FACTORS INFLUENCING THE PROCESS OF CRITICAL THINKING AMONG HEALTH PROFESSIONALS DURING COMPUTER CONFERENCING: A CASE STUDY
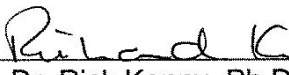
BY
MARY CLARK GREEN

A thesis submitted to the

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The undersigned certify that they have read and recommend to the Athabasca University Governing Council for acceptance a thesis "Factors Influencing the Process of Critical Thinking Among Health Professionals During Computer Conferencing: A Case Study " submitted by Mary Clark Green in partial fulfillment of the requirements for the degree of MASTER OF DISTANCE EDUCATION.

Dr. Rick Kenny, Ph.D.
Supervisor

Dr. Terry Anderson, Ph.D.
Committee Member

Dr. Martha Cleveland-Innes, Ph.D.
Committee Member

Date: April, 2005

DEDICATION

I dedicate this paper to my parents and siblings for the many eventful dinner conversations that challenged assumptions, examined values, and insisted on defensible solutions; to my own children, Danielle and Alex Green whose curiosity and reflective skepticism continue to evoke the question "why" and to David Dolsen, aka research assistant, tireless supporter and budding cook.

ABSTRACT

Despite the growing amount of research evidence regarding effective clinical interventions, rehabilitation health professionals face many barriers in applying this new information to practice. Computer conferencing among health professionals can create new learning environments for critical thinking, specifically, structured reflection, case application, and peer consultations, which are considered important strategies in research utilization.

This case study of 10 rehabilitation health professionals who had successfully completed a graduate level course on reasoning and decision making used content analysis from three data sources: computer transcripts, semi-structured interviews and learner journals. These analyses were designed to explore how health professionals use computer conferencing to integrate new knowledge to practice, how instructors facilitate critical thinking in computer conferences and whether the learners felt this technology would be useful in helping health professionals to apply new knowledge to practice.

The results indicate that instructor facilitation and instructional design are important factors in fostering critical thinking among health professionals during computer conferencing, and peer discussions are important during all phases of critical thinking and research utilization. All learners felt the technology would be useful in helping health professionals apply research to practice. They found the asynchronicity allowed time for deeper and more thoughtful reflection than face-to-face situations, and the act of writing helped to make the implicit of their reasoning explicit and understandable to others. Learners, however, felt that a skilled facilitator, peers with similar clinical backgrounds, and individual motivation were also important factors for success.

ACKNOWLEDGMENTS

TABLE OF CONTENTS

INDEX OF FIGURES

INDEX OF TABLES

CHAPTER 1

INTRODUCTION

<u>Purpose of the Study</u>

The purpose of this study was to explore the factors influencing the process of critical thinking among health professionals in text-based, asynchronous, computer-mediated conferencing.

<u>Significance and Relevance</u>

In distance education the use of web-based technologies such as computer conferencing has increased the capacity for communication and interaction in the learning process. Since computer conferencing has the ability to facilitate interaction among learners and tutors, it provides the potential to achieve higher-level cognitive goals (Garrison & Cleveland-Innes, in press; Archer, Garrison, Anderson, & Rourke, 2001; Garrison, Anderson, & Archer, 2001; Lauzon,1992; Tuckey, 1993).

Health professionals have a professional and legal responsibility to update their knowledge to provide the best care available to their client or patient. Over twenty years ago, Houle (1980) predicted an ever increasing need for continuing education in order for professions to cope with rapid social changes, the explosion of research-based knowledge, and spiraling technological innovations. Added to this are the legal, economic and political pressures applied to health care today. In a study by Craik and Rappolt (2003) rehabilitation health professionals found discussing clinical cases with peers facilitated their reflective processes and enhanced their abilities to integrate research into practice. These consultations

1

also required them to be explicit about their decision-making enabling them to clearly articulate the clinical reasoning behind their treatment approaches. Critical thinking, a reasoned or questioning approach in which one examines assumptions and seeks evidence, (Donald, 2002) takes places throughout the clinical reasoning process.

In today's health care environments, with a move away from discipline-specific departments, rehabilitation health professionals are distributed, more isolated and the opportunities for face-to-face discussions with peers are diminishing. Health professionals are separated by distances, such as those imposed within a large health system itself, or due to rural practices (Lysaght, Altschuld, Grant, & Henderson, 2001; Rappolt & Tassone, 2001; Sheppard & Mackintosh, 1998; von Zeck, 2003). There is a growing need for alternative means for timely exchange of research-based knowledge and an increasing number of continuing education courses are being provided by universities and through distance education providers (Cervero, 2001) to meet these needs. This research will increase understanding of how to use computer conferencing to facilitate critical thinking among health professionals. It is proposed that group conferencing may create a means by which health professionals can create new learning environments for structured reflection, case application, and peer consultations, which are considered important strategies in research utilization.

Definitions

The following definitions of terms were used in this study:

Case-based learning is the practice of using cases as a pedagogical tool in the fields of law, business, medicine, and education — cases may include real or imagined scenarios,

critical incidents analyses, case studies, vignettes, or anecdotal accounts. They further define

case studies as detailed analyses, usually focusing on a particular problem of an individual,

group, or organization (Educational Resources Information Centre, 2004).

Clinical reasoning is a largely, tacit, highly imagistic, and deeply phenomenological

mode of thinking. It involves more than the ability to offer explicit reasons that justify

clinical decisions because it is also based on tacit understanding and habitual knowledge

gained through experience. Clinical reasoning involves more than the simplistic application

of theory, particularly theory as understood in the natural sciences, because complex clinical

tasks often require that the therapist improvise a treatment approach that addresses the unique

meaning of disability as it related to a particular person (Mattingly, 1991, p. 975).

Computer conferencing refers to a web-based communication system that supports

asynchronous, textual interaction between two or more persons. Messages are composed in

the conferencing software and sent to a central location for retrieval from the World Wide

Web. At this location, the messages are organized or "threaded" to reflect some relevant

feature of their overall structure, usually temporal, topical or both (Rourke & Anderson,

2002).

Course method refers to both the instructor facilitation during the computer

conferences as well as the instructional design, i.e. the deliberate selection and organization

of instructional strategies.

Critical thinking is the use of those cognitive skills or strategies that increase the

probability of a desirable outcome. It is used to describe thinking that is purposeful,

reasoned, and goal directed — the kind of thinking involved in solving problems,

formulating inferences, calculating likelihoods, and making decisions, when the thinker is

using skills that are thoughtful and effective for the particular context and type of thinking task (Halpern, 2003; p. 6).

Facilitation, and in this study, group facilitation is defined as the process by which the instructors, and at times, the learners, encourage discussion and activity directed towards a common goal.

Interaction is the exchange among individuals with common (mutual) interests, in an environment in which parties influence one another (Wagner, 1994).

CHAPTER TWO

INTEGRATED SUMMARY OF THE LITERATURE

The development of critical thinking is a valued outcome in both undergraduate and post-graduate education, and in those courses that support continuing professional development. Computer conferencing has been used in these contexts in part because of its ability to deliver "any time and any place," create time delays for reflection, and produce a text-based record for further reflection and evaluation (Garrison, Anderson, & Archer, 2001). Bernard and Lundgren-Cayrol (2001) suggest that conferencing is appropriate for adult learners due to the freedom and responsibility afforded them.

Literature regarding critical thinking within computer conferences was found to be descriptive and experimental but with methodological difficulties making generalization of results difficult (Andrusyszyn, van Soeren, Spence Lachinger, Goldenberg, & DiCenso, 1999; Rourke & Anderson, 2002; Rourke & Anderson, 2004). However, studies have explored and evaluated student perceptions regarding efficacy through questionnaires and interviews (Anderson and Kanuka, 1997; Kanuka & Anderson, 1998; Rovia & Barnum, 2003). Transcript analysis has also been used to explore processes and measure not only the quantity (Bullen, 1999; Fahy, Crawford & Ally, 2001) but also categorize the types and development of cognitive thinking that occur in computer conferences (Fahy, 2002; Kanuka & Anderson, 1998). The role of the instructor in course design and facilitation has also been examined (Garrison & Cleveland-Innes, in press). The following is an integrated summary of the literature which guided this case study inquiry.

5

<u>What is Critical Thinking?</u>

If computer conferencing has the potential to foster critical thinking and this in turn facilitates the application of new knowledge to practice then it is important to start with an understanding of what is meant by critical thinking. In reviewing the literature, one finds many definitions of critical thinking as well as debates regarding how it can be taught and measured. McPeck (1981) suggests that the core meaning of critical thinking is the propensity and skill to engage in an activity with reflective skepticism and the purpose of this skepticism is to advance progress toward the resolution of a problem. Brookfield (1987) also supports the concept of reflective skepticism and believes that it is preceded by imagining and exploring alternatives to the original belief, value and/or action. He suggests that identifying and challenging assumptions is central to critical thinking but critical thinkers also consider how context influences thoughts and actions. Newman, Webb and Cochrane (1995) viewed critical thinking as more than an one-off assessment of a statement for its correctness, being a dynamic activity in which critical perspectives on a problem develop through both individual analysis and social interaction.

Although some consider critical thinking a skill, others see it as a mental process and still others, as a set of procedures. Bailin, Case, Coombs, and Daniels (1999) argue that those who become critical thinkers acquire intellectual resources such as background knowledge, operational knowledge of appropriate standards, knowledge of key concepts, and possession of effective heuristics and certain vital habits of the mind (p.285).

Teaching critical thinking according to Bailin et al (1999) is best taught by infusing it within a curriculum of specific practice which is consistent with Brookfield (1987) as

described above and McPeck's claim that critical thinking itself is contextual and cannot be generalized (1981, 1990). Bailin et al (1999) also contend that problem solving and decision making are arenas in which critical thinking should take place rather than as other kinds of thinking to be contrasted with critical thinking. Finally, group deliberation is considered an important element for fostering critical thinking (Bailin et al., 1999; McPeck, 1981). Group interaction allows for responding constructively to reasons and arguments given by others in the context of the discussion as well as furthering the point or purpose of the critical discussion while maintaining a social environment (Bailin et al., 1999).

Garrison, Anderson, and Archer (2001) who explore critical thinking within computer conferencing suggest that critical thinking is both a process and an outcome. As an outcome one would see evidence of it in individual written assignments; as a process the learner travels through different phases, both individually and with others. Their perspective of critical thinking includes creativity, problem solving, intuition, and insight (Garrison, Anderson, & Archer, 2001).

Evidence of Critical Thinking in Computer Conferences

The Community of Inquiry Model was developed by Garrison, Anderson, and Archer (2001) to investigate the written language in computer conferencing that seems to promote the achievement of critical thinking. They suggest that cognitive presence in computer conferencing is a key element in the development of critical thinking (Garrison, Anderson, & Archer, 2001; Kanuka & Garrison, 2004) and is created through the critical thinking process itself. Cognitive presence reflects higher order knowledge acquisition and application. It is defined as the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry. A community of

7

inquiry (Figure 1) includes not only cognitive presence but also teaching and social presence, which altogether are seen as essential in an educational transaction (Garrison, Anderson, & Archer, 2001).

Community of Inquiry
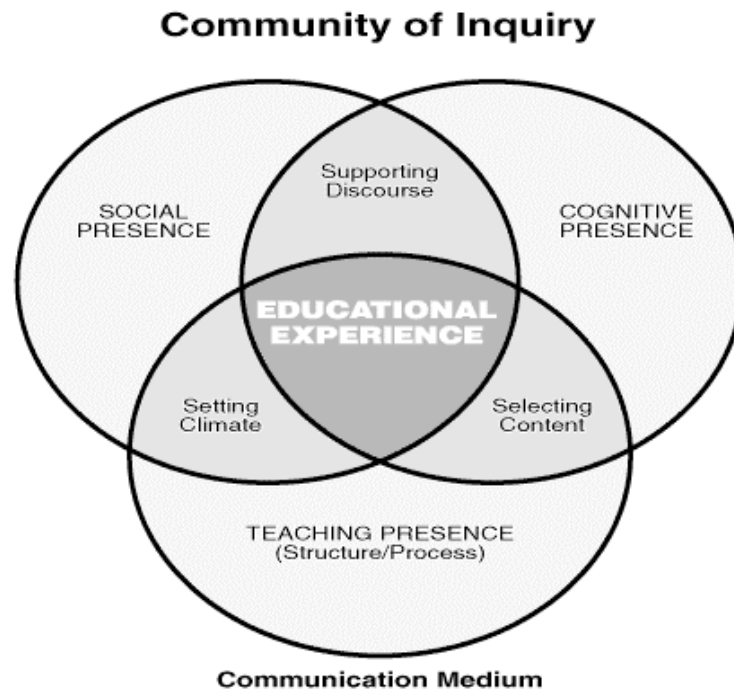
Figure 1. Community of Inquiry (Garrison, Anderson, & Archer, 2001).

In the Practical Inquiry Model (Garrison, Anderson, & Archer, 2001) critical thinking and inquiry is not purely self-reflection but an iterative and reciprocal relationship between the personal and shared worlds. It has been suggested that there are stages or phases of critical thinking in computer conferencing which are similar to Brookfield's proposed stages (1987) and include: (1) A triggering event; (2) Exploration; (3) Integration; and (4) Resolution (Figure 2). These phases also run somewhat parallel to those adapted by Craik and Rappolt (2003) from Knott & Wildavsky (1980) when exploring research utilization among

rehabilitation professionals, specifically occupational therapists. Their process identified four

stages as well. Table 1 suggests that critical thinking is part of research utilization and

fostering this through computer conferencing may aid practicing therapists in transferring

research to practice.
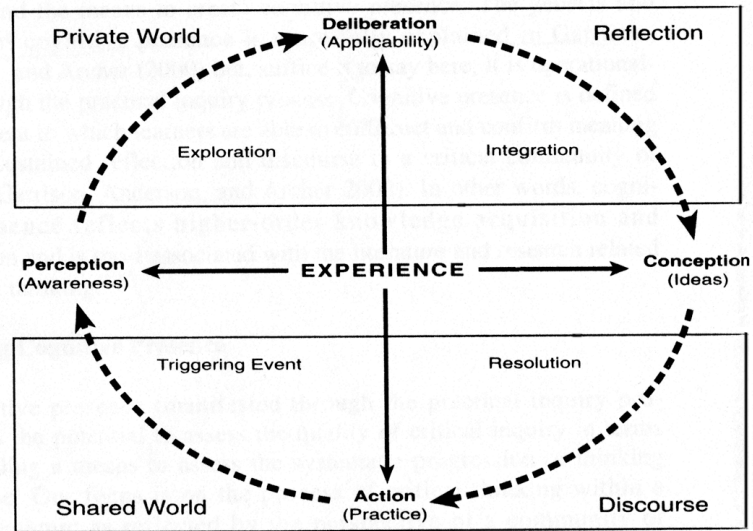
Figure 2. Practical Inquiry Model (Garrison, Anderson, & Archer, 2001)

Table 1

Comparison of the phases of the Practical Inquiry Model (Garrison, Anderson, & Archer (2001) and the Research Utilization Process (Knott & Wildavsky, 1980)

_____

Practical Inquiry Model Phases	Research Utilization Process Stages
Triggering Event Phase	**Acquisition Stage**
Recognizing the problem	Knowledge: search for research evidence
Sense of puzzlement	Skill: search for continuing education
Exploration Phase	**Cognition Stage**
Divergence within online community	
Divergence within single message	
Information Exchange	Critically analyze the evidence
Suggestions for consideration	
Brainstorming	
Leaping to conclusions	
Integration Phase	**Effort Stage**
Convergence among group members	Reflect: How does this new evidence apply
Convergence within a single message	to my clients?
Connecting ideas, synthesis	Case application
Creating solutions	
Resolution Phase	**Adoption Stage**
Vicarious application to real world	Hypothesize occupational outcomes
Testing solutions	Consult with peers, integrate peer feedback
Applying new ideas	on hypotheses
Defending solutions	Reflect: How do these new insights apply
	to other clients?

The research into computer conferences has supported the presence of critical and other higher order thinking but the frequency in which it has been identified has varied. This may be in part due to methodological difficulties (Rourke & Anderson, 2004; Rourke, Anderson, Garrison, & Archer, 2001) and many variables, such as the instructor's facilitation skills (Fahy, 2002; Garrison & Cleveland-Innes, in press; Orrill, 2002), instructional design (Anderson & Garrison, 1995; Carr-Chellman, Dyer, & Breman, 2000; Jeong, 2004; McKlin, Harmon, Evans, & Jones, 2002; & Meyer, 2004), group development (Lobel, Neubauer, & Swedburg, 2002; McDonald & Campbell Gibson, 1998), learners' experience using the technology (Andrusyszyn, van Soeren, Spence Lachinger, Goldenberg, & DiCenso, 1999), and learner characteristics (Garrison & Cleveland-Innes, in press; Rovai & Barnum, 2003).

Specific to health professionals, Curran, Kirby, Parsons, and Lockyer (2003) in a discourse analysis of computer conferencing in continuing medical education concluded that interactive participation that may lead to constructivist learning environments which include critical reflection, interaction and debate will not occur just because conferencing is being used. Rather the course design, participant characteristics and facilitation are key factors.

Newman, Johnson, Webb, and Cochrane (1997) compared face-to-face seminars and computer conferences and found significant differences in critical thinking. Learners in face-to-face situations generated more new ideas but those participating in online conferences were more likely to link ideas to solutions. However, Kanuka and Anderson (1998) found that most interactions in conferencing were ones where learners shared or compared information. Pena-Shaff, Martin, and Gay (2001) also found that computer conferences provided more task-related messages and were more appropriate for self-reflection, while

11

synchronous chat demonstrated a higher level of interactivity (evidenced by messages that asked questions, answered questions, provided support, clarified ideas, built consensus, and contained social messages).

Findings from the examination of conference transcripts of two online graduate courses were consistent with previous research; the highest frequency of coded responses fell under the exploration phase with responses dropping rapidly to 13% in the integration phase and 4% in the resolution phase (Garrison, Anderson, & Archer, 2001). The results of a more recent study by Meyer (2004) are more promising. This study analyzed transcripts in two doctoral-level classes in educational leadership and found that the majority of coded responses fell under that integration phase (32.4%) versus 27% in the exploration phase; and the resolution phase responses reached 19.8% versus 18.3% in the triggering phase.

Research has provided increased understanding regarding the factors affecting the process of critical thinking in computer conferencing. Below is a summary of these factors.

Instructor Facilitation. The instructor provides leadership in the conference through facilitation and direction of the discussion. Research conducted by Garrison and Cleveland-Innes (in press) suggests that critical discourse must be a specific design goal and interaction should be facilitated and directed in a sustained manner if deep approaches to learning are to be achieved. Fahy (2002) also found that the presence of an active moderator and the structure in computer conferences could affect the range of resulting behaviour, especially in achieving a productive balance between expository and epistolary remarks. Orrill (2002) found, however, that even with problematic software and instructor skills, students were able to engage in problem solving.

Kanuka and Garrison (2004) used a focus group interview of experts in conference facilitation to clarify how to support critical discourse in online environments. Three internal (reflection, monitoring, and the construction of knowledge) and three external (discourse, collaboration, and management) methodological constructs were identified and discussed. The conclusion was that a combination of these constructs is important and probably necessary for higher levels of learning.

Instructional Design. Anderson and Garrison (1995) found that learners' satisfaction was significantly enhanced when meaningful opportunities (specific contexts) for mediated interaction were provided. Perceived relevance of the task was also discovered to be important to enacting learning and distance collaboration in a study by Carr-Chellman, Dyer, and Breman (2000). This finding also supports the use of case-based learning. McKlin, Harmon, Evans, and Jones (2002) identified course structure as the reason for the reduced rate of resolution as compared to exploration in their study of graduate online conferences. They felt it was up to the instructor to define whether resolution can be practically achieved. In the Meyer (2004) study cited above, students were specifically requested to resolve a problem and thus, the triggering question influenced the level of response from the students and may be responsible for the higher incidence of resolution responses.

Northrup (2002) found that timely feedback from the instructor and peers, classified as collaborative interactions, were perceived to be important for learning. Jeong (2004) also studied response times and found that postings of critiques and types of argumentation exchanges produced higher response rates despite their average wait times for response being longer than those of other message types. He suggests that incorporation of argumentative

13

interactions into other types of group activities such as group problem solving would generate active and potentially constructive discussions in online learning environments.

Group Development. Social interactions may create conditions for sharing and challenging ideas but do not directly create cognitive presence (Garrison & Cleveland-Innes, in press). Social presence in computer conferencing was studied by Gunawardena (1997) and also Rourke, Anderson, Garrison and Archer (1999) who found that it enhanced learner satisfaction and therefore motivation to continue with the course. Kanuka and Anderson (1998) found that although interactions of social discord were infrequent, they did serve as a catalyst for a knowledge construction process due to evidence of social-cognitive processes in conferencing.

An increase in cognitive interactions may be a result of time. De Simone, Lou, and Schmid (2001) found that the initial group interactions were more social and personal but later developed into higher-level intellectual exchanges on issues related to the field of psychology. People collaborating as a group via computer conferencing have similar interpersonal issues, at comparable stages and proportions, as reported in face-to-face groups (McDonald & Campbell Gibson, 1998). Lobel et al (2002) found group facilitation could affect attentiveness, interaction, involvement, and participation. The findings of Bernard and Lundren-Carol (2001) were more specific and indicate that learners who choose their own groups and have lower tutor involvement produced fewer ideas in conferencing. Rourke and Anderson (2002) looked at group communication to support case studying at a distance. According to learner logs more work was done independently versus collaboratively; while in group interviews learners felt collaboration accounted for the bulk of their time. They did, however, report that decision making was done collaboratively.

14

Experience with Computer Conferencing. Learners' comfort with the technology has also been found to be an important factor and the perception that online courses do not provide the same interactivity as face-to-face delivery still exists (Anderson & Kanuka, 1997; Perdue & Valentine, 2000). In those studies not comparing distance with face-to-face delivery, it was found, however, that comfort increases over time (Andrusyszyn, van Soeren, Spence Lachinger, Goldenberg, & DiCenso, 1999; Cragg, Andrusyszn, & Humbert, 1999). It appears that student preparation for the use of this medium is important. A study by Goodyear and Steeples (1999) indicates that learners have difficulty creating clear, concise and vivid descriptions of their practice that are explicit and meaningful to peers through electronic writing. This is consistent with a study by Ronteltap and Eurelings (2002) where they found that learners needed to learn how to work collaboratively and through writing. Some literature also suggests that written communication is very closely connected with careful and critical thinking (Applebee, 1984; White, 1993). Learners' previous experience collaborating at a distance and an advanced level of understanding of the subject matter were discovered to be important to enacting learning and distance collaboration in a study by Carr-Chellman, Dyer, and Breman (2000).

Learner Characteristics. Individual learner differences can also affect critical thinking in computer conferencing. Garrison and Cleveland-Innes (in press) described three different types of student approaches to learning: deep, surface and achievement-oriented. Learners seeking only to achieve the highest mark or complete the task without application (surface) may not experience deep learning without an instructor who is able to modify the course design and facilitate the integration of new information and knowledge.

<u>Computer Conferencing for Health Professionals</u>

Practicing health professionals are adult learners, and support for computer conferencing in the continuing education of health professionals comes from a need to create cost-effective opportunities for educational opportunities that overcome barriers of distance and time. Health professionals report feelings of isolation from peers and a reduced capacity to engage in continuing professional education (Rappolt, Mitra & Murphy, 2002). Even within the same facility or organization, health professionals are often separated physically and their exact practice locations frequently change. Caseloads have increased, leaving little time for addressing their professional learning needs. As adult learners, these professionals also face the challenges of balancing multiple roles within a 24-hour day (Gillis, 2000).

How health professionals keep up-to-date with research and maintain best practices is not well understood (Rappolt, 2001; Rappolt & Tassone, 2002). Interactive workshops have been found to create moderately large changes in professional practice but didactic sessions alone are unlikely to change professional practice (Cochrane Review, 2001). Research into the ways in which health professionals continue their education indicates that they rely on informal consultations with peers as their first educational resource (Rappolt, 2002; Parboosingh, 2002). However, studies also indicate that while they fail to critically evaluate the information they receive from peers (Rappolt & Tassone, 2002) they also hesitate to apply research-proven approaches into practice without discussion with peers (Dubouloz et al., 1999). A more recent study in which health professionals used computer conferences to participate in action research studies, found they were unable to overcome known major barriers to research utilization such as time constraints and skills for critiquing and synthesizing research findings (Egan, et al., 2004).

16

Parboosingh (2002) suggests that physicians interact with peers to frame issues, brainstorm, validate and share information, make decisions, and create management protocols, all of which contribute to learning in practice. Rappolt (2002) studied these "informal educational consultants," and found that 54% of the physicians in the study turned to readily available and approachable peers and only 24% asked peers that they considered to be experts; the remaining 22% searched the literature. Of the 54% who went to "readily available peers," they rarely consulted innovators and were not critical of the advice they received.

Interaction with peers to discuss evidence and to collaborate on clinical problems appears to be important to student health professionals. Buckingham (2003) surveyed student nurses regarding their participation in online conferencing while on fieldwork placements. She found that students demonstrated that they were able to organize their knowledge in meaningful and useful ways, apply this knowledge to their practice, evaluate and discuss the quality of their readings, and connect this to their practices.

In a literature review of randomized control trials of Internet-based education in which participants were practicing health care professionals or health professionals in training, of the 16 studies that met the criteria, six generated positive changes in participant knowledge over traditional formats and three showed a positive change in practices. The other seven studies showed no difference between Internet-based education versus traditional formats for continuing medical education (Wutoh, Austin Boren, & Balas, 2004).

Theories and Models

Various papers have been written suggesting theoretical frameworks that could help support the development of critical thinking in computer conferences. Ally (2004) suggests

that when the behaviourist, cognitivist and constructivist schools of thoughts are analyzed closely, one finds many overlaps in the ideals and principles. As well, both Jonassen et al (1998) and Peters (2000) believe that behavioural and constructivist concepts can be complimentary and many learning environments use a combination of theories.

Anderson (2004) cautions that it is premature to define a particular theory of online learning but the various models present today may lead the way to one. For the purpose of this paper, the literature highlighted suggests theories to support the valued learning outcome of critical thought for graduate studies. Furthermore, because one of the learning contexts to be studied includes case studies to foster critical thinking, learning theory that supports this instructional design method will also be discussed.

The importance of interpersonal interaction to foster critical thinking originated in the work of Dewey who proposed that reflection both individually and collectively was a necessary part of an educational experience because it fosters the reconstruction of experience and the creation of new knowledge (Dewey, 1933). There are elements of social, cognitive and constructivist learning theory in Dewey's work. Social learning theory supports Dewey's collective actions (Bandura, 1977), cognitive learning schools also place importance on reflection (Ally, 2004) and constructivists maintain that new knowledge is created through learners personalizing their own experiences (Ally, 2004).

Garrison (1993) suggests adoption of socio-cognitive and constructivist theories of learning. Social cognition supports learners working together to create new knowledge collaboratively. Stacey (1999) who studied online collaborative learning with students in a Masters in Business Administration, draws attention to Vygotsky's social constructivist theory and his concept of "a zone of proximal development" as an underlying framework for

adult learning in a social context. She supports Vygotsky's theory that participating in a

group conference will contribute more to the learner's understanding than he or she is

capable of constructing individually. Learners need conversation for thinking and learning to

occur, based on Vygotksy's premise that conversation becomes internalized as thought.

Social constructivists propose that understanding occurs through social negotiation and a

collaborative evaluation of beliefs and understandings (Jonassen, Davidson, Collins,

Campbell, & Bannan Haag, 1998). Cognitive learning theory and constructivist learning

models would suggest the chance of higher order thinking is more likely to occur in an

interactive group environment versus individually (Huang, 2002).

Peters (2000) suggests that we are not used to learning according to the path outlined by

a constructivist model, and that it is a very demanding and ambitious way of learning. He

sees the shift from behavioural approaches in terms of the intensity of the interaction; the

digital environment allows learners a more favourable starting position. They themselves can

engage in a continuous search for learning, becoming active learners versus passively waiting

for the next installment of information. Peters views computer conferencing positively:

> Computer conferencing is a form of autonomous learning that leaves expository
>
> teaching and receptive learning far behind because they are replaced by independent
>
> achievements. The new learning behaviour manifests itself in the search for,
>
> assessment and application of suitable information and in careful (written!)
>
> communication and cooperation (Peters, 2000, p. 14).

Case-based teaching is one way in which to foster critical thinking. Tomey (2003)

reviewed the nursing literature and found that case studies provide a process of participatory

learning that facilitates active and reflective learning and results in the development of

critical thinking and effective problem solving skills. She maintains that case studies help

learners to analyze a case, identify problems and solutions, compare and evaluate optional

solutions, and decide how to handle the actual or hypothetical situation. This is consistent

with Jonassen and Hernandez-Serrano (2002) who suggest that because narrative stories are

essential to solving complex, everyday and professional problems, stories should also be used

as an instructional aid in the form of case-based teaching.

Many practicing health professionals, as discussed above, work independently and

engage in clinical reasoning and decision making on a daily basis. They must gather

information, relate it to that which they know and construct new knowledge in which to solve

complex clinical problems. However, research has shown that they prefer to discuss this

information and their hypotheses with peers, (Dubouloz et al., 1999; Flynn & Klein, 2001)

and not surprisingly social, cognitive and constructivist learning theory supports this. Group

discussions performed in computer conferences when focused on meaningful learning

contexts have shown to promote critical thinking and construction of new knowledge

(Stacey, 1999). In a study by Rourke & Anderson (2002) learners attributed a large part of

their learning, particularly the higher order learning, to collaboration with their group

members. The higher order processes that the learners described included: self-reflection,

knowledge application, decision-making, and criticism and revision of concepts and

solutions.

Research Questions

The results of previous research along with theory indicate support for using

computer conferencing to facilitate critical thinking among health professionals. Further

studies are needed to increase understanding of the best methods for using this technology.

The following questions guided the inquiry.

1. How does participation in peer discussions, through computer conferencing regarding cases, foster the development of critical thinking skills in practicing health professionals?

2. How does the instructor facilitate critical thinking in computer conferences?

3. How do participants perceive this technology and instructional method as a means to facilitate the application of new knowledge to practice?

CHAPTER THREE

METHODOLOGY

<u>Research Design</u>

This research used a case study design which is the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon with some real-life context (Yin, 2003). This design was chosen due to the many variables affecting the phenomena of critical thinking in computer conferencing, the availability of multiple sources of evidence and the existing theoretical propositions that could guide the data collection and analysis. These reasons are consistent with Yin's recommendations (2003). Merriam (1998) also supports the use of a case study design to not only gain an in-depth understanding of the situation under scrutiny, i.e. critical thinking in computer conferences, but also the meaning it has for those involved, in this case health professionals. In this research study, data collection consisted of computer conference transcripts, semi-structured interviews and learner journals.

<u>Research Context</u>

<u>Sampling</u>. The sample chosen to explore using computer conferences was one designed with critical thinking in mind. Rehabilitation Science (RHSC) 503 - Reasoning and Decision Making, is a course offered as part of the University of British Columbia's graduate certificate program in rehabilitation. This course is also one of the five core courses that may be applied to a Master's in Rehabilitation Science.

Participant Selection. Learners were recruited over a three-week period through emails from the course administrator and instructor. Participants included all learners from any session of RHSC 503 who agreed to allow their computer conference transcripts and journals to be analyzed, and agreed to participate in one semi-structured interview. None were excluded except those who did not wish to participate. Learners had to be willing to participate in all three aspects of the study.

The original research design called for the exploration of the course that ran in the Fall of 2004 session. Due to insufficient participation (only 5 of 13 students consented), the study was expanded to include any students who had taken the course since it was first offered in the Fall of 2002. Of the 31 former learners, 10 agreed to participate in the research study, representing 32% of all learners who had taken the course. Four of these participants took the course in the Fall of 2002, one in the Spring of 2003 and five in the Fall of 2004. The course was also held in the Fall of 2003 but the researcher was unable to recruit any learners from this session.

Description of Conferences. The course was designed by experienced developers and content experts using the WebCT platform. The course is designed to run for 13 weeks and there are seven conferences in the course. Participation in these conferences is worth 25 per cent of the learners' final grades. The criteria upon which they are graded are listed below.

(1) Reading the discussions and making substantial contributions to them.

(2) Following up on any responses to their contributions.

(3) Making contributions that are expected to:

    (a) be thoughtful questions or commentaries to enhance understanding of the topic;

    (b) be encouraging in nature, and the feedback to be explicit and practical;

(c) build on or add to a discussion, rather than duplicate previous content; and

(d) be timely in that they enable others to respond before the discussion is scheduled
to end.

The purpose of the conferences, according to the online course description, is to enable exploration of how course concepts can be applied in rehabilitation settings. The conferences vary in duration from one to three weeks. In two of the seven conferences, learners are divided into small groups.

The first online conference is moderated by the instructor and includes all learners who are required to read "Gloria" a real-life case example supplied by the instructor. In this case example, the therapist is disappointed in the clinical outcome of their intervention and the instructor asks the learners to explore alternatives, based on some of the initial readings. In the second conference, the learners are divided into small groups, and required to post their own clinical story, (one where they were not happy with the outcome), lead the discussion on their story, contribute to others and submit an "aha" summary. An "aha" summary would describe the single most important insight the learner made through the exercise. The third conference is a large group discussion. It is designed for learners to explore assumptions and values by discussing their likes and dislikes, and perceived rights and wrongs, of characters in a Tale of Two Islands, a fictional story provided by the instructor. The fourth conference discusses the challenge of using clients' stories as well as differences in clinical reasoning and decision making between the expert and novice therapist. The fifth conference revisits "Gloria" to explore further strategies. In the sixth conference, learners are split into smaller groups again, and are required to post a model of clinical reasoning and decision making, lead the critique on their model, contribute to other

proposed models, and submit a final revised model at the end of week 13. Learners are also asked to post a metaphor to represent their own clinical reasoning and decision-making.

There were differences in the conferences from one course to another. In the Spring 2003 course, they did not divide up into small groups because there were only four students. They also posted their metaphors in a seventh conference. The Fall 2004 course had a significant change in the instructional design. Rather than re-visiting "Gloria" in conference five, they reviewed another difficult clinical case, "Ethel" provided by the instructor. As well, rather than designing their clinical reasoning model individually and then posting it on the site, they worked on it in small groups and together, responded to the other learners' feedback. In two of the Fall 2004 conferences, the instructors acted only as observers. The learners were required to take turns facilitating and provided guidelines to do so.

The instructors were trained specifically in computer conferencing and are experienced facilitators. One instructor, the author of the course, instructed the first two sessions of the course (Fall 2002 and Spring 2003). The second instructor was a participant in the Spring 2003 session and did some instructing. She was the full instructor in the Fall 2004 session.

Learners were also encouraged to keep a journal to assist them in developing their model of clinical reasoning. This activity was optional in the Fall 2004 session. Some earlier learners had not kept their journals so only three out of a possible five were available for the research study.

Analysis. To explore the factors which influence critical thinking in computer conferencing, content analysis of three different sets of data was used. A quantitative transcript analysis of the conferences was completed first, followed by a qualitative content

analysis of the transcriptions of the semi-structured interviews and the journals. The original research design called for the conference transcript analysis to be done after each computer conference closed in the Fall 2004 session. However due to the need to recruit more participants, which also required an amendment to the ethics approval at both Athabasca University and UBC, the transcripts were not received until after the course had ended.

Strauss and Corbin (1998) advocate for an interplay between the quantitative and qualitative data but stress that concepts must be allowed to evolve during research study. With this in mind, the quantitative data gathered by using the COI for the conference transcript analysis provided the investigator with descriptive data regarding the distribution of social, teacher and cognitive presence as well as quantitative findings such as how many integration versus exploratory units were present in each conference. These findings were then compared and contrasted with the themes and sub-themes arising from the content analysis of the interviews and the journals. The quantitative data was then re-examined, particularly in respect to specific indicators that were similar to the emerging themes and sub-themes. This resulted in a rich picture of using real-life case studies in computer conferences to facilitate learners' critical thinking and their perceptions regarding the utility of these conferences in adopting new knowledge to practice.

Transcript Analysis. Consolidated transcripts from each of the three sessions (Fall 2002, Spring 2003 and Fall 2004) were downloaded. Contributions of those learners who did not agree to participate were not coded and only read if it were necessary to clarify a code for a participant. All participating learners were given pseudonyms and non-participants were assigned two initials.

The Community of Inquiry coding scheme developed by Garrison, Anderson and Archer (2001) was used to identify critical thinking in the conferences (Appendix C). This tool was chosen for its existing content validity based on the same authors' theoretical model of critical thinking, the Practical Inquiry Model, wherein cognitive presence is considered a product of critical thinking. As well, the indicators are representative of those identified in the critical thinking literature and run somewhat parallel to the Research Utilization Process Model. The transcripts analysis also included identifying social and teaching presence because instructor role and social interaction were also identified in the literature as factors influencing the success of computer conferencing. Using the COI, an existing tool, recognized the time limitations of the research and the investigator's expertise that did not allow for the development and testing of a new tool.

A drawback of the COI tool has been acknowledged by the authors and concerns the inability to find evidence of resolution in the coding of transcripts. They are unsure as to whether this is due to: "(a) the coding protocol; (b) the instructional design of the course; (c) the medium; (d) the students' lack of cognitive presence; or (e) a combination of all these factors and more" (Rourke, & Anderson, 2004, p. 14). Rourke and Anderson (2004) recommend data be triangulated to determine which of these indicators that the raters were observing, categorizing, and counting were perceptible to the learners, were performing their perceived function, and were differentially effective based on their frequency. The content analysis of the journals and the interviews provided some of this. The nature of this research study, however, was exploratory so the results of the quantitative analyses were used not to denote causality but to build a rich picture of the factors influencing the process of critical thinking among health professionals during computer conferencing.

Unit of Analysis. The unit of analysis was the individual posting or message. The advantages of using the message as outlined by (Rourke, Anderson, Garrison, & Archer, 2001, p. 12) include:

(1) It is objectively identifiable in that all raters can agree consistently on what constitutes a case;

(2) It produces a manageable number of cases; and

(3) The authors determine the unit.

Choosing the sentence as the unit of analysis was ruled out due to the instructional guide given to learners that suggests that point form can be used. The paragraph as the unit was also discarded as former researchers found it difficult to discern what constitutes a paragraph in many learners' postings (Rourke, Anderson, Garrison, & Archer, 2001).

All conferences were coded not just those discussing cases. Although this was a change in the original research design it was felt this might shed light on any differences between computer conferences in which the discussion focused on cases and those that did not. In both the Fall 2002 and Fall 2004 sessions the metaphor discussion was included in conference 6. In Spring 2003, it was conference seven but very short with minimal postings. To aid like comparisons the data from conference seven was added into conference 6 for the Spring 2003 session's data.

Reliability. Inter-rater reliability (IRR) was established using Cohen's kappa coefficient. This is a chance-corrected measure and has been used in previous transcript analysis studies (Garrison, Anderson, & Archer, 2001; McKlin, Harmon, Evans, & Jones, 2002). There were two raters: the investigator and a research assistant. Prior to beginning the coding, the research assistant read the research design and the literature pertaining to the

Practical Inquiry Model and the COI. The investigator and the research assistant coded the transcripts independently. Each coded the same number of units.

The raters followed the procedures outlined by Garrison, Anderson, and Archer (2001) when coding lengthier units that may contain more than one indicator or contradictory ones. "Raters *[coded] down* to an earlier phase, if it was not clear which phase is reflected; and *[coded] up* to a later phase if clear evidence of multiple phases [was] present." (p.17). For long postings that included both exploration and triggering events, the raters coded the unit as a trigger, matching it with the socio-cognitive process: "presenting background information that culminates in a question." The raters also coded two conferences which had lengthier units by paragraphs as well as by unit to see if this affected the results. It did not, so they continued with the use of the message as the unit of analysis.

An IRR form was completed for each conference (see blank sample in Appendix C). IRR was determined by mapping the data onto a table to determine how much fell on the axis of agreement. This resulted in sub-totals of agreement in the four areas of cognitive presence (trigger, exploration, integration, and resolution) and other (social and teacher presence). The coefficient of reliability (CR) was determined by dividing the total agreed by the total coded. A minimum acceptable CR is .80 (Rife, Lacy, and Fico, as cited in Rourke et al., 2000). Fifteen of the 21 conferences coded above this.

Chance agreement (CA), as per Cohen's kappa (K) was determined by summing the squares of the coefficients of each sub-totals (e.g. trigger was a sub-total). CA was then applied to the following equation:

$$K = \frac{CR - CA}{1 - CA}$$

Cohen's kappa is considered a conservative measure and values over .75 may be taken as excellent agreement beyond chance and those values between .40 and .75 are considered reasonable (Riffe, Lacy, and Fico, 1998 in Rourke, et al., 2001). All scores were above .40 and 11 out of 21 conferences were at, or above, .75 as outlined in Table 5.

Many of the conferences had fewer than 50 units to code which was a methodological weakness and affected the kappa calculations. In the Spring 2003 session there was only one participant which further reduced the number of units coded so kappa was calculated by combining all the conferences in which the learner participated. Examples of calculating for kappa in a conference with very few units can be found in Appendix D and one with over 50 units in Appendix E.

In addition to calculating kappa, the investigator and research assistant identified disagreements. Through discussion, agreement was reached with respect to the correct code for the unit under discussion.

In using COI coding template the raters found it necessary to agree upon some additional guidelines to increase the consistency of their coding. As well as the decision cited above regarding the coding of trigger events, the following guidelines were also established:

1. A single pass was done as opposed to a pass for each of the three presences, i.e. social, teaching and cognitive. If a unit included both social and cognitive presence, only cognitive presence was recorded.

2. Teacher presence was assigned only to instructors. During those conferences where learners were required to lead the discussion, the instructor was still observing and had set the structure and process. Learners' directions were coded under trigger event.

3. Under exploration event:

    a. Challenging assumptions of one's own was coded as "divergence within single message" and challenging assumptions of another learner was coded as "divergence within online community".

    b. "Information exchange" was interpreted as facts not ideas and "suggestions for consideration" was interpreted as exchange of ideas.

    c. "Brainstorming" was differentiated from "information exchange" and coded if a list of facts or ideas were posted.

4. One of the main goals of the course was to assist learners in making explicit what was implicit, in other words, putting into words the mental process behind a clinical decision. Integration according to the PIM is considered the creation or occurrence of conception/ideas whereas resolution is action or change in practice. If the learner demonstrated or stated they were "thinking differently" this was coded as resolution whether they had modified his/her clinical practice or not. A change in thinking was considered an action and thus, resolution.

5. Socio-cognitive processes for resolution events were revealed as the coding progressed and included: "Author describes application," and "Author describes change in thinking."

Table 2

Inter-rater Reliability using Cohen's kappa

Session	Units Coded	Coefficient of Reliability	Kappa
Fall 2002			
Conference 1	7	.57	.46
Conference 2			
Group A	33	.82	.74
Group B	29	.66	.61
Conference 3	13	.85	.73
Conference 4	6	.83	.78
Conference 5	5	1.0	1.0
Conference 6	23	.83	.71
Spring 2003			
Combined*	86	.55	.49
Conferences			
Fall 2004			
Conference 1	51**	.69	.61
Conference 2			
Group A	79**	.80	.75
Group B	30	.87	.80
Group C	42	.86	.82
Conference 3	45	.89	.85
Conference 4			
Group A	71**	.90	.85
Group B	36	.89	.84
Group C	125**	.76	.71
Conference 5			
Group A	10	.70	.60
Group B	20	.90	.84
Group C	26	.96	.95
Combined	56*	.89	.85
Conference 6	17	.59	.52

*only one participant   **over 50 units coded

Semi-structured Interviews. As suggested by Miles and Huberman (1994) these interviews served to supplement, validate, explain, illuminate and/or reinterpret quantitative data from the same setting — in this case — the data from the conference transcript analyses. Interviewing is also considered the best technique to use when conducting intensive case studies of a few selected individuals (Merriam, 1998) — in this case — 10 former learners of RHSC 503.

Twelve questions guided the inquiry. The first part (question #1) of the interview was more structured in order to gather factual, socio-demographic data. The remaining questions were less structured, open-ended and designed to serve as a guide only. They were initially developed based on the indicators from the transcript analysis coding template, the literature review and the research questions. Some adjustments were made based on some themes arising from the conference transcript analyses. The questions were not always asked in the same order as presented in Appendix G.

Learners who agreed to participate in the study were sent an email by the investigator to arrange a convenient time for the telephone interview and to confirm a telephone number at which they could be reached. The interviews were recorded electronically and then transcribed in order to augment the investigator's field notes.

Prior to commencing the interviews, an interview-recording sheet was prepared to assist in the recording of the field notes. The data gathered from the answers to question #1 were tabulated manually. A preliminary category of themes was also developed prior to beginning the interviews and based on the conceptual models regarding critical thinking in computer conferencing, the factors affecting computer conferencing based on the literature

review, and the research study questions. A theoretical comparison analysis was used

wherein data gathered was compared and contrasted with existing themes while still allowing

new ones to develop, similar to that described by Strauss and Corbin (1998). The data was

compared with the results of the computer conference transcript analyses, the answers to

question # 1 and the journal review analysis.

Journal Analysis. Copies of the journals from participating students were received

electronically, read and coded using the same theoretical comparison analysis described

above. Three journals were available and coded.

CHAPTER FIVE
RESULTS

The purpose of this study was to explore the factors influencing the process of critical thinking among health professionals in text-based, asynchronous, computer-mediated conferencing. It was proposed that group computer conferencing may be a way in which health professionals can create new learning environments for structured reflection, case application, and peer consultations, which are considered important strategies in research utilization. A rich picture was created and guided by the purpose statement and research questions.

<u>Socio-demographics</u>

The first part of the semi-structured interview, which elicited specific socio-demographic data, begins to paint the picture of these health professionals who participated in computer conferences as part of a formal course at a university graduate level. Contact with all the learners who had taken the course since it began in the Fall of 2002, led to the recruitment of 10 out of 33 possible participants (32%). The group is dominated by women. Their ages are evenly distributed between the ages of 30 and 59 except for one participant who is under 30 and the only male. They live in both large and medium urban areas, as well as small communities. One participant lives outside of Canada, in a small mining community in Indonesia. Most are physiotherapists working full-time. See Table 3.

Their work experience ranges from four to 33 years. Six hold clinical positions, three have both clinical and administrative responsibilities, and one is not working. Most of the participants hold baccalaureate degrees but are pursuing either the graduate certificate or

master's programs. Two have completed the certificate, and one of these two is no longer studying and the other is continuing on in the master's program. All participants have had more than one experience with computer conferencing.

Table 3

Demographics of Participants

Item	Number
Male	1
Female	9
Age Range	
20-29	1
30-39	3
40-49	3
50-59	3
Remote centre (population under 100,000)	2
Mid-size urban (population between 100,000 & 1M)	4
Large urban (population over 1M)	4
Working full-time	8
Working part-time	1
Not working	1
Level of education –	
Baccalaureate	8
Post-graduate certificate	2
Profession	
Physiotherapy	8
Occupational Therapy	2

Computer Transcript Analysis

As discussed in the literature review, developers and researchers of the Community of Inquiry Model (COI) suggest that cognitive presence in computer conferencing is created through the critical thinking process itself (Garrison, Anderson, & Archer, 2001; Kanuka & Garrison, 2004). Thus, the learners' cognitive presence was tabulated using the COI coding template (Appendix C). Their social presence was also tabulated because group deliberation is considered an important context for critical thinking (Bailin, et al., 1999; McPeck, 1991) and interaction with peers to discuss evidence and to collaborate on clinical problems appears to be important to health professionals (Buckingham, 2003; Rappolt, 2002). Finally, teacher presence was tabulated due to the building evidence that this is necessary to achieve higher levels of learning (Garrison & Cleveland-Innes, in press; Fahy, 2002; Kanuka & Garrison, 2004).

Overall Participation. Although only 32% of the learners participated in the research study, 754 out of 1,651 units (46%) were coded; see Table 4. The percentage of overall cognitive or social presence the participants were responsible for could not be calculated, only the percentage of the coded units.

Table 4

Total Units Coded in Relation to all Conference Units

Session	Units Coded	Total Units	Percentage Coded
Fall 2002			
Conference One	7	11	64
Conference Two			
Group A	33	43	77
Group B	29	50	58
Conference Three	13	20	65
Conference Four	6	9	67
Conference Five	5	8	63
Conference Six	23	30	77
Spring 2003			
Combined Conferences	86	211	41
Fall 2004			
Conference One	51	112	53
Conference Two			
Group A	79	134	59
Group B	30	100	30
Group C	42	77	55
Conference Three	45	94	48
Conference Four			
Group A	71	135	53
Group B	36	150	24
Group C	125	280	45
Conference Five			
Group A	10	21	48
Group B	20	66	30
Group C	26	62	42
Conference Six	17	38	45
Total	754	1651	46

Table 5 illustrates the distribution of participants' units for coding among cognitive, social and teaching presence. Cognitive presence is further broken down into triggering, exploration, integration and resolution events in Table 6. Coding revealed that, as in previous studies, such as Garrison, Anderson, and Archer (2001), the majority of postings fell under exploration at 42% and integration at 18% with trigger and resolution both at 8%. If one were to combine integration and resolution as those areas where critical thinking are most likely to occur, (e.g. connecting ideas, synthesis and applying new ideas) it appears that 26% of the participants' postings may indicate critical thinking.

Table 5

Cognitive, Social and Teacher Presence in Computer Conferences – All Sessions

Conference	Cognitive Presence	Social Presence	Teaching Presence	Total Units coded
One	47	4	17	68
Two A,B,C	157	48	38	243
Three	47	0	24	71
Four A,B,C	143	77	25	245
Five A,B,C	40	8	22	70
Six & Seven	28	12	17	57
Total	462	149	143	754
Percent	61%	20%	19%	100%

Table 6

Learner Cognitive and Social Presence in Computer Conferences – All Sessions

Conference	Cognitive: Trigger	Cognitive: Exploration	Cognitive: Integration	Cognitive: Resolution	Social	Total Student Units
One	4	33	8	2	4	51
Two A,B,C	34	74	33	16	48	205
Three	0	35	6	6	0	47
Four A,B,C	13	84	39	7	77	220
Five A,B,C	1	21	11	7	8	48
Six	0	7	10	11	12	40
Total	52	254	107	49	149	611
Percent	8%	42%	18%	8%	24%	100%

The percentage of coded units was slightly higher in the areas of integration and resolution than in Garrison, Anderson, and Archer (2001) where they reached only 13% in the integration phase and 4% in resolution but not as high as in Meyer (2004) where integration reached 32% and resolution was coded at 20% versus 18.3% in the triggering phase (Meyer, 2004). See Table 7.

Table 7

Learner Cognitive Presence Percentages Compared with Previous Research Studies

Research Study	Cognitive: Trigger	Cognitive: Exploration	Cognitive: Integration	Cognitive: Resolution	Social	Units Coded
Garrison, Anderson, & Archer (2002)	8%	42%	13%	4%	33%	95
Meyer (2004)	18%	27%	32%	20%	3%	278
Present Study	8%	42%	18%	8%	24%	754

The finer focus of this research study was to explore the use of case studies in conferencing. Totals for those conferences using case studies were tabulated separately. These included conferences one, two and five. In Table 8, the percentages are similar to the overall average but with a higher triggering percentage (13% versus 8%). In these conferences the instructional design directed the participants to lead the discussion on their own clinical study while the instructors observed. This usually involved the learner posting a question to trigger the discussion and/or to take the group to a new direction which may account for the slightly higher percentage of triggering events and corresponding decrease in social presence.

Table 8

Cognitiver and Social Presence in Computer Conferences – Case Studies

Conference	Cognitive: Trigger	Cognitive: Exploration	Cognitive: Integration	Cognitive: Resolution	Social	Total Student Units
One	4	33	8	2	4	51
Two A,B,C	34	74	33	16	48	205
Five A,B,C	1	21	11	7	8	48
Total	39	128	52	25	60	304
Percent	13%	42%	17%	8%	20%	100%

Consistent with previous research, changes in course design appear to influence the distribution of cognitive events (Garrison, & Cleveland-Innes, in press; McKlin, Harmon, Evans, & Jones, 2002; Meyer, 2004) and critical thinking among health professionals (Curran, Kirby, Parsons, & Lockyer, 2003). In conference three where participants explored their own values and assumptions, the percentage of exploration events rose to 74% (Table 9). Here the learners were guided only by the instructor and the teacher presence was 34%,

higher than the average 19% (Table 10). There were no triggering events nor social presence coded, and integration and resolution were both 13%.

Table 9

Cognitive and Social Presence in Computer Conferences – Values and Model Discussions

Conference	Cognitive: Trigger	Cognitive: Exploration	Cognitive: Integration	Cognitive: Resolution	Social	Total Student Units
Three (Values)	0	35	6	6	0	47
Percentage	0%	74%	13%	13%	0%	100%
Six & Seven (Models)	0	7	10	11	12	40
Percentage	0%	17%	25%	28%	30%	100%

Table 10

Teacher Presence in Computer Conferences

Conference	Teaching Presence	Percentage	Total Units Coded
One	17	25%	68
Two A,B,C	38	16%	243
Three	24	34%	71
Four A,B,C	25	10%	245
Five A,B,C	22	31%	70
Six & Seven	17	30%	57
Total	143	19%	754

As well, conference six (conference five for Fall 2004 session) where learners posted

their completed model and metaphor, exploration fell to 17% while integration rose to 25%

and resolution to 28% (Table 9). Meyer (2004) suggested that the trigger could influence the

number of postings coded in exploration, integration and resolution. In her study, 40% of the

resolution postings, which were 19.8% of all postings, occurred in discussions which

specifically requested the learners to resolve a problem. In this study, learners were asked to

post their final model and metaphor which appears to have influenced the number of

integration and resolution postings as compared to the case study and values discussions.

Figure 3 illustrates the comparison of the data obtained through the analyses of the case

studies, model, and values discussions.

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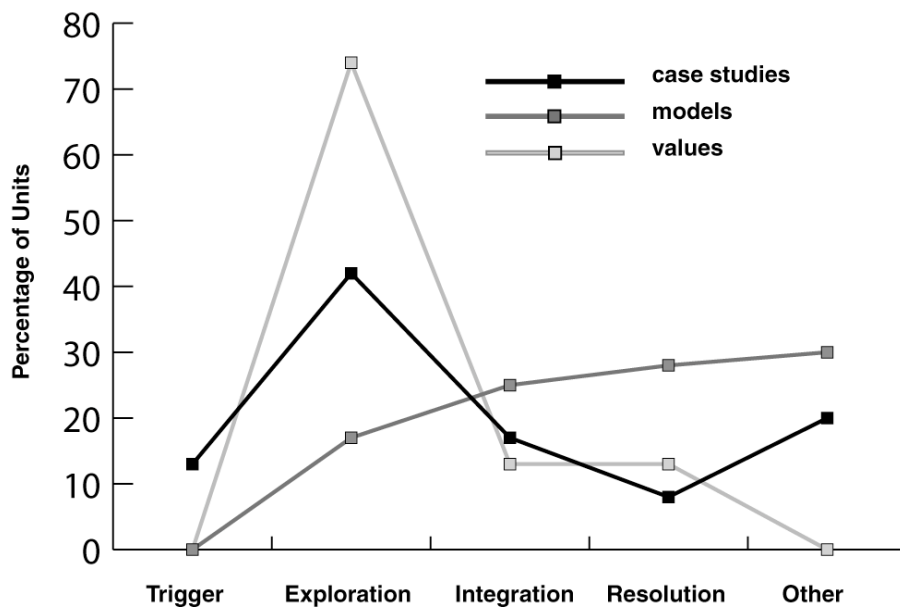
Figure 3. Comparison of case studies, model and values conferences

Session Participation. As described in the method section on page 24, during the three different sessions, changes were made to the design of the course as well as the facilitation, which may affect the distribution of cognitive events. However, when comparing the overall distribution of the three sessions with the average, one can see some similar patterns. Again, the highest percentages fall in the exploration phase for all three with integration next and trigger events and resolution following (Table 11).

Table 11

Percent Comparison of Learner Cognitive and Social Presence in Three Sessions

Session	Trigger	Exploration	Integration	Resolution	Social	# of participants
Fall 2002	6%	35%	16%	10%	16%	4
Spring 2003	16%	43%	23%	7%	11%	1
Fall 2004	8%	41%	17%	7%	27%	5
Average	8%	42%	18%	8%	24%	–

In Table 12 the data for each of the conferences in each session appears and will be discussed below under the cognitive presence events. Only one learner of a possible five from Spring 2003 session participated in the research so these results are an indication of an individual's cognitive presence rather than a group phenomenon.

Table 12

Percent Comparison of Learner Cognitive and Social Presence in each Sessions'
Conferences

Conference	Trigger	Exploration	Integration	Resolution	Other
One					
Fall 2002	0	83	17	0	0
Spring 2003	0	100	0	0	0
Fall 2004	10	58	17	5	10
Two A-C					
Fall 2002	13	44	15	9	19
Spring 2003	35	25	20	5	15
Fall 2004	15	34	16	8	27
Three					
Fall 2002	0	90	10	0	0
Spring 2003	0	83	0	17	0
Fall 2004	0	68	16	16	0
Four A-C					
Fall 2002	0	40	60	0	0
Spring 2003	0	50	0	50	0
Fall 2004	6	38	17	3	36
Five A-C					
Fall 2002	0	0	0	100	0
Spring 2003	0	33	67	0	0
Fall 2004	2	48	21	10	19
Six					
Fall 2002	0	0	27	22	50
Spring 2003	0	33	45	0	22
Fall 2004	0	31	8	54	7

Triggering Events. Except for conference 2 in the Fall 2002 and Spring 2003 sessions there were no triggering events at all. This may be due to the instructor providing specific questions outside the conference to begin the discussion and continue it through the duration of the conference. However, in the Fall 2004 session, conference four was changed from a discussion regarding differences between novice and expert practitioners and using client narratives to one in which the learners worked collaboratively to build a clinical reasoning model. Unlike the two prior sessions, these learners did not develop the model on their own but were required to work collaboratively with other learners which most likely accounts for the appearance of triggering events in this session.

As noted above, the learners were required to lead the discussion in conference two which may account for the higher percentage of triggering events in these conferences (Table 12). In the Spring 2003 session data, the triggering percentage is 35%, quite high in comparison to the average of 8% (Table 13).

Table 13

Overall Average Percent of Conferences

Conference	Trigger	Exploration	Integration	Resolution	Other (social presence)
One	8%	65%	15%	4%	8%
Two A-C	17%	36%	16%	18%	23%
Three	0	74%	13%	13%	0
Four A-C	2%	47%	25%	10%	16%
Five A-C	6%	385	17%	4%	35%

Exploration Events. As discussed above, the highest percentage of exploration events were coded in conference three which was specifically designed to explore learners' values and assumptions and solicit opinions. There is also a high percentage of exploration in each session's conference one in which learners discussed a clinical story provided by the instructor. This conference was held within the first two weeks and the learners were just beginning their readings which may account for fewer integration or resolution rated postings.

Integration and Resolution Events. Integration and resolution events are those that may indicate critical thinking as an outcome rather than a process. In both the Fall 2002 and Spring 2003 sessions there are conferences where neither integration nor resolution events occurred. This could indicate that the learners were able to integrate information during the conference but did not have the opportunity to take their new knowledge to the resolution

stage, i.e. to practise it. Those learners who appeared to jump to resolution without any integration postings, may have done the integration in their own personal world, not feeling the need, or the having the opportunity to share it during the discussions. For instance, as discussed above, the model and metaphor conferences required learners to post a completed model and well-developed metaphor, not develop it through the conference thereby encouraging integration outside of the group process. However, for the Fall 2004 learners who developed the model as a small group in conference four, there is a higher incidence of integration (17%) than resolution (3%). The actual posting of the completed model happened in the conference 6 where resolution rose to 54%.

Semi-structured Interviews Analysis

The analysis of the transcripts of semi-structured interviews led to the emergence of themes and sub-themes relating to the research purpose and questions, as well as comparisons to existing literature, theory and the observed participation evidenced in the computer transcript analysis.

New Learning Environment. It is proposed that studying by distance is a way in which to create new learning environments for health professionals and the following themes arose regarding participants' reasons for choosing distance delivery.

Convenience. Consistent with the literature (Bernard & Lundgren-Cayrol, 2001) access to the courses at anytime or anyplace was appealing to all 10 participants. Not only did they feel it saved travel time but the flexibility to choose when to study and when to participate allowed them to fit the course around existing responsibilities which included family duties and for many, full-time work.

I was wanting to do courses and waiting for something to come

by distance. I'm a business owner, so when I say full-time, it's

a bit of a joke. It's way more than full-time! … That's why I

get up a five. I had kids at home needing help with schoolwork

and so on… It was me looking for something that would fit my

schedule.

People are having to travel to get practice hours under a more

skilled or experienced therapist before they can do the

examinations. I'm frustrated with that, because I think it's a

barriers for continuing education. So the online removes a lot

of barriers for people.

Although there was access to the course at anytime, participating in the conferences

had some restrictions and most participants found the conferencing time consuming and the

greatest challenge. They reported that it took time to prepare a posting, read other the

postings and reply. They felt the need to visit the discussion room either everyday or every

other day in order to keep up and feel part of the discussion. Although it did take time, they

described the computer conferencing as an important part of the course and that their efforts

were rewarded both in their increased understanding of the topic under discussion and, for

some, the mark awarded.

For the time you save, you know, not having to travel to a

classroom, and having a set schedule… it's a little bit offset by

having to sit down and write it. By the time I get my answer

down, it had taken me half an hour to write it.

It would be more of a time issue, in terms of being able to

respond and being able to take the time to sit down and do it

and think through it in the whole mess of life.

The expectation with participating, I thought was quite high,

relative to the other two I've been a part of. But I found it

really useful and I looked forward to it.

Access to Experts. Access to knowledgeable peers and the opportunity to critically discuss recent research are known barriers to health professionals' research knowledge transfer (Egan et al., 2004). These barriers were echoed by the participants and were given as reasons for seeking out distance learning environments. Half report living in smaller or remote communities where there are no formal education programs in their specific practice area and few peers.

I was feeling the need to look beyond my own health care sort

of milieu and to look out to see what else was happening

Because I was sort of getting to the point where if I didn't see

the big picture, I probably wasn't going [to] stay in and do it

any longer. It kind of worried me because I'm a pretty

enthusiastic therapist.

50

It was a really good way to be online and not feel isolated from

the academic world.

… probably three times a year we try to get together as a group

for breakfast and talk about what's going on. Otherwise, I have

a half-time colleague that works on a different [community]

team than I do, whom I can connect with. There are a couple of

OTs at the hospital, but [I'm] pretty much on my own.

When asked directly if they felt this technology would be useful for health

professionals in facilitating the application of new knowledge to practice all 10 participants

answered affirmatively.

Structured Reflection. Health professionals also report difficulty critiquing and

synthesizing research findings (Egan, et al. 2004), skills that are enhanced by the

development of critical thinking skills. Participants described both the process and the

outcomes of critical thinking and what they felt facilitated these in the computer conferences.

Critical Thinking as a Process: Time for Reflection. Participants' descriptions of how

they prepared their conference postings were similar and they appreciated that the

asynchronous communication of the conferences allowed for more time to reflect on the

readings and the questions posed by the instructor and other learners.

It's not face-to-face so there's no pressure to come up with

your first response but to be able mull [over] an answer… look

it up in the literature. I think if it had been face-to-face I

51

wouldn't have used the readings as much, and my answers

wouldn't have been as considered…

Sometimes I'm better at putting down a bit of a response, leave

it for a day, come back to it, and you've thought of other things

in the interim. It's just like you have a fuller response.

Critical Thinking: Creative Process. Participants appreciated other learners who were

willing to be creative and generate alternative ideas as well as the instructor's questioning

and guidance that encouraged this.

It helped me when people saw the question and were able and

willing to go outside the box on the question. They would say,

"How about this and how does it fit together." It really starts to

engage the discussion and you start to respond in the same

way.

I hate to say this, but I think some people who take these

courses were a little competition oriented.., but in that course…

it was sort of, "Wow, you look at it that way? I never would

have thought that way."

They were taking us in one direction, it felt like, then all of a

sudden… I just remember the feeling, it's like, "Ahh… isn't

that interesting?" as the questions developed.

The following is an example of a conference posting demonstrating this:

Well, when you spell it out like that, we did make a lot of

assumptions. I believe it is the context of the story that leads us

to make assumptions about the ferryboat captain.

And certainly as we examine our assumptions that we make we

have to realize what they are in order to defend how they fit

into our values, for example, did the girl know the hermits or

was this the first meeting. That might change my attitude

toward them depending on the context of the relationship.

Critical Thinking as an Outcome: Metacognition. Increased awareness of how they

think as well as a change in thinking was expressed by all the participants and was a specific

learning objective of the course.

I think that my thinking grew, changed… the clinical reasoning

provided me with tools that I use not only in my professional

but also my personal life. The questioning, the reasoning, the

clarification, the way to communicate, the way to be

empathetic with the other, deeper – that was the main point

with this reasoning course… go deeper.

53

… the major improvement is that I think my reflective process

is more structured and more efficient.

It just got me thinking in a whole different way and it's

changed [my] perspective and probably it's kept me back in

health care.

There was huge learning. What I think it did for me, to a large

degree, is help me realize how I think and how I reason. I just

didn't I have to actually put it down on paper and read what

others were saying. [The instructor] talked about the "aha

moment". There were quite a few of them in that course.

Critical Thinking as an Outcome: Changes to Practice. They also expressed how the

conferences helped to apply the new thinking to practice.

[Conferences] challenge you to think more. You can bring a

course home and never have any interaction with somebody

else. You'll pick up some knowledge, but you will never be

able to apply that knowledge. You don't practise with it and if

you don't practise with it, I don't think it lasts all that

long…[with practise] you are able to take it into the workplace

and say, "Okay, now I know I can apply this here… the idea,

this thought."

… you put read something once, and then [conference] helps

put it into practice and put it into perspective.

I was able to look at questions from a few different angles by

the end of it, or situations. Putting questions to myself that I

wouldn't have done in the beginning.

The same thoughts were echoed towards the end of the course, when learners were

required to post their model.

Krista is right when she says that creating the model makes her

think more about clinical reasoning. I agree that it made me

more aware of the process. I think even though I'm not doing a

lot of clinical work right now but I am planning for a new

district [health] system I find I am employing the same

processes in my decision-making since what I do at the

system's level will affect the patient and therefore I need to

apply the same care and diligence.

Course Delivery.

Instructor Facilitation. When asked what helped their participation in the courses, the

first response for all 10 participants was the instructor. The most common sub-theme was one

of support and setting a positive climate in which participants felt comfortable contributing.

This is consistent with critical thinking literature in which instructors are encouraged to

"allow [learners] to risk failure without feeling that in doing so, they have actually failed."

(Brookfield, 1987, p. 75)

> The atmosphere was professional and was supportive and
>
> personally supportive as well… helped me feel confident in
>
> telling my story.

> I think I always felt valued by the instructor.

Another frequent sub-theme was guiding participants in new directions.

> She was picking our brains, and helping us to develop in
>
> different ways of thinking, guiding us in a very, very
>
> professional manner.

> I think the difference has to be that the person on the other end
>
> needs to know the questions to ask.

Examples of this instructor presence in the conferences are found below:

> I appreciate how everyone builds on what the others have said.
>
> I also am impressed with how you are bringing the literature

56

and your clinical practice into these discussions making them

very rich.

Hello all, I am impressed with the discussion that is taking

place and the insightful comments that are being made about

Gloria's story.

SP, you make the comment "there is a clear assumption that

this client needs to be able to dress in order to gain maximum

independence." TH, you made several comments about the

values of the client. CT you mention in your comments, that

perhaps independence wasn't even an issue for the couple. My

question for you all is "How do you think Gloria (and most

rehab professionals) view independence? And, how does our

view of it, affect our ability to reason and make decisions.

Thanks to you all for contributing to a lively and provocative

discussion! - MM

These support the existing literature regarding directing and sustaining discussion in a

purposeful manner for deep learning to occur (Garrison & Cleveland-Innes, in press) and

Brookfield (1987) who suggests that instructors must "simultaneously challenges students'

old modes of thinking and provide structure and support for the development of new ones."

(p. 74)

When asked if they notice any difference when the instructor was just observing, all but one felt the instructor was still present. The following are differing views from learners referring to the same discussion on model building.

Even just knowing that she was observing and she did even jump in a couple of times when she sensed the group was frustrated or stuck…. [it] was sort of comforting because it was much easier to ask questions 'cause you assumed she was following the general flow of things.

Well it took more energy than what I was hoping would be necessary at times, when the group was kind of breaking down or going in different directions. I was kind of hoping for a little bit more input from the instructor in those kinds of situations. It was distinctly lacking.

Interestingly, the computer conference transcript analysis for this specific discussion indicates a higher overall participation than the other two small groups (125 postings compared to 71 and 36 in the other groups) but similar distribution of cognitive, social and teacher presence. However, there was a much higher incidence of triggering events (10% vs. 3% and 1%) due to learners questioning each other's suggestions and taking the discussion in a new direction. Both these learners felt this discussion was valuable and that they learned more here than in the case study discussions. This supports Fahy's finding that the instructor's presence was important in achieving a productive balance between expository

and epistolary remarks (2002). Brookfield (1987) also suggested that diversity and divergence should be encouraged and there should be no attempt to bring matters to an artificial or premature resolution.

Instructional Design. Many of the learners had taken other courses in the program and made comparisons to these. As discussed above, the expectation for participating in this course was higher than others and worth 35% of the learner's mark. One of the main learning objectives of the course was for learners to make explicit what was implicit in their clinical reasoning. Having to write and justify their reasoning in the conferences was a way in which to encourage their critical thinking and see evidence of it. The discussions were designed to challenge the learners' critical thinking as they developed more knowledge of their own clinical reasoning and had completed readings that triggered new directions. Learners, although they did not articulate it in terms of course design, did notice these differences.

> The think the initial one, clinical stories, was easier to do in
>
> that it was something that related very specifically to my
>
> clinical experience. It was a concept that was already familiar
>
> to me, and something I felt able to cope with.

> We each seemed to have a different point of view on it, and I
>
> could easily look at those more concrete examples (case
>
> studies) and think, "Well what about this?" … there was a
>
> bigger scope of possibilities for my own contributions in there.
>
> I guess it wasn't as likely to have been said already.

… when I posted a story the discussion was less intense, I

would say and there weren't as many, for lack of a better word,

conflict in terms of I have my opinion, someone else has a

different opinion, and one person or another are reluctant to

waiver from that…

It might have had something to do with the timing… early on

in the course maybe people weren't quite as comfortable yet

with being more critical…

I was more relaxed… it was more like sharing.

These comments are consistent with the analysis of the computer conferences where

it was discovered that the majority of cognitive events were in the exploration phase (42%)

with integration and resolution occurring much less frequently (17% and 7% respectively).

Model Discussions More Difficult than Case Discussions. These model discussions

were the final ones in the course and designed to challenge the learners to apply what they

had learned in previous discussions and readings. The learners' descriptions are consistent

with the results of the computer transcript analyses which found higher incidences of

integration and resolution events in the model discussions (Table 9).

… we actually had to build something and contribute more. It

wasn't just a discussion… There was more quantity of posts

and perhaps not just giving opinions but actually building

things, building on ideas.

I think the more I was challenged the more I felt I needed to

support my own opinion or justify my answer.

Technology. All participants felt the technology was easy to use. Difficulties

mentioned were at the beginning of the course and due to some administration mix-ups (for

one participant in the Fall 2004 session), adjusting to the time it takes to post (as covered

above) and Internet connections. In general, the asynchronous computer conferencing was

preferred to the synchronous chat rooms which they felt required more coordination due to

busy schedules and time zones, etc. Two participants who had less reliable Internet

connections preferred the asynchronous discussions due to the "one-time only" availability of

the chat room. If they were unable to get online, they would lose out even though the chat

room discussions were archived.

Trying to get time for the chat room and if you left it at a good

time for the West then it was really late for the

East…Everybody was working and you didn't want to miss

them… your got to know your classmates so well, you didn't

want to miss an opportunity to bond with them.

Chat was stressful for me because of the potential of being

disconnected and not being able to get back on again.

With one of the chats – well it was my Internet connection – I

don't know what happened. I was so frustrated I was about

61

ready to throw it out the window. I basically didn't contribute –

let's see the chat that must have been almost an hour long –

and I didn't contribute until perhaps the last 20 minutes.

However, small groups that used the chat rooms found their synchronicity preferable when trying to reach decisions regarding creating models.

The model building one I found much more difficult… I think

the process of trying to do that online was quite tricky,

particularly doing it online in the discussion. We did an awful

lot better when we got into a chat room.

Another feature mentioned by some of the learners was the coffee room which was an informal discussion room. Learners recalled that it was helpful in building relationships (getting to know what other learners' interests, responsibilities and weekend plans), and networking and consulting on specific clinical issues. Although there was evidence of social presences in all but one of the discussions (Table 6), this added opportunity was appreciated by learners.

We actually had some useful discussions in that coffee room. I

remember someone saying somebody with a particular clinical

problem had approached them and they had no idea how to

deal with it. Did anybody know of any research? It was quite a

good conversation.

One of the girls was having trouble with her horse at the

time… she was giving it away for a week and taking her horse

down to a special vet. I think it just fills in what you're missing

by not being in a classroom.

Case Application. During the course, learners discussed both instructor-provided

cases and each other's real-life cases. Sub-themes arising from the interviews are discussed

below.

Access to Different Perspectives. In keeping with the critical thinking literature,

participants acknowledged the value of other perspectives and approaches that could be taken

with the difficult cases that they presented.

I did find [case studies] actually really interesting in seeing

what other people did. And perhaps, their approaches. So I did

actually get quite a bit out of those discussions.

… the perspectives were much more diverse [than in day-to-

day practice] which then obviously allows for much different

viewpoints, which I guess is important for clinical reasoning to

help you think in different ways. That would be one of the

major benefits I think.

I think for clinical reasoning the case-based approach was very

appropriate, and very helpful because you could really dig in

and look at personal issues, and see why you made that

decision on that person, not just because of the clinical

findings.

Examples found in the computer transcript support these thoughts.

In hindsight and even how I look at things now, I should have

tried to get into Mrs. R's shoes, as you suggested Susan.

I agree with what RL has said to a great extent. Personally I

tend to favour narrative reasoning when trying to involve

families of patients. I try to "build a story" with them and have

them imagine the outcome.

Importance of Relevant Case Studies. At the same time, one learner expressed

frustration with the provided cases being too simplistic and two felt that the rest of their

group did not have the background to respond to their own individual case.

One frustration I had with my case study [was] that other

people in my group that were commenting upon it, I found,

didn't quite understand what I was trying to get across.

Peer Consultations. Some participants had more opportunities for face-to-face peer

consultations than others in their day-to-day practice. Those with fewer opportunities had

sought out other distance communication strategies such as email, listservs, web sites where

they could ask an expert, and online journals. All but one admitted that they used these

informal learning environments very infrequently.

   Increased Understanding. Participants found reading other learners' postings helped

them to understand the required readings, understand the question posed by the instructor,

gain new perspectives and apply their understanding to their day-to-day practice.

> I found the readings from the text hard to digest, and I'd have
>
> to read them twice for anything to sink in. The conferences
>
> would help reinforce some of those readings. People would
>
> pick up things that I'd missed which I found really valuable.

   In the conferences evidence of this was found in postings such as these:

> It's great the thoughts people have been sharing. I've had to
>
> read the material twice to get the info to stick. I've started
>
> journaling because I need a short-hand way to refresh the
>
> terminology, etc. Those four readings were information laden
>
> and I need more practise using them.

   Personal to Shared Worlds. They also described a process of individual reflection,

writing the posting and looking forward to the questions posted from their peers. This mirrors

the Practical Inquiry Model (Figure 2) in which the individual moves back and forth between

both his/her private world and the shared world during the critical thinking process.

> I just process that information for myself and then come up
>
> with a response in my head, and reflect upon that response, and

then post a response. Another thing too would be if the other

people already responded to the question, and then I would go

through the same process through them. Read their question,

think of how I would respond and reflect upon it, and then

obviously for me the answer is within the context of my

clinical practice. The other people allow me to get some insight

into other contexts.

This same process was described in the computer conferences by one

learner.

I think it is so interesting how we have been taking the same

course and work in similar situations yet produce such varied

models of reasoning. I think it is poetic justice that a

complicated, developmental process like clinical reasoning can

challenge each of us to remain individualized in our

interpretation but for a common goal or result based on similar,

accepted components. It really does help make the implicit

explicit. Really interesting work everyone!

Group Development. During the interviews, learners identified that relationships were

formed and communication was enhanced outside of the formal discussions as outlined

above.

It was a peer role… where certain people I think within the

course really got to know each other because they knew they

could bounce ideas off… so I think those relationships were

created.

There's a bond that develops even though you've never met

each other, you have no idea who they are. You get this class

thing. It's very nice. I think that adds to the quality of it.

Size of Group. For some discussions the learners were divided into small groups and

there were mixed opinions regarding this. For some, the smaller groups were less

intimidating, especially at the beginning of the course and other learners found there were

more opportunities to participate in the smaller group. However, if there were learners who

were not participating, because the group was small, it put greater responsibility on the other

learners.

I was quite tentative at first… it was a big plus for me that it

was a small group… There were people in the group that were

a lot quicker to contribute and they probably progressed in the

discussion more than I did, but I got a little less intimidated in

posting comments.

I think sometimes when a whole big group was discussing

something it tended to get a bit like who can get in first, a bit

competitive. I think with the whole big group it wasn't really

so much a discussion because there wasn't the opportunity for

back and forth ideas. You posted your one idea and then there

wasn't time to, or there wasn't opportunity with so many

people to reflect a lot on other people's discussion items and

comment back, or be asked about your own discussions.

I might be wrong 'cause our group was fine, but I think some

of the other groups, they didn't have people that participated

quite as well. And then that would be frustrating. That's kind

of the luck of the draw.

An example of how learners coped with this in the conference is as

follows:

Seems we're on the same wavelength. Given the time frame, I

think we need to carry on without Mildred and she'll catch up

when she can.

Journal Analysis

Only three journals of five possible journals were available and these were analyzed

in the same manner as the transcripts of the interviews. The directions regarding the journals

required the learners to record any thoughts, feelings or actions that were related to the

course readings and discussions. At the end of each week, the learners were to list "What they had learned."

In most of the journal entries, learners formed an opinion regarding specific readings and related it to their practice. Typical entries were:

> This is an aha for me. I was so excited when I read this because
> so many other theories of learning and thinking only go so far
> in explaining the ongoing contribution of learning.

> I like the idea of narrative reasoning but as yet I can't envision
> how to use it.

All three mentioned the case study discussions and how they helped in their understanding.

> I had a lot of difficulty with the Higgs and Jones article which
> elaborated on context. The discussion around my clinical story
> enlightened me more on the topic because it was at a level I
> could understand and was interactive. The simple question of
> what values and beliefs had I exhibited in the story was enough
> to dissect my own frustration in the situation with Sam [client]
> and left me feeling incredibly positive about the potential of
> this approach.

Thinking in stories or narrative reasoning was a very

interesting concept for me. It was made real in looking at John

in my clinical story.

From the analysis of Melinda's story, I learned the importance

of making changes or at least of trying to make them in the

health care system.

Insights into the process of critical thinking were also revealed in the journals and

how the learners were attempting to try it:

This week has been full of ideas and lessons. I need time to

decant them. One question I am asking myself is the one I

wrote in my comments on Melinda's story: Are the conflicts

inside us coming from our spirits, minds, hearts or actions? I

am trying to see in my daily activities what aspect of every

situation is affecting me more and how I can make an

immediate change on it. I would say I am driving crazy my

husband with my constant analysis about presence and

communication.

Today I had a very complex problem to work through, so I

have been thinking about the process. From the history I

established some preliminary ideas… I started with several

hypotheses and am testing them. I am also looking more

broadly to the effect this is having on her life.

It makes sense to me that to understand the context of the client

and family, the therapist has to establish an environment that

enables the client to share and feel comfortable. I have begun

to try to incorporate this into practice for example with a young

client who has recently had major surgery….

An increase in metacognition was also mentioned in all three journals:

I am more aware of the thinking process. I think I am more

reflective.

I feel that I am beginning to look at the whys in many more

situations since reading the course materials. This process is

making me more aware of how I work through the information

gained from the client…

What I haven't been aware of is how much my deeper context

(personal and professional beliefs, attitudes and values) affects

my interactions with clients and families.

Appreciation for peers and the instructor was expressed strongly by one of the participants and demonstrated how the relationships build over the duration of the course. The importance of social presence as discussed in the literature (Gunawardena, 1997; Rourke, Anderson, Garrison, & Archer, 1999) was confirmed by the following journal entries:

> The course is very well designed. I found [instructor] welcoming, nice and warm. That gave me a "good feeling". It was also great to read encouraging words from my classmates.

> I learned that I am not alone in searching for a better way of thinking and reasoning.

> To be confronted with mistakes made in the past was not easy. I was lucky to have a group who analyzed my story with respect and understanding. I learned to integrate with my own the different ideas that my group expressed.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

This research studied ten learners who, except for one, were practicing health professionals and who had completed a course designed to enhance their clinical reasoning and decision-making skills. Content analysis was done on three data sources: computer conference transcripts, semi-structured interview transcripts, and learner journals. The purpose of this study was to explore the factors influencing the process of critical thinking among health professionals in text-based, asynchronous, computer-mediated conferencing. The results will be discussed in relation to the three research questions.

<u>Themes Related to the Research Questions</u>

<u>Question one: How does participation in peer discussions, through computer conferencing regarding cases, foster the development of critical thinking skills in practicing health professionals?</u> During the analysis it became apparent that computer conferencing provided opportunities for individual and group reflection, increased understanding of reading materials, and forced participants to write clear descriptions of the critical thinking that supported their clinical reasoning and decision making. Case discussions resulted in more exploration in contrast to model discussions which led to more collaborative decision making.

Provides the Opportunity for Structured Reflection. Participants referred to the advantage of the asynchronous communication in that it allowed for self-reflection and

integration that many of them found difficult to do spontaneously in face-to-face health team meetings and/or classrooms. These perceptions are similar to those identified in a study by Pena-Shaff, Martin, and Gay (2001) where asynchronous conferences were found to be more appropriate for self-reflection than synchronous chat rooms, and the study by Newman, Johnson, Webb, and Cochrane (1997) where, compared with face-to-face situations which generated more new ideas, conferences were more likely to link the ideas to solutions.

Participants found that the computer conferences developed their critical thinking skills by fostering group reflection through questioning and by providing a forum to challenge each other's assumptions and think more deeply and creatively. In the groups that focused on creating a clinical reasoning model, learners felt the need to defend their positions and although there were disagreements, they were pleased with the final result, a finding similar to that found by Jeong (2004) who suggested incorporation of argumentative interactions would generate active and constructive discussions.

Increases Understanding. The shared world as described by Garrison, Anderson, and Archer (2001) (Figure 2) was also identified as important to learners. Studying each other's postings helped participants to understand the questions posed by the instructor as well as the readings. They gained new perspectives, had their understanding confirmed by peers, and were encouraged to apply new knowledge and/or proposed approaches to practice. Small groups (three-four learners and one instructor) were preferred, provided everyone was active and "pulled their weight". Relationships were formed with peers and, for some, continued outside the formal learning process, occasionally involving professional consults. Social presence occurred in most conferences but not all. It reached 30% in the discussions where collaboration was needed to reach decisions regarding the development of the model. This

adds to previous findings of Rourke and Anderson (2002) who found that decision making was done collaboratively despite a discrepancy between learner logs and learner's perceptions regarding the time spent in group communication on cases.

Makes the Implicit Explicit. Composing their postings encouraged the learners to articulate their understanding of the readings and justify their opinions as well as to challenge others which relates to the literature that suggests written communication is very closely connected with careful and critical thinking (Applebee, 1984; White, 1993). Similar to what was proposed by Peters (2000), learners became active participants through careful written communication. Learning to compose for the conferences was identified as initially difficult by a few participants who acknowledged that it became easier with practice, a finding that is also supported in previous research (Ronteltap & Eurelings, 2002).

Fosters more Exploration. Using the Community of Inquiry Coding template to do computer conference transcript analysis, the presence of critical thinking was found with varying distributions of trigger, exploration, integration, and resolution events, depending on the nature of the discussion, i.e. cases versus values versus models. The overall average participation was consistent with a previous study by Garrison, Anderson & Archer (2001) in that the majority of postings were coded as exploration (42%) with integration at 18%, followed by triggering events and resolution both at 8%. Social presence represented 24%. Discussions regarding cases were very similar to the averages with exploration and resolution the same at 42% and 8%, respectively, integration at 17%, triggering events rising to 13% while social presence dropped to 20%. Discussions regarding values resulted in the highest exploration percentages at 74%.

Participants in this study were monitoring their metacognition throughout the course and therefore were able to articulate the critical thinking process during the semi-structured interviews and their journal writings. Describing and exploring real-life cases was viewed positively but learners found it less challenging than integrating the new knowledge to create a clinical reasoning model. The same feelings were echoed regarding the values discussions where participants felt less pressure to justify their opinions because they were expressing personal values. These descriptions are similar to the findings in the computer transcript analyses. Indicators identified under exploration included brainstorming and offering suggestions for consideration, and socio-cognitive processes falling under exploration include personal narratives and unsupported opinions.

It was in the model discussions where more integration and resolution events occurred. Exploration fell to 17% (from 42% in the case studies) and integration rose to 25% (17% in the case studies) and resolution was 28% (8% in case studies). Learners describe these conferences as more challenging because they had to connect the readings with their proposed model designs and be prepared to defend their positions to others. Examples of indicators found here included connecting ideas (under integration) and defending solutions (under resolution).

Discussing cases does foster critical thinking as found by Stacey (1999) and Tomey (2003). Participation was more at the exploration level of asking questions and brainstorming solutions with less integration or commitment of new knowledge to practice. Some of this may be due to the case studies being held earlier in the course where learners were just beginning the readings and had less to apply. The course was also designed to culminate in the building of a clinical reasoning model that learners could use in their practice and this

later discussion did involved more integration of the readings and application to practice (resolution). Many participants said they had incorporated their model into their day-to-day practice and some were planning to use it with their students during fieldwork placements.

In this study, participating in online peer discussions fostered the development of critical thinking by encouraging structured reflection and increasing understanding through thoughtful exchange of written communication with peers. There were definite differences in the distribution of cognitive phases between case and model discussions. These are discussed further under question two which guided the inquiry in terms of instructional method.

Question Two: How does the instructor facilitate critical thinking in computer conferences? As indicated in previous research this study also found that the course method was an important element in fostering critical thinking skills (Fahy, 2002; Garrison & Cleveland-Innes, in press; McKlin, Harmon, Evans, & Jones, 2002; & Meyer, 2004). All three analyses indicated that instructor facilitation and instructional design played major roles in fostering critical thinking among the participants.

Facilitates Discussion. In the semi-structured interviews, when participants were asked what helped their participation in the conference, the first response for each interviewee was "the instructor". Careful and deliberate questioning by the instructor was recognized, as well as directing the discussions in new directions. These findings are consistent with those of Garrison & Cleveland-Innes (in press).

Equally as important was creating a positive climate and an atmosphere of trust where learners felt comfortable disclosing clinical problems and brainstorming possible alternatives without fear that they were not valued by the instructor or other learners. Even in those discussions where the instructor was acting only as an observer, all but one participant felt

77

that the instructor was still present and ready to step in when needed. Lobel et al (2002) also found group facilitation could affect interaction and participation.

The conference transcript analyses support these findings. Teacher presence ranged from 10% to 34%. The lowest percentage was found in the learner-led conferences and the highest in the values discussions where the instructors were challenging the learners' personal assumptions and values. These changes in the teacher presence were deliberate adjustments to the instructional design.

Manipulates Course Design. McKlin, Harmon, Evans, & Jones (2002) and Myer (2004) suggest that the instructional design can influence the distribution of cognitive phases. In this study a relationship was found as well. If learners were asked to facilitate the discussion by asking questions then the number of triggering events increased. An example of this was in the learner-led case study discussions where the percentage was 13% compared to the average 8%. Likewise, if learners were asked to explore, such in the values discussion, the exploration percentage rose to 74% compared to 42% in case study discussions and 17% in the model discussions. When asked to apply the information gained from the readings and discussions, and post evidence of this (as in the model or metaphor discussions), the percentage of integration and resolution events increased to 25% and 28% respectively.

The presence of critical thinking and the distribution of cognitive phases were influenced by the instructor's careful facilitation and deliberate modification of the course design. This mirrors findings by Garrison & Clevelend-Innes (in press) as well as Curran, Kirby, Parson, & Lockyer (2003) who found critical reflection, interaction and debate were influenced by facilitation, participant characteristics and course design during computer conferencing for continuing medical education.

Question Three: How do participants perceive this technology and instructional method as a means to facilitate the application of new knowledge to practice? Participants were unanimous in their support for using this technology. As suggested in the literature, education technology can create new learning environments where the barriers of distance and time are removed (Garrison, Anderson & Archer, 2001). It can also provide access to experts to overcome the tendency of health professionals to contact "readily available peers" versus experts (Rappolt, 2002). Although the technology offered flexibility it was seen as time consuming and therefore provision of relevant cases and commitment by learners were also seen as important elements to success.

Flexibility. Consistent with the literature (Bernard & Lundgren-Cayrol, 2001), participants appreciated the "time for reflection advantage" offered by asynchronous communication. The asynchronicity also accommodated different schedules. Some reported checking the postings one night and then thinking about their response during the next day, followed by writing and posting that evening. Others were appreciative of the time to reflect over the weekend. Participating in the conferences was seen as very time consuming for all the participants and some noted that the time-limited conference schedule helped to keep them on track and visiting the conference board frequently.

Studies regarding computer conferencing suggest that previous experience with the technology influences its effectiveness for learners (Andrusyszyn, van Soeren, Spence Lachinger, Goldenberg, & DiCenso, 1999; Cragg, Andrusyszn, & Humbert, 1999). In this case, all participants had used this technology before and reported that it was easy to use. They did recall that it was necessary to take time to get familiar with it but the time needed was minimal.

Time Commitment. Participants felt that learners must recognize the time commitment involved; the advantages of reduced travel time and convenience of accessing the discussions at anytime were countered by the time it takes to compose postings that required reflecting on readings and the questions asked. This was similar to the findings of Egan et al (2004) who found that participants had difficulty overcoming the barriers of time to participate in the conferences. However, their study used asynchronous conferences to facilitate an action research study, were not part of a formal learning situation, and carried on for 12 months, which was a much larger commitment, over time, than the two to three week discussions held in the course studied here.

Relevant Case Studies. Some, but not all participants, stressed the importance of relevant case studies and peers who had the background to discuss these which is consistent with both Anderson & Garrison (1995) and Carr-Chellam, Dyer, & Breman (2000) who found that learners' satisfaction was significantly enhanced when specific contexts for mediated interaction were provided. Connecting with "like peers" may be a barrier but for those living in smaller and remote areas it was seen as well worth the effort to overcome this barrier through the use of technology.

Motivation to Participate. The importance of rewarding participation was apparent in the analyses. The course was designed for peers to assist each other in developing their clinical reasoning skills and making the process of clinical reasoning explicit through writing in the computer conferences. The overall mark assigned to the conferences was significant but learners felt it appropriately reflected the requirement. These learners were motivated to achieve deep learning because it was a main objective of the course. However, two participants did acknowledge that they would have participated less if not for the fact that

25% of their mark was based on conference participation. These findings support the research by Garrison and Cleveland-Innes (in press) regarding the different types of approaches that students take to learning and how the course method can influence this, such as including marks for those who are achievement-oriented.

Although learners support the use of this technology to interact with peers and apply new knowledge to practice, it is not without reservations. The main one is time, followed by commitment, which also means finding the time to not only write one's postings but also respond in a timely manner to other postings. They felt that if the right composition of health professionals was available, the technology could provide a lifeline to those whose opportunities for interaction with peers is limited. They all recognized the importance of a skilled facilitator to assist in the critiquing and synthesizing of new information which was another barrier identified in the Egan et al (2002) study.

Limitations of the Study

This was a limited case study that looked at a formal learning environment designed to develop clinical reasoning skills in practicing health professionals. Only 10 out of a possible 33 learners participated in the study. The learners who did participate may have done so because they are supportive of the technology. Some of the conferences analyzed had teacher:learner ratios of 1:4 which is much smaller than the average 1:20 ratio found in most online courses. Therefore, the results should not be generalized to other learners or other learning situations.

It should also be noted that although pseudonyms were given to all participants and initials to all non-participants, at times it was necessary to read the non-participants' postings

81

to understand the context. Although their identities were unknown, some may consider this to be contradictory to their wishes.

Inter-rater reliability was established for the computer conference transcripts but it was not done in the analyses of the semi-structure interview transcripts or learner journals. Coding done by more than one researcher (and meeting to resolve differences) would have strengthened the assurance that the themes which emerged were accurate reflections of the data.

Implications and Recommendations for Distance Education Practice

In this case study, it was found that peer discussions have an important role to play in the critical thinking process. This applies to the earlier stages of research utilization by helping with the critical analysis of evidence which, in previous research, was identified as a barrier to applying research to practice. The use of computer conferences to connect peers at all stages is recommended. This differs from the Research Utilization Process (RUP) (Table 1) where it is not until the final phase that 'consults with peers' are proposed.

However, creating a supportive online learning situation where learners are able to critically reflect and feel comfortable challenging one another's assumptions requires a skilled instructor who knows how to manipulate the instructional design and how to facilitate discussions for structured reflection. Health professionals considering using this technology, both in formal and informal learning situations, would require detailed guidelines regarding how to structure the conferences both in terms of design and facilitating deeper levels of reflection and integration. To sustain a computer conference, they would also need to be

aware of the importance of social presence in building the group's cohesiveness, gathering a group whose interests are similar, and the considerable time commitment required.

Implications for Future Research

  These findings add to the existing research regarding critical thinking and computer conferencing and support previous findings regarding the influence of course method on the distribution of cognitive phases. Additional research is needed to explore using case study methods in computer conferences and if this instructional design could be adapted to better enable changes to practice that are based on critically appraised research results. It is not clear if the higher levels of exploration and lower levels of integration and resolution in the case study conferences were due to the course method, the participants' stage in learning, or other factors, including the COI coding tool. Further research into the comparisons of the stages of research utilization and critical thinking may shed further light on the process of transferring new knowledge to practice and the ways in which this can be facilitated in computer conferences and build new learning opportunities for isolated health professionals. Research into the utility of this technology in less-structured learning situations is also recommended.

  The COI was found to be a useful tool for analyzing computer transcripts. It was also useful in identifying both the process of critical thinking and changes in metacognition among health professionals while engaged in clinical reasoning. The use of triangulation, i.e. content analysis of two other data sources in addition to the conference transcripts is recommended and will help to build the validity of the COI coding template. Analyses of the semi-structured interviews and journals mirrored findings from the computer transcripts,

clarified results and provided additional insights into the process of critical thinking inside and outside the computer conferences.

Further development of the coding template is indicated on a number of levels. Future researchers who choose the COI coding template are encouraged to add under socio-cognitive processes "author describes application," and "author describes changes in thinking," in the resolution stage.

Studies examining indicators and socio-cognitive processes may help to inform the larger question of whether a learner can be cognitively present but not critically thinking. In other words, can triggering events and the exploration phase of cognitive presence be considered evidence of critical thinking or lower orders of thinking, albeit still important to the process? Further comparisons of critical thinking and the practical inquiry model may help to inform how to design computer conferences that further enhance the process of critical thinking and encourage necessary changes in practice based on new evidence.

Finally, due to the difficulties in recruiting participants, organizations particularly those offering online courses at the graduate level, should consider promoting to learners and instructors the importance of participation in research projects and the advances in ethical standards to protect their rights and privacy.

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APPENDIX A

THE UNIVERSITY OF BRITISH COLUMBIA

UBC

School of Rehabilitation Sciences
T-316, 2211 Wesbrook Mall
UBC Hospital
Vancouver, BC V6T 1Z4
604 822 7411

September 1, 2004

Dear Student,

We are conducting research on the process of critical thinking during asynchronous text-based computer conferences, i.e. online discussions that do not occur in real time. As you are aware, in RHSC 503: Reasoning and Decision Making, real-life cases focus the online group discussions. Critical thinking is considered a necessary part of clinical reasoning. During the process of critical thinking, you will develop critical perspectives on a problem through your own, as well as your study group's analysis. This research study is exploratory in nature and meant to investigate the nature of critical thinking that takes place when students engage in structured online discussions. We are interested in discovering how online computer conferencing helps students such as yourself to develop the critical thinking skills necessary to transfer new knowledge to practice.

This project is research for my graduate thesis and is one component necessary for completion of my Master's in Distance Education through Athabasca University. The formal title is 'Critical Thinking and Case-based Learning in Computer Conferencing: A Case Study.' It is a collaborative project of Sue Stanton, Division of Occupational Therapy, University of British Columbia, Dr. Richard Kenny, Athabasca University and myself. Your instructor will not be involved in the study in any way. The purpose of this email is to invite you to participate in this research project by agreeing to allow us to analyze your RHSC 503 WebCT discussion forum postings and the journal that you keep during the course, as well as participate in one semi-structured interview, conducted by telephone.

The transcript analysis will take place after each computer conference has been closed. The journals will be reviewed after the course is completed. No active participation is needed from you for these two analyses. Keeping a journal during RHSC 503 is recommended by the instructor to assist you in course assignments even though it is not formerly assessed. Time needed for the journal will vary with the number and length of entries; however, typically it will average 10 minutes a week throughout the course. We estimate that participation in the semi-structured interview, by telephone, may take up to 1.5 hours. The interview will be audio taped for later transcription and analysis. Should your comments be quoted in any publication, a pseudonym will be used. Please be aware, however, that your confidentiality

may be limited to the extent that the other members of the class were privy to the discussions and might recall specific comments.

Should you be willing to participate, would you please email me at westprint@shaw.ca. I will then be in touch shortly to confirm your participation by sending you an informed consent form to complete. Thank you, very much.

Sincerely

Mary Clark Green
Student, Master's in Distance Education
Athabasca University
Telephone: 604-536-4575
Email: westprint@shaw.ca

APPENDIX B

THE UNIVERSITY OF BRITISH COLUMBIA

School of Rehabilitation Sciences
T-316, 2211 Wesbrook Mall
UBC Hospital
Vancouver, BC V6T 1Z4
604 822 7411

September 1, 2004

Critical Thinking and Case-based Learning in
Computer Conferencing: A Case Study

Dear Student,

We are conducting research on the process of critical thinking during asynchronous text-based computer conferences, i.e. online discussions that do not occur in real time. As you are aware, in RHSC 503: Reasoning and Decision Making, real-life cases focus the online group discussions. Critical thinking is considered a necessary part of clinical reasoning. During the process of critical thinking, you will develop critical perspectives on a problem through your own, as well as your study group's analysis. This research study is exploratory in nature and meant to investigate the nature of critical thinking that takes place when students engage in structured online discussions. We are interested in discovering how online computer conferencing helps students such as yourself to develop the critical thinking skills necessary to transfer new knowledge to practice.

This project is research for my graduate thesis and is one component necessary for completion of my Master's in Distance Education through Athabasca University. It is a collaborative project of Sue Stanton, Division of Occupational Therapy, University of British Columbia, Dr. Richard Kenny, Athabasca University, and myself. Your instructor will not be involved in the study in any way.

You may contact the researchers as follows:

Sue Stanton (604) 822-7411; stanton@interchange.ubc.ca
Mary Clark Green (604) 536-4575; westprint@shaw.ca.
Dr. Richard F. Kenny 1-888-529-5725 (Toll-free); rickk@athabascau.ca

The purpose of this email is to invite you to participate in this research project by agreeing to allow us to analyze your RHSC 503 WebCT discussion forum postings and the journal that you keep during the course, as well as participate in one semi-structured interview by telephone. The transcript analysis will take place after each computer conference has been closed. The journals will be reviewed after the course is completed. No active participation is needed from you for these two analyses. Keeping a journal during RHSC 503 is

recommended by the instructor to assist you in course assignments even though it is not formerly assessed. Time needed for the journal will vary with the number and length of entries; however, typically it will average 10 minutes a week throughout the course. We estimate that participation in the semi-structured interview, by telephone, may take up to 1.5 hours. The interview will be audio taped for later transcription and analysis.

Please rest assured that we will take all reasonable precautions to protect your anonymity as a participant and the confidentiality of all data collected. Each participant will be given a pseudonym and any data that may act to identify him or her specifically will be removed. Please be aware, however, that your confidentiality may be limited to the extent that the other members of the class were privy to the WebCT discussions and might recall specific comments. Original data will be accessible only to the three investigators and one research assistant. Participants will have complete access to the findings of the study and will be given a printed copy of any published materials that derive from the research upon request. Information received will not be used in any way that is detrimental or demeaning to the participant.

I hope that you will agree to participate. However, please be aware of your right to refuse on the expressed understanding that if you choose not to participate in the study, this will not reflect negatively on you in any way, nor will any issues arise from your refusal. Also be aware of your right to discontinue your participation in the study at any time, without explanation. This is your right, and it will be respected.

If you are willing to let us analyze your discussion postings and journal entries, as well as participate in the interviews, please reply to this email and type the date and your name above the spaces provided below. By responding to this email message, you are acknowledging that the subject of this research and the contents of this consent form have been adequately explained to you, and that you agree to participate in the study. Please note as well that, by signing this consent form, you do not waive any of your legal rights.

_____   _____
Dated   Signature of Participant

Researcher:

_____
Mary Clark Green, B.Sc. (OT)

Please provide us with your telephone number (including area code) _____
And the best time of day to reach you: __ a.m. __ p.m. __ evening. Time zone: _____

    Should you have any questions concerning your rights as participant, please contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

APPENDIX C

Categories and Descriptors of Cognitive Presence in the Community of Inquiry Coding Template (Garrison, Anderson and Archer, 2001)

Event	Indicators	Sociocognitive Processes
Triggering Event	Recognizing the problem Sense of puzzlement	Presenting background information that culminates in a question Asking questions Messages that take discussion in a new direction
Exploration	Divergence within online community Divergence within single message Information Exchange Suggestions for consideration Brainstorming Leaping to conclusions	Unsubstantiated contra-diction of previous ideas Many different ideas/themes presented in one message Personal narratives/descriptions/facts (not used as evidence to support a conclusion) Author explicitly characterizes messages as exploration Adds to established points but does not systematically defend/justify/develop addition Offers unsupported opinions
Integration	Convergence – among group members Convergence – within a single message Connecting ideas – synthesis Creating solutions	Reference to previous message followed by substantiated agreement Building on, adding to others' ideas Justified, developed, defensible, yet tentative hypotheses Integrating information from various sources Explicit characterization of message as a solution by participant
Resolution	Vicarious application to real world Testing solutions Applying new ideas Defending solutions	None Coded

APPENDIX D

Inter-rater Reliability Table

Transcript:_____ Date:_____

Coder 1: MCG   Coder 2: DGD

Unit of Coding: posting ☐   paragraph ☐   sentence ☐

POSTINGS Coded/Total = _____ / _____ = _____% **Coded**

Coder 2: DGD

		Cognitive Presence			Other includes social and teacher presence	Sub-Totals
		Trigger (T)	Exploration (E)	Integration (I)	Resolution (R)		
Coder 1: MCG — T							
E							
I							
R							
Other							
Sub-Totals							

T:T + E:E + I:I + R:R + Other:Other = Total Agreed   Total Coded

AGREED: Cat. Agreed / TC

Total Agreed: TA=_____
Total Coded: TC=_____

T _____ = 0._____

E _____ = 0._____

Coefficient of Reliability (TA/TC):   CR = ._____

Chance Agreement (CA)

I _____ = 0._____

$CA = (T/TC)^2 + (E/TC)^2 + (I/TC)^2 + (R/TC)^2 + (Other/TC)^2$

$= \left(\underline{}\right)^2 + \left(\underline{}\right)^2 + \left(\underline{}\right)^2 + \left(\underline{}\right)^2 + \left(\underline{}\right)^2$

R _____ = 0._____

$= 0.\underline{} + 0.\underline{} + 0.\underline{} + 0.\underline{} + 0.\underline{}$

Oth_____ = 0._____

                                        CA = 0._____

TA _____ = 0._____

Kappa = CR − CA / 1 − CA

K = 0._____ − 0._____ = 0._____   K =._____

     1 − 0._____   0._____

APPENDIX E

Inter-rater Reliability Table

Transcript: _Fall 02 - Conference One_   Date: _February 20, 2005_

Coder 1: MCG   Coder 2: DGD

Unit of Coding: posting ☑ paragraph ☐ sentence ☐

POSTINGS Coded/Total = ___7___ / ___11___ = ___64___ % Coded

Coder 2: DGD

	Trigger (T)	Cognitive Presence Exploration (E)	Integration (I)	Resolution (R)	Other includes social and teacher presence	Sub-Totals
T						
E		3				3
I		2		1		3
R						
Other					1	1
Sub-Totals		5		1	1	7

(Coder 1: MCG — left vertical label)

T:T + E:E + I:I + R:R + Other:Other = Total Agreed   Total Coded

AGREED: $\frac{\text{Cat. Agreed}}{\text{TC}}$

Total Agreed: TA = ___4___
Total Coded: TC = ___7___

T ____ = 0._____

E __3__ = 0._4286_

I ____ = 0._____

R ____ = 0._____

Oth _1_ = 0._1429_

TA _4_ = 0._5715_

Coefficient of Reliability (TA/TC):   **CR = ._571_**

Chance Agreement (CA)

$CA = (T/TC)^2 + (E/TC)^2 + (I/TC)^2 + (R/TC)^2 + (Other/TC)^2$

$= (—)^2 + (\frac{3}{7})^2 + (—)^2 + (—)^2 + (\frac{1}{7})^2$

$= 0.—\ + 0.\underline{1837} + 0.—\ + 0.—\ + 0.\underline{0204}$

CA = 0._2041_

Kappa = CR – CA / 1 – CA

$K = \dfrac{0.\underline{5715} - 0.\underline{2041}}{1 - 0.\underline{2041}} = \dfrac{0.\underline{3674}}{0.\underline{7959}}$ **K = ._462_**

APPENDIX F

Inter-rater Reliability Table

Transcript: _Fall 04- Conference 4, Group C_ Date: _Feb 6 l05_

Coder 1: MCG   Coder 2: DGD

Unit of Coding: posting ☑ paragraph ☐ sentence ☐

POSTINGS Coded/Total = _125_ / _280_ = _45_ % Coded

Coder 2: DGD

	Trigger (T)	Cognitive Presence Exploration (E)	Integration (I)	Resolution (R)	Other includes social and teacher presence	Sub-Totals
T	10	1				11
E		35	13		8	56
I		3	15			18
R				2		2
Other		2	3		33	35
Sub-Totals	10	41	31	2	41	125

(Coder 1: MCG is the vertical label for the rows.)

T:T + E:E + I:I + R:R + Other:Other = Total Agreed   Total Coded

AGREED: $\frac{\text{Cat. Agreed}}{TC}$

Total Agreed: TA= _95_
Total Coded: TC= _125_

T $\frac{10}{} = 0.\underline{0800}$

E $\frac{35}{} = 0.\underline{2800}$

I $\frac{15}{} = 0.\underline{1200}$

R $\frac{2}{} = 0.\underline{0160}$

Oth $\frac{33}{} = 0.\underline{2640}$

TA $\frac{95}{} = 0.\underline{7600}$

Coefficient of Reliability (TA/TC):   CR = ._760_

Chance Agreement (CA)

$CA = (T/TC)^2 + (E/TC)^2 + (I/TC)^2 + (R/TC)^2 + (Other/TC)^2$

$= \left(\frac{10}{125}\right)^2 + \left(\frac{35}{125}\right)^2 + \left(\frac{15}{125}\right)^2 + \left(\frac{2}{25}\right)^2 + \left(\frac{33}{125}\right)^2$

$= 0.\underline{0064} + 0.\underline{0784} + 0.\underline{0144} + 0.\underline{0003} + 0.\underline{0697}$

CA = 0. _1692_

Kappa = CR – CA / 1 – CA

K = $\frac{0.\underline{7600} - 0.\underline{1692}}{1 - 0.\underline{1692}}$ = $\frac{0.\underline{5908}}{0.\underline{8308}}$ K =._711_

APPENDIX G – PART ONE

Interview Recording Sheet

Pseudonym _____ Date _____

Time started _____ Time ended _____

Told interviewee re: recording by tape and would be transcribed Yes _____

Interviewer _____

Part I. Socio-demographics

1.   Are you between the ages of
____ 21-29
____ 30-39
____ 40-49
____ 50-59
____ 60 or older?

2. Are you male? _____ Female? _____

3. What city do you currently reside in?

4. Are you presently working…_____ full-time, _____ part-time _____ hours per week
_____ not at all?

5. How many years have you practised as a health professional? _____ years

Your present position is_____ (clinical, administration, etc.)

6. What level of education do you currently hold, i.e. baccalaureate, master's, etc.?

7. How many online courses are you currently taking? _____

8. Is this your first experience with computer conferencing in a structured learning environment?

Yes _____

If not, please describe your other experiences such as e-mail correspondence, listservs, etc.

1

APPENDIX G – PART TWO

Part II

1. Why did you choose to study at a distance?

2. When wanting to discuss clinical issues with peers, can you describe how you connect in your day-to-day work?

3. How would you describe the process you went through when participating in the computer conferences, from reading other messages, to writing and posting your own messages?

    - Did they compose off line and then just post? Were their contributions spontaneous, written while they were online, etc.

4. You participated in three conferences: Clinical stories, model building and a brief case study. What differences did you notice in your participation in these conferences?
    - Better with time
    - Clinical stories/case study different from model building

5. What helped the process and your participation in the conferences?

6. What hindered the process and your participation in the conferences?

7. How would you describe your interaction with others during computer conferences? Did you take on different roles, i.e. diplomat, devil's advocate, etc. Did you receive valuable, constructive feedback, new insights, assistance with integration of theory, etc?

8. Were your expectations met?

9. How would you describe your knowledge growth during computer conferencing? Did you experience resolution of problems? Did you discover ways in which you may try to modify your practice?

10. How do you see computer conferencing being used to enhance the growth of knowledge among health professionals? (exploration only or discussion valuable in integration?)

11. Is that anything else that you would like to add?

2