6
some	0	4	2	1	2	3	3	3	23	1	42
	0	9.5	4.8	2.4	4.8	7.1	7.1	7.1	54.8	2.4	100.0
	0	30.8	25.0	20.0	28.6	25.0	30.0	23.1	30.3	33.3	26.8
many	5	3	2	1	1	3	2	4	17	0	38
	13.2	7.9	5.3	2.6	2.6	7.9	5.3	10.6	44.7	0	100.0
	50.0	23.1	25.0	20.0	14.3	25.0	20.0	30.8	22.4	0	24.2
all	1	0	0	1	1	0	0	0	0	0	3
	33.3	0	0	33.3	33.3	0	0	0	0	0	100.0
	10.0	0	0	20.0	14.3	0	0	0	0	0	1.9
Total	10	13	8	5	7	12	10	13	76	3	157
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Positive online learning experience											
strongly	0	0	0	0	0	0	1	0	0	0	1
disagree	0	0	0	0	0	0	100.0	0	0	0	100.0
	0	0	0	0	0	0	10.0	0	0	0	0.6
disagree	1	0	1	0	1	0	1	2	5	0	11
	9.0	0	9.1	0	9.1	0	9.1	18.2	45.5	0	100.0
	10.0	0	12.5	0	14.3	0	10.0	15.4	6.6	0	7.0
neutral	4	2	2	1	3	1	1	6	30	0	50
	8.0	4.0	4.0	2.0	6.0	2.0	2.0	12.0	60.0	0	100.0
	40.0	15.4	25.0	20.0	42.9	8.3	10.0	46.2	39.5	0	31.8
agree	3	5	5	1	3	10	5	5	36	3	76
	3.9	6.6	6.6	1.3	3.9	13.2	6.6	6.6	47.4	3.9	100.0
	30.0	38.5	62.5	20.0	42.9	83.3	50.0	38.5	47.4	100.0	48.4
strongly	2	6	0	3	0	1	2	0	5	0	19
agree	10.5	31.6	0	15.8	0	5.3	10.5	0	26.3	0	100.0
	20.0	46.2	0	60.0	0	8.3	20.0	0	6.6	0	12.1
Total	10	13	8	5	7	12	10	13	76	3	157
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
exposure to collaborative learning experiences											
none	0	0	0	0	0	0	0	0	3	0	3
	0	0	0	0	0	0	0	0	100.0	0	100.0
	0	0	0	0	0	0	0	0	3.9	0	1.9
not often	1	2	0	1	0	2	2	2	9	0	19
	5.3	10.5	0	5.3	0	10.5	10.5	10.5	47.4	0	100.0
	10.0	15.4	0	20.0	0	16.7	20.0	15.4	11.8	0	12.1
sometimes	5	8	3	0	6	4	2	4	35	0	67
	7.5	11.9	4.5	0	9.0	6.0	3.0	6.0	52.2	0	100.0
	50.0	61.5	37.5	0	85.7	33.3	20.0	30.8	46.1	0	42.7
often	4	3	5	4	1	4	6	6	25	3	61
	6.6	4.9	8.2	6.6	1.6	6.6	9.8	9.8	41.0	4.9	100.0
	40.0	23.1	62.5	80.0	14.3	33.3	60.0	46.2	32.9	100.0	38.9
always	0	0	0	0	0	2	0	1	4	0	7
	0	0	0	0	0	28.6	0	14.3	57.1	0	100.0
	0	0	0	0	0	16.7	0	7.7	5.3	0	4.5
Total											
	10	13	8	5	7	12	10	13	76	3	157
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Positive collaborative learning experiences											
strongly disagree	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 33.3 7.7	2 66.7 2.6	0 0 0	3 100.0 1.9
disagree	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 8.3 8.3	0 0 0	1 8.3 7.7	10 83.3 13.2	0 0 0	12 100.0 7.6
neutral	1 2.0 10.0	4 8.2 30.4	5 10.2 62.5	0 0 0	2 4.1 28.6	4 8.2 33.3	5 10.2 50.0	3 6.1 23.1	25 51.0 32.9	0 0 0	49 100.0 31.2
agree	7 9.1 70.0	7 9.1 53.8	2 2.6 25.0	4 5.2 80.0	5 6.5 71.4	3 3.9 25.0	4 5.2 40.0	7 9.1 53.8	35 45.5 46.1	3 3.9 100.0	77 100.0 49.0
strongly agree	2 12.5 20.0	2 12.5 15.4	1 6.3 12.5	1 6.3 20.0	0 0 0	4 25.0 33.3	1 6.3 10.0	1 6.3 7.7	4 25.0 5.3	0 0 0	16 100.0 10.2
Total	10 100.0	13 100.0	8 100.0	5 100.0	7 100.0	12 100.0	10 100.0	13 100.0	76 100.0	3 100.0	157 100.0

Count Row % Column % Total	Site A (n= 10)	Site B (n=13)	Site C (n=8)	Site D (n=5)	Site E (n=7)	Site F (n=12)	Site G (n=10)	Site H (n=13)	Site I (n=76)	Site J (n=3)	Total
Types of collaborative learning experiences (list given)											
none	1	0	0	0	1	1	1	0	4	0	8
	12.5	0	0	0	12.5	12.5	12.5	0	50.0	0	100.0
	10.0	0	0	0	14.3	8.3	10.0	0	5.3	0	5.1
one	6	6	4	2	2	3	1	6	23	1	54
	11.1	11.1	7.4	3.7	3.7	5.6	1.9	11.1	42.6	1.9	100.0
	60.0	46.2	50.0	40.0	28.6	25.0	10.0	46.2	30.3	33.3	34.4
two	2	5	2	2	3	3	4	6	28	2	57
	3.5	3.5	3.5	3.5	5.3	5.3	7.0	10.5	49.1	3.5	100.0
	20.0	38.5	25.0	40.0	42.9	25.0	40.0	46.2	36.9	66.7	36.3
three	0	1	1	1	0	3	4	1	13	0	24
	0	4.2	4.2	4.2	0	12.5	16.7	4.2	54.2	0	100.0
	0	7.7	12.5	20.0	0	25.0	40.0	7.7	17.1	0	15.3
all	1	1	1	0	1	2	0	0	8	0	14
	7.1	7.1	7.1	0	7.1	14.3	0	0	57.1	0	100.0
	10.0	7.7	12.5	0	14.3	16.7	0	0	10.5	0	8.9
Total	10	13	8	5	7	12	10	13	76	3	157
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.10 H-5

Scale Items Frequency Analysis of the CoI Survey Instrument by Intervention Site

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
Design & Organization									
1. The instructor clearly communicated important course topics.	75.0 0 3.75 .50 4	83.4 8.3 4.33 1.23 12	80.0 0 3.80 .45 5	75.0 25.0 3.25 1.50 4	66.7 0 3.83 .75 6	70.0 0 4.00 .82 10	91.7 0 4.33 .65 12	80.0 3.6 3.93 .69 55	79.7 3.8 3.98 .81 108
2. The instructor clearly communicated important course goals.	75.0 0 3.75 .50 4	91.7 0 4.42 .67 12	60.0 20.0 3.40 .89 5	40.0 20.0 3.00 1.41 4	66.7 0 3.67 .52 6	60.0 0 3.80 .79 10	83.3 0 4.17 .72 12	72.7 7.3 3.85 .83 55	73.2 5.5 3.88 .83 108
3. The instructor provided clear instructions on how to participate in course learning activities.	75.0 0 4.00 .82 4	91.7 8.3 4.50 .91 12	80.0 20.0 3.80 1.10 5	75.0 0 4.00 .82 4	83.4 0 4.00 .63 6	80.0 10.0 3.90 .88 10	91.7 0 4.08 .52 12	85.4 3.6 4.04 .69 55	85.2 4.6 4.06 .74 108
4. The instructor clearly communicated important due dates/time frames for learning activities	100.0 0 4.25 .50 4	83.3 16.7 4.25 1.14 12	60.0 0 3.60 .55 5	100.0 0 4.75 .50 4	50.0 0 3.67 .82 6	70.0 0 3.80 .63 10	91.7 0 4.33 .65 12	80.0 14.5 3.95 .97 55	79.6 9.3 4.02 .90 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
Facilitation									
5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	75.0 0 3.75 .50 4	75.0 0 4.00 .74 12	20.0 20.0 3.00 .71 5	100.0 0 3.25 .50 4	33.3 0 3.33 .52 6	60.0 0 3.90 .88 10	66.7 0 3.92 .79 12	58.2 7.3 3.62 .85 55	57.4 4.6 3.67 .81 108
6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	50.0 0 3.75 .96 4	83.3 0 4.33 .78 12	60.0 40.0 3.20 1.10 5	75.0 0 3.75 .50 4	66.7 0 3.67 .52 6	60.0 0 3.90 .88 10	83.3 0 4.17 .72 12	74.6 14.5 3.78 .92 55	73.1 9.3 3.86 .87 108
7. The instructor helped to keep course participants engaged and participating in productive dialogue.	50.0 25.0 3.25 .96 4	66.7 0 3.83 .72 12	60.0 40.0 3.20 1.10 5	75.0 0 3.75 .50 4	83.3 0 3.83 .41 6	70.0 0 4.10 .88 10	91.7 8.3 4.17 .84 12	66.7 9.3 3.76 .93 54	70.1 8.4 3.80 .87 107
8. The instructor helped keep the course participants on task in a way that helped me to learn.	50.0 0 3.50 .58 4	75.0 8.3 3.75 .76 12	60.0 20.0 3.40 .89 5	75.0 0 4.00 .82 4	83.3 0 3.83 .42 6	60.0 0 3.80 .79 10	75.0 8.3 3.92 .90 12	58.2 12.7 3.55 .84 55	63.9 9.3 3.66 .80 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
9. The instructor encouraged course participants to explore new concepts in this course.	75.0 25.0 4.00 1.4 4	100.0 0 4.33 .49 12	60.0 20.0 3.40 .89 5	75.0 0 4.25 .96 4	66.7 0 3.67 .52 6	80.0 0 4.10 .74 10	83.3 0 4.17 .72 12	63.6 5.5 3.69 .74 55	72.2 4.6 3.87 .78 108
10. Instructor actions reinforced the development of a sense of community among course participants.	25.0 25.0 3.00 .82 4	75.0 0 4.17 .84 12	20.0 40.0 2.80 .84 5	50.0 0 3.75 .96 4	50.0 0 3.50 .55 6	60.0 0 3.70 .68 10	83.3 8.3 3.83 .72 12	47.3 9.1 3.44 .81 55	53.7 8.3 3.56 .82 108
Direct Instruction									
11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	75.0 25.0 3.75 1.26 4	66.7 0 3.92 .79 12	80.0 20.0 3.80 1.10 5	25.0 0 3.50 1.00 4	83.3 0 3.83 .41 6	60.0 0 3.90 .88 10	75.0 0 3.92 .67 12	66.7 9.3 3.74 .85 54	67.3 6.5 3.79 .82 107
12. The instructor provided feedback that helped me understand my strengths and weaknesses.	25.0 0 3.25 .50 4	83.4 0 4.25 .75 12	40.0 0 3.40 .55 5	75.0 0 3.75 .50 4	50.0 0 3.50 .55 6	70.0 10.0 3.80 .92 10	50.0 33.3 3.25 1.06 12	40.0 27.3 3.18 .96 55	50.0 18.5 3.42 .94 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
13. The instructor provided feedback in a timely fashion.	25.0 0 3.25 .50 4	100.0 0 4.58 .52 12	80.0 0 4.20 .84 5	75.0 0 4.00 .82 4	83.4 0 4.00 .63 6	80.0 10.0 4.00 .94 10	83.3 0 4.08 .67 12	70.4 9.3 3.74 .87 54	75.6 5.6 3.93 .83 107
Affective expression									
14. Getting to know other course participants gave me a sense of belonging in the course.	25.0 0 3.25 .50 4	50.0 0 3.58 1.17 12	80.0 0 3.80 .45 5	25.0 0 3.25 .50 4	50.0 16.7 3.33 .82 6	60.0 0 4.00 .94 10	58.4 0 3.75 .75 12	43.6 25.5 3.15 .95 55	48.2 14.8 3.39 .94 108
15. I was able to form distinct impressions of some course participants.	25.0 25.0 2.75 1.26 4	58.3 0 3.67 .65 12	80.0 0 3.80 .45 5	25.0 25.0 3.00 .82 4	50.0 33.4 3.00 1.27 6	30.0 0 3.50 .85 10	75.0 0 3.92 .67 12	40.0 25.5 3.13 .96 55	46.3 16.7 3.31 .93 108
16. Online or web-based communication is an excellent medium for social interaction.	50.0 0 3.50 .58 4	33.4 16.6 3.25 1.14 12	20.0 80.0 2.20 1.10 5	50.0 0 3.75 .96 4	66.7 0 3.67 .52 6	40.0 20.0 3.40 1.08 10	31.3 41.6 2.83 1.03 12	40.0 27.3 3.07 1.09 55	39.8 25.9 3.13 1.06 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
Open communication									
17. I felt comfortable conversing through the online medium.	25.0 25.0 3.00 .82 4	74.3 16.7 4.00 1.13 12	60.0 20.0 3.40 .89 5	75.0 0 4.25 .96 4	83.3 0 4.17 .75 6	70.0 10.0 3.80 .92 10	58.3 25.0 3.33 .89 12	59.2 20.4 3.43 1.09 54	62.6 17.8 3.57 1.04 107
18. I felt comfortable participating in the course discussions.	25.0 25.0 3.00 .82 4	58.3 16.6 3.58 1.24 12	60.0 0 3.60 .55 5	50.0 0 4.00 1.16 4	83.3 0 4.17 .75 6	90.0 10.0 4.00 .82 10	75.0 8.3 3.75 .75 12	60.0 14.6 3.43 1.09 54	63.9 12.0 3.62 .95 108
19. I felt comfortable interacting with other course participants.	25.0 25.0 3.00 .82 4	66.6 0 4.00 .85 12	75.0 25.0 3.50 1.00 5	75.0 0 4.25 .96 4	66.6 0 4.00 .89 6	90.0 10.0 4.20 .92 10	66.7 8.3 3.75 .87 12	69.1 9.1 3.67 .75 55	69.1 8.4 3.78 .83 108
Group cohesion									
20. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	50.0 0 3.50 .58 4	41.7 8.3 3.50 .91 12	60.0 0 3.60 .55 5	25.0 25.0 3.25 1.26 4	50.0 0 3.67 .82 6	60.0 0 3.67 .68 10	83.3 8.3 3.83 .72 12	54.6 12.7 3.49 .82 55	55.6 9.3 3.56 .79 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
21. I felt that my point of view was acknowledged by other course participants.	25.0 0 3.25 .50 4	66.6 8.3 3.67 .78 12	60.0 0 3.8 .84 5	50.0 0 3.75 .96 4	33.3 16.7 3.17 .75 6	80.0 0 4.00 .67 10	83.3 0 3.92 .52 12	63.7 3.6 3.67 .67 55	63.9 3.7 3.69 .69 108
22. Online discussions help me to develop a sense of collaboration.	50.0 25.0 3.25 .96 4	58.4 16.7 3.58 1.00 12	40.0 20.0 3.20 .84 5	75.0 0 4.00 .82 4	33.3 33.4 2.83 1.17 6	60.0 20.0 3.70 1.16 10	33.3 41.7 3.00 1.05 12	41.8 27.2 3.05 1.10 55	45.3 25.9 3.20 1.07 108
Triggering event									
23. Problems posed increased my interest in course issues.	100.0 0 4.00 0 4	33.4 8.3 3.42 .90 12	40.0 0 3.40 .55 5	50.0 0 4.00 1.16 4	50.0 0 3.50 .55 6	70.0 0 4.00 .82 10	50.0 8.3 3.42 .67 12	36.3 25.5 3.09 .95 55	44.4 14.8 3.35 .90 108
24. Course activities piqued my curiosity.	100.0 0 4.00 0 4	58.4 0 3.75 .75 12	40.0 20.0 3.20 .84 5	25.0 0 3.25 .50 4	50.0 0 3.50 .55 6	90.0 0 4.00 .47 10	66.6 0 3.75 .62 12	38.2 23.6 3.09 1.06 55	50.9 13.0 3.39 .93 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
25. I felt motivated to explore content related questions.	100.0 0 4.25 .50 4	66.7 0 3.92 .79 12	60.0 0 3.60 .55 5	75.0 0 3.75 .50 4	50.0 0 3.50 .55 6	60.0 0 3.70 .68 10	66.6 8.3 3.67 .78 12	30.9 36.4 2.89 1.03 55	48.1 19.4 3.31 .97 108
Exploration									
26. I utilized a variety of information sources to explore problems posed in this course.	75.0 0 3.75 .50 4	83.3 8.3 4.00 .85 12	0 20.0 2.80 .45 5	50.0 25.0 3.50 1.29 4	66.7 16.7 3.50 1.38 6	50.0 0 3.60 .70 10	83.3 0 4.17 .72 12	38.2 31.0 3.07 1.02 55	50.9 19.4 3.40 1.01 108
27. Brainstorming and finding relevant information helped me resolve content related questions.	50.0 0 3.50 .58 4	75.0 16.7 3.83 1.03 12	60.0 0 3.60 .55 5	75.0 0 4.00 .82 4	50.0 16.7 3.17 1.17 6	50.0 0 3.70 .82 10	66.7 0 3.83 .72 12	50.9 18.2 3.33 .84 55	56.4 12.0 3.51 .86 108
28. Online discussions were valuable in helping me appreciate different perspectives.	50.0 50.0 3.00 1.16 4	58.3 33.3 3.50 1.24 12	60.0 20.0 3.60 1.14 5	25.0 25.0 3.00 1.63 4	66.7 0 3.67 .52 6	90.0 0 4.20 .63 10	83.3 0 3.83 .39 12	49.1 25.5 3.20 1.08 55	58.3 20.4 3.43 1.04 108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
Integration									
29. Combining new	75.0	75.0	60.0	50.0	33.3	50.0	75.0	51.0	56.5
information helped me	25.0	8.3	20.0	25.0	16.7	0	0	16.3	13.0
answer questions raised	3.50	3.83	3.40	3.25	3.17	3.50	3.75	3.36	3.46
in course activities.	1.00	.84	.89	1.71	.75	.53	.45	.91	.86
	4	12	5	4	6	10	12	55	108
30. Learning activities	25.0	100.0	0	75.0	33.3	60.0	66.6	60.0	60.2
helped me construct	25.0	0	20.0	0	16.7	0	8.3	12.7	10.2
explanations/solutions.	3.00	4.25	2.80	4.00	3.17	3.60	3.67	3.49	3.56
	.82	.45	.45	.82	.75	.52	.78	.88	.82
	4	12	5	4	6	10	12	55	108
31. Reflection on course	75.0	83.4	25.0	75.0	50.0	70.0	75.0	52.8	60.7
content and discussions	25.0	8.3	0	0	0	0	8.3	17.5	12.1
helped me understand	3.50	3.92	3.25	4.25	3.50	3.80	3.75	3.38	3.56
fundamental concepts in	1.00	.79	.50	.96	.55	.63	.75	.95	.87
this class.	4	12	5	4	6	10	12	55	108
Resolution									
32. I can describe ways to	75.0	83.3	20.0	75.0	16.7	60.0	83.3	60.0	62.1
test and apply the knowledge	0	0	60.0	0	16.7	0	0	10.9	9.3
created in this course.	3.75	4.17	2.60	4.00	3.00	3.60	4.17	3.49	3.61
	.50	.72	.89	.82	.63	.52	.72	.77	.81
	4	12	5	4	6	10	12	55	108

Positive % Negative % Mean Standard Deviation Total	Site A (n= 4)	Site B (n=12)	Site C (n=5)	Site D (n=4)	Site E (n=6)	Site G (n=10)	Site H (n=12)	Site I (n=55)	Total
33. I have developed solutions to course problems that can be applied in practice.	50.0 25.0 3.25 .96 4	75.0 0 4.00 .74 12	60.0 20.0 3.40 .89 5	75.0 0 4.00 .82 4	16.7 0 3.17 .41 6	60.0 0 3.70 .68 10	50.0 0 3.67 .78 12	40.0 14.5 3.27 .80 55	48.1 9.3 3.46 .80 108
34. I can apply the knowledge created in this course to my work or other non-class related activities.	50.0 25.0 3.25 .96 4	83.3 8.3 4.08 .90 12	60.0 0 3.60 .55 5	75.0 0 4.00 .82 4	83.4 0 4.00 .63 6	60.0 10.0 3.70 .95 10	100.0 0 4.33 .49 12	50.9 12.7 3.42 .90 55	63.9 9.3 3.68 .88 108

Table 4.11 H-6

RDLR and Discussion Statistics

Site	RDLR			Discussions		Average	Most Active	Least Active
	Number of Visits	Average Time	Total Time	Read	Posted	Session Length	Hour of Day	Hour of Day
A	56	0:02:58	2:46:48	52	8	0:10:58	11:00-12:00	0:00-01:00
B	131	0:07:03	15:24:16	2794	72	0:28:28	12:00-13:00	03:00-04:00
C, D, E	49	0:11:29	9:23:19	368	22	0:19:44	07:00-08:00	08:00-09:00
F	11	0:02:59	0:32:58	108	5	0:02:13	21:00-22:00	06:00-07:00
G	--	--	--	--	121	--	--	--
H	137	0:11:41	26:41:32	9782	228	0:14:02	09:00 – 10:00	04:00-05:00
I	--	--	--	--	1406	--	--	--
J	110	0:06:17	11:32:25	--	--	0:09:10	14:00-15:00	02:00-03:00

Note. Dashes indicate that data was unavailable.

Table 4.20 H-7

Inter-correlations for Cognitive Presence and Predictor Variables

Measure	Cognitive Presence	Social Presence	Teaching Presence	SDL Readiness	Prior Online Learning Exp.	Prior Collaborative Learning Exp.
Cog. Pres.	--	.76	.75	.06	.05	.11
Soc. Pres.		--	.65	-.01	.12	.16
Teach. Pres.			--	.03	.18	.10
SDL Read.				--	-.02	.13
Prior Online Exp.					--	.35
Prior Coll. Exp.						--

Appendix I

Figure 5.1 Visual Model of the Coding Process (Creswell, 2008)

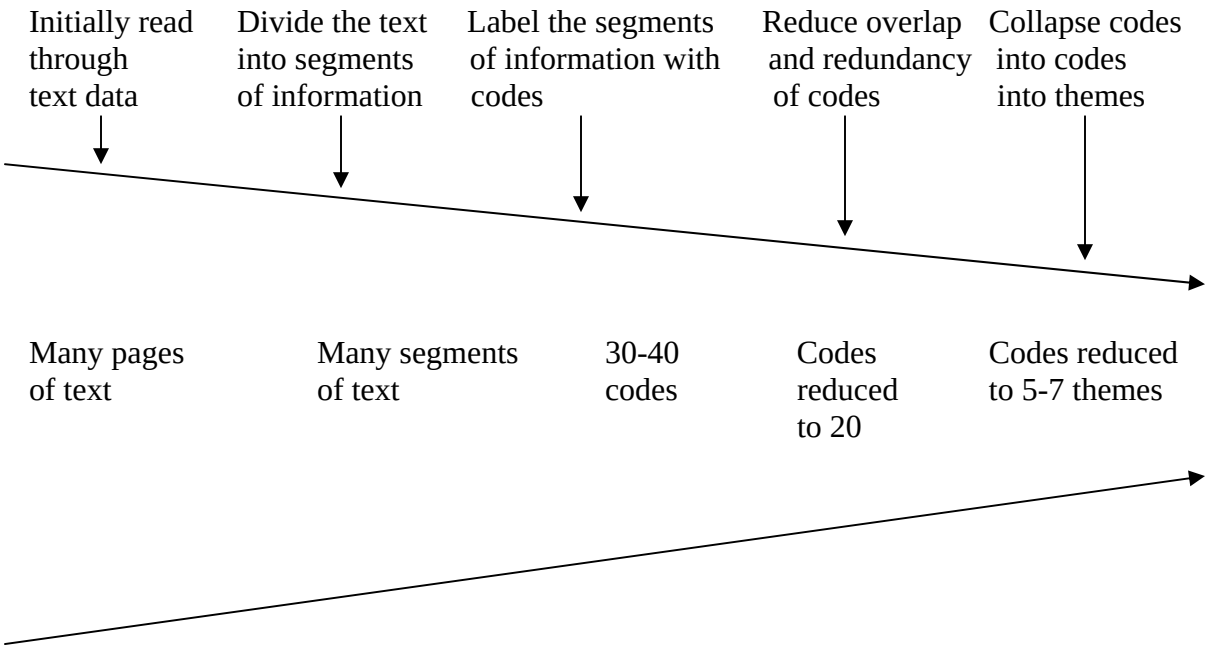

Figure 5.1 Visual model of the coding process Creswell, 2008, p. 251.