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INVESTIGATING THE EFFECT OF DIRECT INSTRUCTION OF ARGUMENT MAPPING STRATEGIES ON COGNITIVE PRESENCE AMONG PARTICIPANTS IN THE ONLINE COMMUNITY OF INQUIRY

BY

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DEDICATION

This thesis is dedicated to my sister and to the loving memory of my father who I love and miss dearly.

ABSTRACT

The purpose of this study was to investigate the effect of direct instructions of argument mapping strategies on students' perception of their cognitive presence in the online community of inquiry. The intervention in this study consisted of a one-hour long lesson on argument mapping strategies. It is proposed that providing awareness of argument mapping strategies would enhance students' text-based discourse competencies. From the population of communities of inquiry of online higher education students, a convenience sample of distance learners were drawn from a Master of Distance Education program that is offered completely online at Athabasca University. A quasi-experimental design consisting of pretest-posttest comparison was used. Key findings suggest that direct instructions of argument mapping strategies changed participants' perceptions of their own discussion skills, improving their awareness of the text-based critical discourse process and thus paving the first step towards improved cognitive presence in the online community of inquiry.

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heartedness, and extreme confidence and stamina in the face of heavy demands of life is an inspiration.

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CHAPTER I

INTRODUCTION

The Community of Inquiry framework (CoI) as introduced by Garrison, Anderson, and Archer (2000) consists of processes intended to construct meaningful knowledge through collaborative engagement of learners in online critical discourses. According to this framework, knowledge is constructed through the development of three elements – social, teaching, and cognitive presence. According to Van Dijk (2007), when participating in a discourse, people create a mental model that connects both the conversation and the social context. To emphasize the importance of mental models, Van Dijk (2007) claims, "to exclude mental models from our theories and analyses of conversation because they are not 'observable', and to exclusively admit only what is 'demonstrably displayed' in talk, is in my opinion based on a behaviourist . . . fallacy" (p. 299). Some researchers believe that mental models are very important and use visual representation of learners' mental models to evaluate their cognitive changes before and after exposure to different learning environments (e.g., McNeil and Ganesh, 2006). Investigating learners' collaborative mental models, researchers have distinguished knowledge-construction from knowledge-sharing in the community of inquiries (Alst, 2009). While knowledge construction refers to deep and meaningful learning, which is about "qualitative changes in the complexity of students' thinking about and conceptualization of context-specific subject matter" (Moore as cited in Alst, 2009, p. 261), knowledge sharing refers to "introduction of information and ideas without

paying extensive attention to their interpretation, evaluation, and development" (Alst, 2009). Some researchers tracked students' discourses and tried to explain them based on the mental models of the communicative situation (i.e., based on the inferential processes and the construction of a mental representation) (Alst, 2009). According to Alst (2009), students' engagements in discourses range from low (knowledge assimilation or the addition of information to the existing knowledge) to moderate (knowledge modification) to high (metacognitive processing). According to Garrison and Anderson (2003), cognitive presence is the "intellectual environment that supports sustained critical discourse and higher order knowledge acquisition and application" (p.55). Progressive phases listed under the cognitive presence of community of inquiry framework are descriptive of the extent to which learners are able to construct knowledge (Garrison & Anderson, 2003). However, not knowing how to utilize the CoI framework processes appropriately might not allow for a development of a satisfactory link between the CoI framework and deep and meaningful knowledge construction. In an online community of inquiry, not all discourses that happen are meaningful and lead to knowledge construction.

This study proposes that, in a community of inquiry, students can enhance their cognitive presence by better understanding the structure and dynamics of the collaborative mental models using argument mapping strategies. Argument mapping strategies could be used as a guiding tool that allows making sense of problems and engaging in complex mental processing. This study presents the results of relevant research in order to develop and validate students' awareness of the text-based critical discourse process in an online educational community of inquiry.

Furthermore, students' judgments of their cognitive presence can be explained through their assessment of critical discourse competence.

Statement of the Problem

The objective of the CoI model is to foster deep and meaningful learning in an online community of learners (Garrison, Anderson & Archer, 2000). However, some empirical research suggests that students' involvement in communicative processes that result in critical discourses or higher levels of cognitive presence is infrequent (Rourke & Kanuka, 2009). On the other hand, according to Garrison, Anderson, and Archer (2000), maintaining a sufficient level of social, teaching and cognitive presence would result in constructive and collaborative learning. Garrison, Anderson, and Archer (2000) place considerable emphasis on teaching presence in which instructors are expected to play an active role that is neither a "guide on the side" nor a "sage on stage." Since being active would require instructors to maintain students' learning competences compatible with the complexity level of cognitive presence phases, this study hypothesized that students' awareness of the text-based critical discourse processes could improve the two-way mutual process between students and instructors in each phase of the cognitive presence. In fact, this study was proposed because it hypothesized that the difficulty in maintaining a sufficient level of engagement in each phase of cognitive presence could be due to students' lack of online critical discourse competence. Therefore, by introducing direct instructions of argument mapping strategies to Distance Education (DE) students, this study attempted to enhance students' planning, monitoring and evaluating of the online critical discourses. Enhancing students' awareness of the text-based critical

discourse processes through argument mapping strategies could be the seed to further develop and sustain metacognitive skills through an effectively developed social, teaching, and cognitive presence.

Statement of Purpose

The purpose of this quantitative study was to investigate the effect of direct instructions of argument mapping strategies on the perception of cognitive presence among participants in the community of inquiry for the Distance Education learners.

Assumptions of the Study

In this study, it was anticipated that students' awareness of the text-based critical discourse processes through the use of argument mapping strategies would predict their critical discourse competency, which in turn would be reflected in more favorable perceptions of cognitive presence.

Significance of this Study

The aim of this study was to further the research regarding the acquisition of argument mapping strategies in a distance education environment. This study revealed whether or not direct instruction of argument mapping strategies changes and/or improves students' perception of cognitive presence. This study will further the dialogue regarding direct instruction of argument mapping strategies in online communities of inquiry and its feasibility. Furthermore, this study and dialogue will bring to light the importance of discourse competencies and practices which yield text-based discourse competence, and it will further encourage students to engage in high-quality group discourses.

Definition of Terms

Community of Inquiry: As defined by Garrison (2011), an online community of inquiry refers to an educational process in which a group of learners "collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding" (p. 2).

Community of Inquiry Framework: Garrison, Anderson, and Archer (2000) introduced a process that leads to deep and meaningful online learning. Deep and meaningful learning is predicted through the interaction of three elements – social presence, teaching presence, and cognitive presence.

Deep and Meaningful Learning: The definition of deep and meaningful learning is consistent with Ausubel's model of meaningful learning and Marton and Soljo's deep learning (Rourke & Kanuka, 2009). Ausubel's meaningful learning is associated with constructing knowledge through the process of discovery and problem solving, and Marton and Saljo's deep learning refers to "critical examination of new facts and the effort to make numerous connections with existing knowledge structures" (Rourke & Kanuka, 2009, p. 24).

Knowledge Construction: Knowledge construction refers to deep and meaningful learning as opposed to simple knowledge sharing that lacks interpretation, evaluation, reflection, and problem-solving (Alst, 2009).

Cognitive Presence: Garrison, Anderson, and Archer (2001) defined cognitive presence as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (p. 11).

Practical Inquiry Model: Garrison, Anderson, and Archer (2000) presented a critical thinking model to assess cognitive presence. The practical inquiry model is consisted of the following four phases:

1. Triggering Event: students share background information that raise questions.
2. Exploration: students raise unsupported ideas and themes for the purpose of exploration and brainstorming.
3. Integration: students start referencing to previous messages, build on ideas, and present tentative hypotheses.
4. Resolution/Application: students apply new ideas and provide evidences for problem solutions and defend why certain solutions were used.

Argument Mapping Strategies: argument mapping strategies were designed for this study for the purpose of enabling users to present complex reasoning in a visual and easy to follow way.

Critical Thinking Skills: The Delphi report by Facione (1990a) refers to the following skills as the critical thinking cognitive skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation. In the current thesis, complex levels of engagement in the Triggering Event, Exploration, Integration, and Resolution phases of cognitive presence as well as the argument mapping strategies were considered to be critical thinking skills.

Statement of the Delimitations

This study was delimited by including participants that are restricted to distance learners of a leading Canadian online university, Athabasca University. It was also delimited by the inclusion of students who were registered in online

graduate-level program of Master of Distance Education (MDDE). Another delimitation was the theoretical perspective. This study was delimited to a combination of objectivist and constructivist approaches to learning, to cognitive strategies, and to the cognitive load theory. Furthermore, the objectives of this study were delimited to examining the level of cognitive presence, one of the three elements of CoI framework, to the use of direct instructions of argument mapping strategies as a unit of instruction for constructing critical discourse.

Statement of the Limitations

The limiting factors that could influence the sample representativeness in this study were: sampling procedure, sample size, and student participation. The small sample size was one of the factors that limited this study. In addition, because of the type of nonprobability sampling (i.e., convenience sampling), no generalizations can be inferred from this study. This study was further limited by student's availability and willingness to participate.

CHAPTER II

REVIEW OF LITERATURE

Community of inquiry is a well-researched framework. There has been a great deal of research published that deals with the overall community of inquiry framework as well as studies on social, teaching, and cognitive presence. The focus of many studies has been on evaluating the level of knowledge construction and learners' quality and quantity of cognitive presence. However, few studies have examined the use of direct critical thinking skills instruction in an online community of inquiry, and no study has examined the influence of using argument mapping strategies on cognitive presence. The focus of this literature review is on the following topics:

- Use of Community of Inquiry framework for online learning communities
- Issues of the cognitive presence of community of inquiry framework
- Students' psychological characteristics and the barriers to critical discourse
- Direct instructions to improve critical thinking skills
    - Guided versus unguided teaching and learning
    - Direct versus indirect instruction on critical thinking processes
    - Coordinating direct instruction and constructivist learning
- Enhancing the quality of posts in discussion forums
- Argument mapping strategies to improve learning

Use of Community of Inquiry Framework for Online Learning Communities

Garrison, Anderson, and Archer developed the Community of Inquiry (CoI) framework based on Dewey's philosophical conception of a guided, democratic, and

dialogical speech community referred to as "community of philosophical inquiry" (Swan, Garrison, Richardson, 2009). CoI model represents a conceptual framework that is focused on the social constructivist model (Swan & Ice, 2010). A constructivist approach maximizes the extent of interaction and collaboration, and this is considered a key to maximizing students' learning potential (ONeil, 2009). Furthermore, asynchronous discussion forums are potential vehicles for DE teachers and learners to engage one another in social constructivism activities that have the potential for critical thinking development (Prasad, 2009). Critical thinking implies a fundamental goal for today's education (Garrison, Anderson, & Archer, 2000; MacKnight, 2000; Moore, 2004; Perkins & Murphy, 2006; Arend, 2009). However, defining the concept of critical thinking and establishing ways to nurture and develop it by an educational process in an academic setting still remains a matter of uncertainty among educators (Prasad, 2009).

In this research study, social presence and teaching presence were removed from the data depiction as the focus of attention was on cognitive presence. Categories and indicators of cognitive presence include:

- Triggering Event (problem recognition, sense of puzzlement);
- Exploration (divergence within the online community, divergence within a single message, information exchange, suggestions for considerations, brainstorming, and leaps to conclusion);
- Integration (convergence within the online community, convergence within a single message, connecting ideas and synthesis, creating solutions);

- and Resolution (vicarious application to real world, testing solutions, and defending solutions) (Garrison, Anderson & Archer, 2004).

The researcher used the four levels of cognitive presence and the sub-levels of each phase of the cognitive presence as measurement tools for assessing the quality of DE students' perceived level of engagement in the cognitive presence categories.

Issues of the Cognitive Presence of Community of Inquiry Framework

In this section, issues that have emerged in research on cognitive presence are explored. These issues concern how researchers conceive of community of inquiry framework. Community of inquiry framework has contributed valuable insights and significant methodological solutions for investigating online learning (Garrison & Archer, 2000; Garrison, Cleveland-Innes, Koole, & Kappelman, 2006). According to Akyol et al. (2009), for the advancement of the CoI model and for the future direction of research, it is crucial to take into consideration the debates and the critiques that identify the potential shortcomings of the framework or its application. The impact of the role of social presence, teaching presence, and cognitive presence has been investigated and the results are inclusive as to the connection between these factors and knowledge construction. Rourke and Kanuka (2009) argue that CoI framework does not reflect deep and meaningful learning. They evaluated several studies (e.g., Garrison, Anderson, & Archer, 2001; Kanuka, Rourke, & Laflamme, 2007; Vaughan & Garrison, 2005) and concluded that online learners exhibited a low degree of engagement in higher level phases of the cognitive presence (i.e., Integration and Resolution) while engaged more in lower stages of the cognitive processes (i.e., Triggering Event and Exploration) (Rourke & Kanuka, 2009). In

response to the critiques, Akyol et al. (2009) claim that CoI framework's focus is on transaction processes and not on learning outcomes.

The main issue surrounding cognitive presence concerns the progressive development of critical discourses in an online community of inquiry (Garrison, 2007). The findings of many research studies revealed that online discussions of a community of inquiry hardly progress past the first two phases of cognitive presence (i.e., problem identification phase and exploration phase) (Celentin, 2007; Garrison, Anderson & Archer, 2001; Kanuka & Anderson, 1998; Luebeck & Bice, 2005; McKlin, Harmon, Evans, & Jones, 2002; Meyer, 2003; Meyer, 2004; Murphy, 2004; Newman, Johnson, Cochrane, & Webb, 1996; Vaughan & Garrison, 2005). However, Vaughan, Cleveland-Innes, and Garrison (2013) argue that the instructor's role in facilitating discourses and providing direct instructions is crucial in moving cognitive presence beyond the Exploration phase. Another crucial strategy that could move discussions to the Integration phase and Resolution phase is to enhance learners' metacognitive awareness by requiring them to identify and self-code their discourses for cognitive presence using the practical inquiry model (Vaughan, Cleveland-Innes, & Garrison, 2013) (see Table 1). Practical inquiry model is used as a tool to assess cognitive presence (Garrison, Anderson, & Archer, 2004).

Table 1. Practical Inquiry Model for Self-Coding Discussion Forum Postings

Phase	Description	Key Questions
Triggering events	This phase initiates the inquiry process through a well- thought-out activity to ensure full engagement and buy- in from the students. This has several positive outcomes in terms of involving students, assessing the state of knowledge, and generating unintended but constructive ideas.	What were the key questions or issues identified in the discussion?
Exploration	This phase focuses first on understanding the nature of the problem and then searching for relevant information and possible explanations.	What opportunities and challenges were discussed?
Integration	This phase moves into a more focused and structured phase of constructing meaning. Decisions are made about the integration of ideas and how order can be created parsimoniously.	What recommendations and conclusions can you draw from the discussion?
Resolution/application	This phase is the resolution of the dilemma or problem, whether that is reducing complexity by constructing a meaningful framework or discovering a contextually specific solution. This confirmation or testing phase may be accomplished by direct or vicarious action	How can we apply the lessons learned from this discussion to our course assignments and future career plans?

Adopted from Vaughan, Cleveland-Innes, & Garrison (2013)

Another issue concerning the cognitive presence of learners is the relationship between the processes of cognitive presence and the student's learning outcomes. While a research study by Akyol and Garrison (2011) indicates a significant relationship between the processes of practical inquiry model and learning outcomes, some other studies (e.g., Tran, 2011; Maddrell, 2011) indicate otherwise. Akyol and Garrison's (2011) research study suggests that collaborative development of cognitive presence is correlated with students' perceived learning and the learning outcomes assessed through grading rubrics. However, Tran's (2011) research findings indicate that there is a non-significant correlation between cognitive presence and student performance. While the findings of some research studies illustrate the mean level (i.e., measure of central tendency) of all students' cognitive presence, Tran (2011) tried to determine every student's maximum level of cognitive presence by assessing their mastery level of the subject matter. However, one of the possible limitations that might have had an effect on the results of Tran's (2011) study is that it was done in a short time period (i.e., one or two week module). Another possible limitation that was not addressed by the researcher is that the study focused on processing familiar information about plagiarism, which is not representative of unfamiliar topics in which students have to process new information.

In another study, Maddrell (2011) found no correlation between student achievement and cognitive presence. Tran (2011) and Maddrell's (2011) studies claim that there is little evidence that deep and effective learning outcomes are achieved in a community of inquiry. Moreover, Tran's (2011) findings were

different from the findings of previous studies and showed that students reached higher levels of cognitive presence (i.e., Integration and Resolution) without achieving a maximum level of cognitive presence at the Triggering Event or Exploration stages. The question ensues: why are meaningful learning outcomes achieved as assessed by the instructor through different measurements of cognitive learning outcomes and not achieved in an online community of inquiry? Why is there a lack of maximum level of cognitive presence at the Triggering Event or Exploration stages in Tran's (2011) study? Why the students in Tran (2011) study displayed Integration and Resolution without progressing through previous phases of cognitive presence? Although the students achieved a mastery level in their assignments, why weren't they able to make a cohesive mental model of the online discourses throughout the study period? What interventions could be used to improve cognitive presence, enhance students' critical thinking skills, and lessen discourse misalignments and breakdowns?

Community of Inquiry framework is the most parsimonious model to provide a definition, description, and measurement of the main factors influencing the development of different dimensions of online learning processes in communities of inquiry (Shea & Bidjerano, 2010; Swan & Ice, 2010). Shea and Bidjerano (2010) stressed the need to be cognizant of the CoI framework's limits and have suggested the need for extending the framework to include the element of the learner role. In conclusion, a lack of critical discourses in an online community of inquiry might mean that there is no sufficient development of social, teaching, emotion and cognitive presence or might mean that these variables alone cannot explain the

differing levels of knowledge construction in a community of inquiry. In this thesis, it is hypothesized that the other intervening variable that might be in play is students' text-based discourse competencies. The students themselves and their critical thinking skills should also be put under scrutiny to get a better understanding of online critical discourses. In this regard, text-based discourse competencies may contribute to higher quality of knowledge construction in a community of inquiry.

Students' Psychological Characteristics and the Barriers to Critical Discourse

Based on the findings of educational psychology, students' differences in prior knowledge (Kalyuga as cited in Joksimovic, Gasevic, Kovanovic, Adesope, & Hatala, 2014), learning style preferences (Schunk, 2012), metacognitive awareness (McCabe as cited in Joksimovic et al., 2014), working memory capacity (Paas et al., as cited in Joksimovic et al., 2014), and motivation (Pintrich as cited in Joksimovic et al., 2014) result in different performances. According to Rourke and Kanuka's study (2007), the barriers to online critical discourse include: different orientations toward critical discourse, interpretation of critiques as a sign of disrespect and personal attack, and time pressure to complete all the course requirements. Furthermore, in their study, Murphy and Coleman (2004) identified four categories of learners' experiences related to online barriers to critical discourse. One of the categories is labeled "student behavior," which highlights some learners' feelings of being excluded when their posts are not answered, getting discouraged by the behavior of other learners (i.e., experiencing assertive behavior and negative responses), and becoming frustrated by lengthy discussions (Murphy & Coleman, 2004). Murphy and Coleman (2004) suggest that these feelings are the result of

learners' ill-preparation for online group discourses. The second category of students' experiences of online discourse challenges is related to "text-only online communications," which indicates discourse misinterpretation, misconstruction of meaning and incomprehensible writing (Murphy & Coleman, 2004). The third category of challenges is related to the lack of purpose and direction for the topic of discussion or related to students' sense of pressure to meet the course requirements (Murphy & Coleman, 2004). The fourth category of challenges is related to the lack of forum features that would allow students to delete or edit their messages (Murphy & Coleman, 2004). As a result, students avoid adding another message because they are reluctant to add to the great number of posts that are displayed on the discussion page (Murphy & Coleman, 2004). Furthermore, Jonassen and Remidez (2005) associated the barriers to online critical discourses with students' lack of skills in analysis, argumentation, and further rhetorical skills.

An understanding of the group dynamics within the online community of inquiry could assist the instructor in employing strategies to improve the productivity of the text-base group discourses. In an online community of inquiry, students' level of engagement may vary based on the adopted role identities. Role is defined as the social construct describing a collection of behavioral competencies needed for online learners to be active participants of a community of inquiry (Garrison, Cleveland-Innes, Fung, 2004). Various studies have been carried out to study the distribution of participation in an online-text based community of inquiry and to identify the differing roles of learners. Beaudoin (2008) has identified the notions of high visibility and non-visibility to distinguish the level of active versus lurking

participation in an asynchronous learning environment. It is argued by Beaudoin (2008) that those who have the tendency to be invisible and make no contribution to the online group discourses might be actively constructing knowledge but the research study shows the learning outcomes are higher among high visibility participants. Various terms such as "passive recipient" (Romiszowski & Mason, 2004), "witness learner" (Fritsch, 1999), "free-rider and bystander" (Preece, Nonnecke, & Andrews, 2004), "hidden participant" (Soroka & Rafaeli, 2006), "observer" (Ramirez, Zhang, McFrew, & Lin, 2007), or "quiet participant" (Hammond, 1999), and the lurking behavior as "vicarious learner" (Hrastinski, 2008) and "limited student contribution" (Hew, Cheung, & Ng, 2010) are used to refer to invisible participants. It is claimed that invisible participants can construct knowledge from reflecting on the group discourses and therefore being an "engaged lurker" (Waters & Gasson, 2006). On the other hand, incorporating collaborative learning in a community of inquiry requires learners' engagement in negotiation of perspectives through participation. The question is how to benefit from all the community members' participation and at the same time deal with the low-frequency postings of some members. Garrison, Cleveland-Innes and Fung (2004) suggest that an online community of inquiry requires a role adjustment of learners. In order to transform students' role identity from passive to active learners, it is necessary to know the reasons behind the lurking behavior of some students. In a research study, Preece, Nonnecke, and Andrews (2004) have conducted data from 219 lurkers and analyzed their responses. From the analysis of the responses, Preece, Nonnecke, and Andrews (2004) have demonstrated the reasons as to why some students prefer not

to contribute in the online discourses of community of inquiry. The reasons found by Preece, Nonnecke, and Andrews (2004) for lurking and the percentage of selected reasons by respondents include: “just reading/browsing is enough” (53.9%); “still learning about the group” (29.7%); “shy about posting” (28.3%); “nothing to offer” (22.8%); “no requirement to post” (21.5%); “others respond the way I would” (18.7%); “want to remain anonymous” (15.1%); “had no intention to post from the outset” (13.2%); and “of no value to me” (11.0%). In order to address the reasons that lead to lurking behavior and to adjust student’s role identity, suitable teaching presence strategies are required. The key focus should concern the ways to assist the lurking participants to offer responses that contribute to a high-quality collaborative learning experience without emphasizing on the quantity of postings. This thesis suggested that offering students direct instructions of argument mapping strategies might support both lurkers and other posters and enhance the quality of the community of inquiry learning experience.

Direct Instructions to Improve Critical Thinking Skills

Online learning environments can be deployed in different ways for distance educational purposes, leading to differing approaches to online teaching and learning in higher education. The educational literature is replete with a wide range of instructional methods that reflect constructivist view of teaching and learning. The Community of Inquiry framework has identified the cognitive processes in an online community of inquiry. The processes that are presented in the cognitive presence construct of the CoI framework can be improved by educational interventions. The question then follows: in an online teaching and learning environment, what is the

degree of control that learners have over their knowledge construction process? What are the teaching methods that could be used by teachers in order to employ constructivist teaching in an online community of inquiry?

Guided versus unguided teaching and learning. Coomey and Stephenson (2001) present an online learning framework which represents varying degrees of teachers' locus of control in relationship to students' locus of control over instructions, content, and the online learning process. Coomey and Stephenson (2001) identified four main quadrants or sections framed along two dimensions (see Figure 1). Each quadrant specifies the locus of control of learning and the specified learning tasks. The locus of control of learning is identified in terms of teacher determined versus learner managed and the learning tasks are identified in terms of controlled tasks as opposed to open-ended or strategic tasks (Coomey & Stephenson, 2001). Layne and Ice (2014, p. 9) have identified the quadrants as follows:

- North West quadrant (teacher-controlled, specified learning activities)
- North East quadrant (learner-managed, specified learning activities)
- South West quadrant (teacher-controlled, open-ended or strategic learning)
- South East quadrant (learner-managed, open-ended or strategic learning)

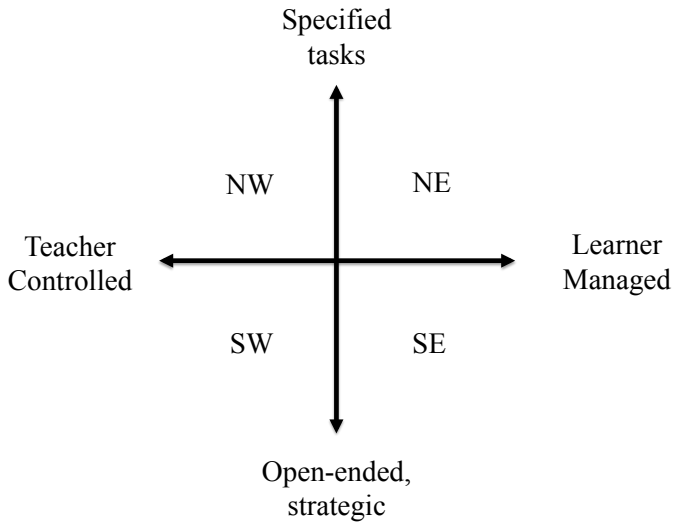


Figure 1. Teaching and Learning Paradigm Model (Coomey & Stephenson, 2001)

In the dynamics of an online community of inquiry, understanding the dimensions of learning tasks and the instructor and learner's roles is important. Layne and Ice (2014) believe that NE (i.e., learner-managed, specified learning activities) and SW (i.e., teacher-controlled, open-ended or strategic learning) quadrants are the critical points where the integration of teaching, social and cognitive presences elicits the shift of educational experience from instructor-controlled to learner-managed learning.

Although there are various versions of constructivism, in all approaches the role of instructors shift from "sage on the stage" to "guide on the side" (Burge & Roberts, 1993; French, Hale, Johnson, & Farr, 1999). On an epistemological continuum, radical and social constructivism would represent opposite extremes in terms of objectivity or subjectivity; however, each one of them is used to fulfill a certain teaching-learning goal. The instructors' role in the cognitive constructivist learning model is to create experiences in which learners' participation would lead to a process of reframing mental representation (i.e., schema) to fit the new information

and instigate the construction of mental structures. Contrary to the cognitive constructivist learning model, the instructor's role in the social and radical constructivist learning model is to guide learners to an understanding of their experiences and to the knowledge construction established as a social negotiation of reality (Kanuka & Anderson, 1999). However, radical constructivism does not suggest that students should be left alone because they are able to perform on their own. Rather it suggests that teachers should guide students to develop their own learning strategies (Kanuka & Anderson, 1999). According to Kanuka and Anderson (1999), "it would be absurd to say there is nothing educators can do that will influence and facilitate the process of knowledge construction" (p. 9).

Some scholars suggest a fusion of teaching roles. For example, Vaughan, Cleveland-Innes, and Garrison (2013) place considerable emphasis on teaching presence in which the instructors are expected to play an active role that is being "more than a 'guide on the side' but less than a 'sage on the stage'" (p. 5). The question of whether teaching should emphasize direct, explicit instructional guidance or discovery learning is at the core of the argument between the proponents and the opponents of constructivist learning model. Kirschner, Sweller, and Clark (2006) argue that having learners construct their own knowledge should not be preferred to providing direct instructional guidance. According to Kirschner, Sweller, and Clark (2006), constructivist approaches, discovery learning, problem-based learning, and inquiry learning are less effective than approaches using direct instruction. Problem-based learning and inquiry learning are among the instructional approaches that engage learners with problem-solving and investigative practices of complex issues.

However, instructional models such as problem-based and inquiry learning should only be implemented if some measures have been determined to decide whether or not the learners' competencies are compatible with the top of what are referred to as learning hierarchies. According to Bloom (1956), the bottom rung on learning hierarchy is "recalling facts" and the top rung is "evaluation." That is, it might be ineffective to use these instructional models if the learners have not yet mastered the lower categories of the learning hierarchy. Kirschner, Sweller, and Clark's (2006) argument has been criticized for equating problem-based learning and inquiry learning with minimally-guided discovery approaches through which instructors provide minimal guidance while engaging learners to explore issues or problems. Hmelo-Silver, Duncan, and Chinn (2007) argue that Kirschner, Sweller, and Clark (2006) "have mistakenly conflated [Problem-Based Learning] PBL and [Inquiry Learning] IL with discovery learning." One of the proposed flaws to Kirschner, Sweller, and Clark's (2006) argument is that it groups problem-based learning and inquiry learning, which consist of significant amount of scaffolding activities, under the category of minimally guided approaches (Hmelo-Silver, Duncan, & Chinn, 2007). In fact, according to Mayer (2004), constructivist approaches to learning depend on collaborative learning environments that allow discussion, modeling, guided discovery, and scaffolding.

In the community of inquiry framework, teaching presence plays a major role in the development of a community of inquiry and consists of three components: instructional design and organization, facilitation of discourse, and direct instruction. The design aspect of teaching presence is described as the planning of the structure,

process, interaction and evaluation (Anderson, Rourke, Garrison, & Archer, 2001). Facilitation of discourse is associated with "connecting ideas, asking for clarification, and diagnosing misconception" (deNoyelles, Zydney, & Chen, 2014, pg. 154). The final component of teaching presence is direct instruction in which the subject matter expert presents content, injects knowledge from various sources, and provides explanatory feedback (deNoyelles, Zydney, & Chen, 2014; Anderson, Rourke, Garrison, & Archer, 2001). A question that might arise when exploring the components of teaching presence in CoI framework is: what is the difference between facilitation of discourse and direct instruction? To address this issue, Vaughan's (as cited in Garrison, 2007) research findings from online transcripts revealed that the frequency of facilitation comments dropped while the direct instructions increased as discourses progressed in the online community of inquiry. Facilitating roles of instructors include reviewing posts and commenting on students' discourses, asking questions and monitoring the discourses to help propel the discussions forward toward desirable direction, maintaining the quality of discourse, making sure the discussions are progressing efficiently, motivating inactive participants and slowing down participants from dominating the discussion (Swan, Richardson, Ice, Garrison, Cleveland-Innes, & Arbaugh, 2008). Facilitating discourses in a community of inquiry is necessary but not sufficient for enabling knowledge construction within a given subject. In addition, educational leadership of a subject matter expert is required to recognize misconceptions and interject information when necessary (Vaughan, Cleveland-Innes, & Garrison, 2013).

Therefore, in order to improve the quality of discussions and to help students develop critical thinking responses, instructors' active participation is required. Extensive amount of time is required to actively participate in discussions and instructors struggle with how much to engage in online discussions (deNoyelles, Zydney, & Chen, 2014). For this reason, it is crucial to understand the dimensions of teaching presence and the roles of an instructor in an online community of inquiry.

Direct versus indirect instruction on critical thinking processes. In an online community of inquiry, it is expected that the subject matter expert provide direct instructions that are related to the content of the course, the organization of the content by the students, and the use of technology by the students (Anderson, 2004). However, providing direct instructions on critical thinking processes or explicitly teaching critical thinking in a domain-specific community of inquiry is not among the listed expectations from the subject matter expert.

Garrison, Anderson, and Archer (1999) suggest using social constructivist techniques in the community of inquiry framework in order to develop critical thinking. Facilitating critical thinking in an online community of inquiry is operationalized by the practical inquiry model, which portrays the process of critical thinking as embracing triggering event, exploration, integration, and resolution activities (Vaughan, Cleveland-Innes, & Garrison, 2013). The question is whether teachers should indirectly set up and facilitate the process of critical thinking through the use of practical inquiry model or should they provide direct, explicit instructions of the critical thinking skills embedded within the processes of the practical inquiry model. Would acquiring domain-specific knowledge by the use of the practical

inquiry model lead to enhanced level of cognitive presence and result in critical inquiry or should instructors explicitly teach students how to transfer through the phases of practical inquiry model? It is claimed that "acquiring critical thinking skills would be greatly assisted by an understanding of the process" (Garrison, Anderson, and Archer, 2001, p. 3). Many researchers claim that improving critical thinking competencies requires explicit instruction and are less likely to develop with indirect practices (Abrami et al., 2008; Case, 2005; Facione, 1990b; Halpern, 1998; Paul, 1992). In fact, Paul (1992) believes that critical thinking is integral to being able to think critically within the discipline and the skills can be taught both in a general critical thinking course and by using critical thinking instructions in the context of a discipline-specific course. Although the relationship between teaching presence and cognitive presence in the community of inquiry framework is complementary (Garrison & Cleveland-Innes, 2005), the ultimate goal is achieved when students learn how to utilize critical thinking skills in real life where critical thinking is not prompted by instructors anymore. According to Davies (2007), there is a debate between the "specifists" and the "generalist" regarding the teaching and learning practices of critical thinking. While the specifists argue that critical thinking should be subject-specific, the generalists believe that critical thinking is independent of disciplinary domain (Davies, 2007). In his study, Davies (2007) claims that the debate between specifists and generalists leads to a fallacy and suggests infusing both approaches to critical thinking. Some studies have suggested that better educational outcomes are achieved when more general critical skills are infused in the context of a discipline (Ikuenobe 2001, 2003; Solon, 2001).

A study conducted by Friedel, Irani, Rudd, Gallo, Eckhardt, Ricketts (2008) on explicit teaching of critical thinking skills of undergraduate students enrolled in agricultural biotechnology confirmed the need for explicit teaching of critical thinking skills. The study compared the difference between two types of instructional methods: explicit teaching for critical thinking skills and inquiry-based method of instruction. The explicit instructions for critical thinking skills were developed from Facione's identified critical thinking skills and the inquiry-based learning and teaching methods were developed based on National Science Education Standards (Friedel et al., 2008). The findings reported in Friedel et al. (2008) study showed a significant relationship between explicit teaching of critical thinking skills and the total critical thinking skills scores in the thinking skill evaluation. In comparison to the inquiry-based learning, the three elements adopted from Facione's critical thinking skills (i.e., analysis, evaluation, and inference) developed more when the students attended the critical thinking workshop. The importance of teaching professional skills explicitly is found in another study conducted by Hurst, Cleveland-Innes, Hawranik, and Gauvreau (2013). Hurst, Cleveland-Innes, Hawranik, and Gauvreau (2013) developed and offered online workshops that provided skill building instructions and exercises for academic writing, career planning and career development, and personal management strategies. Constructing effective arguments was among the skills taught and practiced in the academic writing workshop. The popular assumption is that professional skills are developed in the process of domain-specific tasks and the interaction with the students and the instructor (Hurst, Cleveland-Innes, Hawranik, & Gauvreau, 2013). However, the

research findings of Hurst et al. (2013) were contrary to this assumption and indicated that learners valued the explicit teaching of professional skills.

In order to improve critical thinking skills in online communities of inquiry, different strategies have been proposed by scholars. The focus of this paper is on methods that could improve discussion skills needed for an effective online community of inquiry. Elder and Paul's (2006) model of Thinker's Guide series include different titles such as concepts and tools of critical thinking, intellectual skills that enable analytical thinking, the skills of asking essential questions, skills necessary for deep comprehension, skills needed for substantive writing, and the effective use of intellect and emotions (Elder & Paul, 2006). In a study by McGuire (2010) the effectiveness of direct critical thinking instructions using argument mapping and Critical Thinker's interventions were investigated. The results of this study show that purposeful use of these interventions could enhance learners' awareness of critical thinking and their critical thinking competencies (McGuire, 2010). However, despite providing students with direct instruction as to how to improve critical thinking skills, the results of this study cannot be generalized to the online communities of inquiry. The need for acquiring deliberate thinking skills in a community of inquiry appears to be appropriate for enhancing metacognitive awareness in students. Vaughan, Cleveland-Innes, and Garrison (2013) claim that students' metacognitive awareness and assumed responsibility for monitoring and regulating one's learning will increase the potential to progress through the phases of cognitive presence.

Coordinating direct instruction and constructivist learning. What are the instructional approaches towards teaching critical thinking skills required to progress through the phases of practical inquiry model? According to Bransford, Brown, and Cocking (2000), "a fundamental tenet of modern learning theory is that different kinds of learning goals require different approaches to instruction" (p.51). Kuhn (2007) suggests providing less direct information but instead teaching students inquiry skills, which could enable them to acquire knowledge. In fact, the focus of science teaching as suggested by Kuhn (2007) should be on discovery learning methods, which is a constructivist-based approach to education and a technique of inquiry learning (Sweller, Kirschner, & Clark, 2007). On the other hand, Sweller, Kirschner and Clark (2007) claim that direct, explicit educational instructions are more effective and efficient for novice learners. Contrary to those who merely take the constructivist teaching positions (e.g., Kuhn, 2007) or those who advocate for providing direct, explicit instructional guidance (e.g., Sweller et al., 2007), Mayer (2004) suggests the use of "guided discovery" method, which is a combination of direct instruction and constructivist activities of knowledge construction. According to Mayer (2004), constructing knowledge by virtue of learning through required discussions in a community of inquiry is doomed to fail if the students are not guided by teachers and not provided with the materials to be learned.

Similar to Mayer's (2004) viewpoint, in this thesis, it was assumed that teaching students inquiry skills by providing them direct instructions might have an advantage over developing critical thinking skills by virtue of learning through required discussions in a community of inquiry. According to Mayer (2004), "pure

discovery - even when it involves lots of hands-on activity and large amounts of group discussion - may fail to promote the first cognitive process, namely, selecting relevant incoming information" (p. 17). Similarly, in the research presented in the current thesis, it was assumed that group discourses in an online community of inquiry may be less effective if students not know how to select and logically organize the relevant incoming knowledge. Thus, in order to support constructivist inquiry learning, Mayer's (2004) method of combining direct instruction and constructivist learning was applicable. For example, instructors can incorporate direct instructions of argument mapping strategies while allowing students to have the cognitively beneficial inquiry learning experience. Direct instruction would allow students to apply the new skill as they participate in the community of inquiry discourses. In this study, it is endeavored to determine if direct instructions on argument mapping strategies in an online community of inquiry would be more motivating and yield larger pre-test to post-test scores. The study posited that the level of text-based discourse competency that a learner accomplishes after receiving the instructions on argument mapping strategies might affect students' perception of cognitive presence in an online community of inquiry.

Enhancing the Quality of Posts in Discussion Forums

In an online community of inquiry, instructors need to employ different strategies to improve group productivity and encourage active and lurking students to participate. According to Akyol and Garrison (2011), critical thinking and inquiry requires student's awareness and competence to take responsibility and control of meaning and confirmed knowledge. Several strategies to support online communities

of inquiry have been identified in previous literature studies. DeNoyelles, Zydney, and Chen (2014) have classified the strategies connecting the three presences of online community of inquiry framework. These strategies include:

- Modeling social cues to encourage social interactions
- Selecting discussion prompts such as problem-based, project-based, debate, and protocol prompt
- Providing modest feedback to allow student control
- Posing questions and adopting a challenging stance to provoke more reasoned arguments
- Using video or audio feedback to enrich and soften the feedback
- Allowing peers to facilitate discussions

To improve threaded discussions in a sample course, Brescia and Miller (2005) charged graduate students with the moderation of discussions. The moderators were given a researcher-developed mentoring taxonomy to help them with the process of leading discussions. The taxonomy included these categories and subcategories: coaching through participation (model good analysis, clarify, challenge good hypotheses, question, ask for clarification); providing structure (frame tasks, summarize, encourage reflection); supporting individual students (nourish good ideas, champion lost ideas, provide feedback, and recommend resources). The results show that the moderators made few posts and the students were more comfortable using strategies such as the nourishing of good ideas, feedback, and summarizing. They preferred using positive feedback and, in terms of questioning, they offered explanations if students had trouble understanding a concept. They enjoyed

providing resources as well. Other categories of the taxonomy were used less by the moderators. Although this study is a step forward toward enhancing student responsibility and self-awareness, the little use of "coaching through participation" category and "challenge hypothesis" subcategory is indicative of little argumentative interaction. Lack of argumentative interaction could be due to students' different attitude toward critical discourse in the community of inquiry and their lack of skills in constructing a plausible critical discourse. The solution proposed in the research presented in the current thesis was to teach learning strategies by incorporating direct instructions of argument mapping strategies into the community of inquiry to foster the development of online text-based discourse competencies. Higher level of competency was assumed to increase students' self-efficacy and self-regulation and contribute to the perceived level of engagement in the discussion forums.

Mapping Strategies to Improve Learning

In order to understand a coherent discourse, Bock and Brewer (1985) believe that the comprehender produces a mental model based on the information in the text and his/her world-knowledge of schemas. Due to the capacity limitation of human information processing, mental models are mapped to verbal and pictorial codes to create an external representation. Sentences forming a discourse need to be coherent and describe an interpretable set of ideas or sequence of events (Johnson-Laird as cited in Bock & Brewer, 1985). In an online community of inquiry, discussion forums are the collaborative learning settings wherein discourses happen through text-based asynchronous computer mediated communication. The lack of visual-spatial cues to find the logical structure in text-based presentation of information

might lead to cognitive load (i.e., overloading the working memory which is limited in capacity) (Dwyer, 2011) and high levels of cognitive load might reduce memory constraints, comprehension, and critical thinking (Sweller, 2010; van Gelder, 2003). On the other hand, presenting information in meaningful chunks of visual-spatial format could facilitate the organization of information in working memory and long-term memory and decrease cognitive load (van Gelder, 2003). Argument mapping is a method of visualizing, clarifying and organizing thinking by using boxes and line diagrams for the purpose of showing the logical relationships between the ideas that are communicated in a text form (Dwyer, 2011). In collaborative and inquiry approaches to learning in online settings, argumentation is one of the fundamental factors for practicing and developing critical thinking skills (van Gelder, 2003). Therefore, becoming a critical thinker requires skills that involve the processes of building arguments to support a claim, analyzing and evaluating the evidence and counter-evidence in developing supporting arguments (van Gelder, 2003).

It is argued that higher-order thinking, which includes metacognitive self-regulation strategies, are needed in order to assist learners in the acquisition and implementation of knowledge (Folsom-Kovarik, Schatz, Sukthankar, Nicholson, 2010; Huffaker & Calvert, 2003; U.S. National Research Council, 2002). Metacognition in online communities of inquiry is referred to "the set of higher knowledge and skills to monitor and regulate manifest cognitive processes of self and others" (Akyol & Garrison, 2011, p. 184). Vaughan, Cleveland-Innes, and Garrison (2013) suggest implementing instructional practices for improving metacognitive proficiency. Methods for implementing metacognitive strategy use are

peer assessments, collective reflection, modeling the processes involved in metacognitive construct, reflective journal writing, and self-coding the discourses for cognitive presence using the practical inquiry model (Vaughan, Cleveland-Innes, & Garrison, 2013). Most importantly, Ellis, Denton, and Bond (2014) refer to activities such as concept mapping. Previous literature reviews suggest that there is a positive relationship between metacognitive awareness and individual learning (e.g., Gulikers, Bastiaens, Kirschner, & Kester, 2006; Michalsky, Mevarech, & Haibi, 2009). Therefore, Pintrich (2002) underlines the importance of teaching metacognitive skills explicitly. While implicit methods of teaching refer to metacognitive processes being modeled indirectly, explicit methods of instruction involves modeling the processes while directly identifying the processes and the benefits of using the metacognitive strategies. In their study, Kistner, Rakoczy, Otto, Dignath-van Ewijk, Buttner, Klieme (2010) found that explicit instructions are positively related to students' performance. In Kistner's et al. study, participants were sampled from grade nine students. Further research studies are needed to find if there is a positive relationship between explicit strategies of instruction and adult student's cognitive presence in an online learning environment.

For the purpose of improving DE learners' online critical discourses, the focus of this research study was on argument mapping strategies. Improving on Toulmin's proposed model of argumentation and Gestalt psychology, Horn tried to make complex arguments more manageable by constructing graphical representation of arguments (as cited in Dwyer, 2011). For example, Rationale is a software tool for argument mapping that could enable students to use visual representations to create

meaningful groupings from chunks of information (van Gelder, 2007). On the other hand, Harrel (2008) believes that for argument mapping no computer program is required and using pencil and paper is sufficient. The few studies that have used mapping interventions show different results in terms of critical thinking skills improvement.

In a study by Bessick (2008), which was done as a fulfillment for Doctorate degree, the Critical Thinker's guide and the Rationale Argument mapping were used as a supplement to tutoring a sample of undergraduate students who were repeating a course. No significant improvement of students' critical thinking skills was found in this study. In another study, Wu and Wang (2012) used a dual mapping environment consisting of concept mapping and argument mapping tools for students recruited from medical schools in China in an online learning program. The instructors participated in Wu and Wang's (2012) study believed that teaching skills of problem solving has a positive impact on teaching and learning. Unlike Bessick's (2008) study, the results of Wu and Wang's (2012) study indicated that the dual mapping environment was effective and well-received by students. In an experimental study, Dwyer (2011) compared argument mapping to alternative educational strategies such as hierarchical outlining and text summarization. In comparison to the other strategies, results indicated that argument mapping enhanced students' recall performance, argument analysis, verbal reasoning, hypothesis testing, assessing likelihood and uncertainty, and problem solving (Dwyer, 2011). In another experiment, Dwyer (2011) compared the effect of argument-mapping-infused critical thinking course offered online with a no-intervention control group. The results

indicated that online argument-mapping-infused critical course enhanced students critical thinking pre-to-post-testing.

Summary

This study investigated the processes by which DE students can construct a mental model of an online text-based group discourse of community of inquiry. This issue was an important one because this study predicted that being able to construct a meaningful mental model of a group discourse can enhance student's skills to have a better cognitive presence in the community of inquiry. Despite widespread interest in developing a conceptual and transactional process model such as CoI framework to achieve deep and meaningful learning, less attention has been given to skills required by students to construct a cohesive mental model of text-based group discourses. The prediction of this study was that social presence and teaching presence are important factors for the development of cognitive presence but are not sufficient to dominate the discourse. At the same time, learners with a sufficient level of text-based discourse competence could provide crucial input to the discourses and ensure that the community's cognitive presence moves to the Resolution phase. Providing direct instructions on argument mapping strategies was expected to help ensure learners' increasing competence as they learn to monitor, organize, and construct critical discourses. This study predicted that introducing direct instructions of argument mapping strategies to DE students would address their different learning styles preferences, lessen their cognitive overload, improve their metacognitive awareness, change their negative attitude toward critical discourse, and enhance their

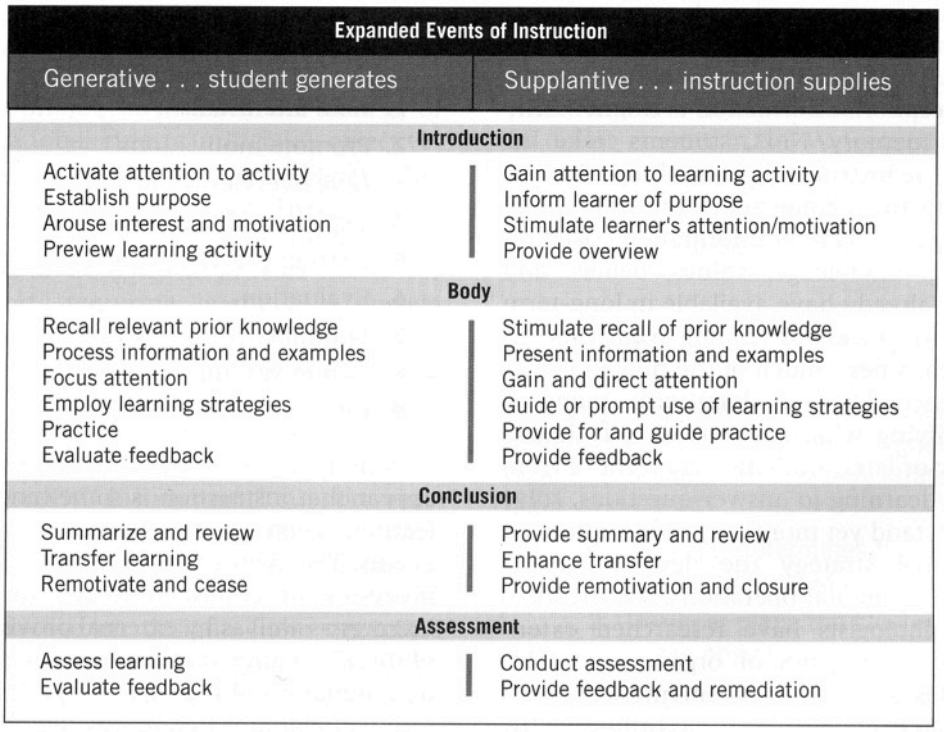
engagement in more meaningful discussions to construct knowledge as a community of inquiry.

Theoretical Perspective

This study's framework of investigation was positivist. It proposed an intervention that integrates the behaviorist and constructivist approaches to instructional design. The goal of this study was to use cognitive information processing and cognitive strategies to optimize learning outcomes.

Integrating objectivist and constructivist approaches to learning. In order to make sure that learning happens successfully, different procedures are required to address different learning goals. While the objectivist's epistemology is based on the assumption that knowledge is in the real world and can be transferred to learners, the constructivist's epistemology refers to the assumption that knowledge is constructed by learners when they build interpretations of the external world through their experiences (Ertmer & Newby, 1993). In order to facilitate learning, an instructional designer needs to employ learning strategies that are appropriate for particular learning tasks. To determine the balance between instructional strategies and learner strategies in relation to the variables of context, learner, and task, Smith and Ragan (2005) have proposed a model of "generative" and "supplantive" approaches to the lesson strategies. If the instructions are designed to incorporate the constructivist's approach to learning, generative strategies are implemented to allow learners "to construct their own idiosyncratic meanings from the instruction . . ." (Smith & Ragan, 2005, p. 141). On the other hand, if the instructions are designed to incorporate the objectivist's approach to learning, supplantive strategies are

implemented "to supplant, facilitate, or scaffold more of the information processing for the learner by providing elaborations that supply all or part of the educational goal . . ." (Smith & Ragan, 2005, p. 142). Smith and Ragan (2005) have provided a checklist for the instances of generative and supplantive strategies (see Figure 2).



Expanded Events of Instruction	
Generative . . . student generates	Supplantive . . . instruction supplies
Introduction	
Activate attention to activity	Gain attention to learning activity
Establish purpose	Inform learner of purpose
Arouse interest and motivation	Stimulate learner's attention/motivation
Preview learning activity	Provide overview
Body	
Recall relevant prior knowledge	Stimulate recall of prior knowledge
Process information and examples	Present information and examples
Focus attention	Gain and direct attention
Employ learning strategies	Guide or prompt use of learning strategies
Practice	Provide for and guide practice
Evaluate feedback	Provide feedback
Conclusion	
Summarize and review	Provide summary and review
Transfer learning	Enhance transfer
Remotivate and cease	Provide remotivation and closure
Assessment	
Assess learning	Conduct assessment
Evaluate feedback	Provide feedback and remediation

Figure 2. The Expanded Events of Instruction. Adopted from Smith & Ragan (2005)

According to Cronje (2006), while supplantive approach ranges from indirect to direct learning, generative approach ranges from simple to complex learning. Instead of locating constructivism and objectivism on the opposite ends of the continuum, Cronje (2006) has argued to plot them "at right angles to one another" (p. 387). Based on Cronje's (2006) argument, a two dimensional model could allow the selection of both generative and supplantive instructional strategies. He identified four main quadrants of teaching and learning (see Figure 3).

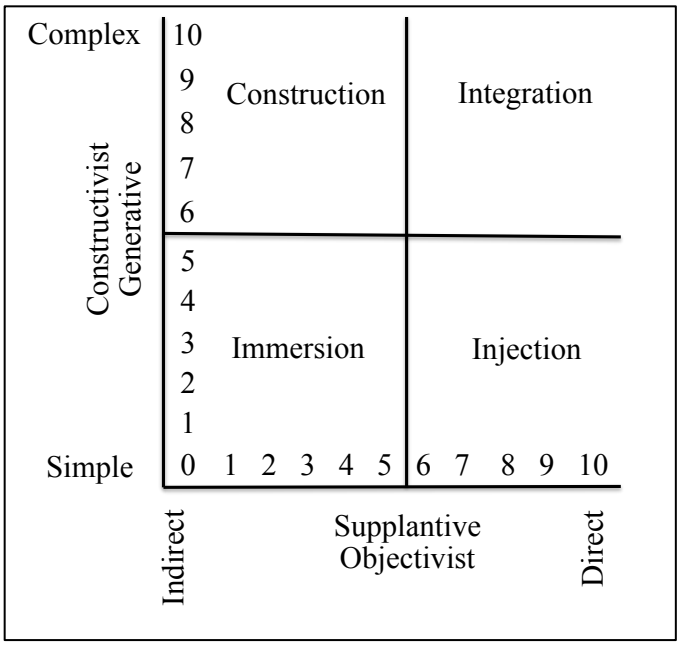


Figure 3. Quadrants of teaching and learning. Adopted from Cronje (2006)

While learning through Injection refers to the knowledge being transferred directly to learners, Immersion is claimed to be an "incidental" learning in which students are immersed in experiences. Learning through Construction refers to meaning being constructed intrinsically by being encouraged to use prior experiences. Finally, learning through Integration refers to the "combination of instruction and construction in appropriate conditions" (Cronje, 2006, p. 398). Cronje (2006) suggests that in the Integration quadrant, the instructional designer is able to select elements of both Supplantive and Generative strategies as required by instructional goals. The main goal of the current thesis was to introduce argument mapping strategies as a combination of instruction and construction. Providing direct instructions of argument mapping strategies could contribute to a high-quality collaborative learning experience through required discussions in a community of inquiry.

Information Processing System: Cognitive Load Theory. Since sensory memory is associated with senses and holds information in memory very briefly, cognitive information processing model offers some strategies in order to have an effective use of limited capacity of sensory memory (Schunk, 2012). According to van Merrienboer and Sweller (as cited in Schunk, 2012), "a key idea is that instructional methods should decrease extraneous cognitive load so that existing resources can be devoted to learning" (p. 224). Therefore, blocking out unwanted or irrelevant stimuli and not overloading students' processing system is volitional. From a cognitive perspective, developing logical argumentative discourses are complex and challenging (Hoffmann & Paglieri, 2011). Argument from a philosophical perspective consists of a set of claims (i.e. premises) that are stated in support of a further claim (i.e. the conclusion) (Hoffmann & Paglieri, 2011). Therefore, it becomes crucial to identify the well-grounded messages from the number of messages posted to the discussion forums and organize an argument consisted of the premises presented by the participants in the community of inquiry. Based on the observations from the cognitive overload theory, argumentation maps as cognitive tools were predicted to facilitate high levels of thinking and online critical discourse construction. As meaning is derived from socially negotiated online group discourses, the participants in this thesis were given the opportunity to organize large set of claims, evaluate premises, identify patterns, develop organizational schemes, and recommend conclusions with argument mapping strategies.

Cognitive strategies. Gagne's taxonomy of learning is influenced by information-processing view of learning. His taxonomy of learning consists of five categories of learning (i.e., verbal information, intellectual skills, cognitive strategy, attitude, and motor skills) (Smith & Ragan, 2005). According to Gagne, Brigg, and Wagner (1988), cognitive strategies are "internal processes by which learners select and modify their ways of attending, learning, remembering and thinking" (p. 67). Argument mapping strategies were used in this study as cognitive strategies, which help learners organize information graphically. Argument maps externalize the taxonomic levels of cognitive strategies implemented while learning and constitute a useful metacognitive tool for boosting learners' attainment of higher order cognitive skills. In this study, Bloom's taxonomy and learning strategies were applied to instructional objectives for argument mapping unit of instruction and to the argument mapping strategies.

CHAPTER III

METHODOLOGY

Research Questions and Hypothesis

This study sought to answer questions pertaining to the cognitive presence in the community of inquiry. The question was: what are the levels of cognitive presence perceived by online learners during the online discussion when they are given direct instructions on argument mapping strategies? The null hypothesis was as follows: there is no significant effect of the direct instruction of argument mapping strategies on participants' perceived level of cognitive presence at the alpha level of 0.05.

Research Design

This study was quantitative in nature, and it used a quasi-experimental design. Campbell and Stanley (1963) have introduced quasi-experimental research design, which is a nonrandomized research design. A common type of quasi-experimental research design is a nonrandomized, pre-post intervention design (Campbell and Stanley, 1963). In this study, a pretest and posttest were administered to the selected sample group. A small survey sample size of 10 participants was obtained. Contrary to previous studies, this study focused on the perspective of distance education master level students only. The types of variables that this study measured were ordinal. The researcher presented a one-hour long lesson on argument mapping strategies to the sample group. The instructions on argument mapping strategies were designed by the researcher and were delivered through Adobe Connect. The content of the designed lesson is reported in Appendix E.

Research Population and Sample

From the population of communities of inquiry of online higher education students, a convenience sample of distance learners was drawn from a Master of Distance Education program that is offered completely online at Athabasca University. With nonprobability-based convenience sampling, the sample for this study was selected on the basis of students' availability (i.e., volunteerism).

Instrumentation

Participants were invited to respond to two questionnaires. The first questionnaire was designed by the researcher to be completed by the target sample group prior to conducting the research. The same set of questions was used in the second questionnaire, which was completed at the end of the course. Both questionnaires were Likert-type scale and they both required approximately 20 minutes to complete. The designed pre-test/post-test questionnaire was based on the coding protocol used to assess cognitive presence of the community of inquiry in the discussion forums (see Appendix B). The questionnaires consisted of questions about the cognitive presence of the community of inquiry before and after the use of visual mapping strategies. Although other critical thinking measurement instruments exist, the purpose of this study (i.e., investigating whether direct instructions of visual argument mapping strategies could improve the stages of cognitive presence of the CoI framework) made the cognitive presence coding protocol the appropriate choice. Finally, the content of the lesson on argument mapping strategies included the following:

- Introduction

- Objectives
- Essential parts of arguments
- Organizing ideas in argument maps
- Dealing with controversial issues
- Text analysis
- Exercise
- Conclusion

The lesson included examples from popular debates and examples from topics explored in Master of Distance Education Program (see Appendix E).

Pilot Study

A general pilot study was carried out by the researcher involving two MDE students who accepted the invitation for answering the survey items and attending an Adobe Connect trial presentation of argument mapping strategy held by the researcher. Students were asked to complete the questionnaire and provide feedback. As a result of pilot testing the questionnaire, the researcher sought to examine whether each question is understood, whether each question measures what it is supposed to measure, whether both students interpret the questions the same way, whether they were able to understand and follow the directions provided in the questionnaire, and whether the questionnaire creates a positive impression that motivates participants to respond. Furthermore, the researcher pilot tested the LimeSurvey online survey tool by providing a customized link to access the survey. In addition, Adobe Connect software was pilot tested for its functionality, usability, file sharing, audio and recording. Finally, the lesson on argument mapping strategies

was pilot tested to evaluate the instructional strategies used to structure the learning object (i.e., the lesson on argument mapping strategy). In the pilot test, the lesson was examined to ensure that Gagne's events of learning are met (Smith & Ragan, 2005). The following aspects of the instructional strategies were evaluated:

- the respondents comprehend the content;
- the learning materials provided in the lesson foster the type and level of learning identified in the learning goals or objectives;
- the question given at the beginning of the lesson capture learner's attention and set their mind for what is coming next;
- the examples provided throughout the lesson are relevant and provide context for the issues and themes canvassed in the lesson;
- the lesson utilized evidence, such as credible sources of information to meet the objectives;
- the headings and unit outline aid the learners to proceed through the unit easily and not get lost or frustrated;
- the tables and graphics used arouse learners' motivation and interest;
- the content pages are concise and organized into sections;
- the selection and sequencing of content capture learners' attention and arouse their interest and motivation;
- and the exercise questions at the end of the lesson meet the learning objective.

Data Collection

Data were collected from a pre-treatment/post-treatment quantitative

questionnaire. The study was sequential, with the data collected at one point in time over a period of fourteen weeks. The data collection procedures were carried out over thirteen weeks of an academic semester (see Table 2).

Table 2. Data Collection Procedures

Dates	**Data Collection Activities**
April 29 (Week 1)	Letter of invitation sent out
June 1 (Week 6)	Consent form and pre-test survey sent to volunteers
June 1 – July 15 (Week 6 – Week 12)	An hour long online synchronous lesson presented by the principal investigator to each volunteer
June 21 – July 27 (Week 8 – Week 13)	Post-test survey sent to volunteers

On April 29, 2015, an initial request for participation in a quantitative research study was e-mailed to Distance Education Master degree program students at Athabasca University by a Centre for Distance Education (CDE) administrator. On August 4, 2015, the data collection was completed.

Due to the time needed to participate and to reflect upon their level of participation in the discussion forums, the student volunteers were asked to participate in the study on the 6th week of the course. Prior to distributing the second survey regarding participants' perception of their level of participation in the discussion forums after receiving the argument mapping strategies intervention, the participants were given three weeks gap in order to be able to reflect upon the received argument mapping strategies while participating in the discussion forums of

their courses.

Ethical Considerations

This research study involved minimal ethical risk. Students recruited were informed of the nature and purpose of the research study in the letter of invitation (see Appendix C). Expectations of participants were clearly stated to volunteers and it was emphasized that participation was completely voluntary and results would be confidential. Furthermore, participants were assured that there would be no consequences from deciding to withdraw from the research study. All participants agreed to the written consent forms (see Appendix D). Upon return of the consent forms, participants were given the required information to access the survey along with a token number, known only to the researcher. The research study conclusions do not contain any names or personal information.

Treatment of the Data

The study consisted of non-parametric statistics. The dependent variable (student cognitive presence) was measured at the ordinal level. The independent variable (being presented to the direct instructions for argument mapping strategies) consisted of two related groups in which the same participants were measured on two occasions (pre-test and post-test) on the same dependent variable. The non-parametric test, Wilcoxon test for paired samples, was used to determine if there were a significant difference between the sample group's pre-test and post-test results. In this study, Garrison, Anderson, and Archer's (2000) cognitive presence coding protocol was used to develop a questionnaire and measure the quality of cognitive presence (see Appendix A).

CHAPTER IV

RESULTS

The purpose of this study was to investigate the effect of direct instructions of argument mapping strategies on students' perceived level of cognitive presence in the online community of inquiry. The following research question and hypothesis guided this investigation.

> Research question: what are the levels of cognitive presence perceived by online learners during the online discussion when they are given direct instructions on argument mapping strategies?
>
> Null Hypothesis: there is no significant effect of the direct instruction of argument mapping strategies on participants' perception of their level of cognitive presence at the alpha level of 0.05.

As described above, the questionnaire consisted of 12 questions, which were based on the indicators of cognitive presence adapted/adopted from the Garrison, Anderson, and Archer's (2000) CoI framework. The Wilcoxon Signed-Rank Test was used to compare pre-intervention and post-intervention results of the Likert scale scores for each participant (see Table 3, 4 & 5). As Table 3 demonstrates, the post-intervention survey (i.e., Survey 2) received a higher mean score (M = 7.44) while the pre-intervention survey (i.e., Survey 1) received a lower mean score (M = 6.92). Moreover, Table 6 shows that the responses to Survey 1 were more homogeneous (SD = 1.757) compared to Survey 2 whereas the responses to Survey 2 were more heterogeneous (SD = 2.053) compared to Survey 1.

Table 3. Wilcoxon Descriptive Statistics

Descriptive Statistics								
	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
Pre-treatment	120	6.92	1.757	1	10	6.00	7.00	8.00
Post-treatment	120	7.44	2.053	1	10	6.00	8.00	9.00

Table 4. Wilcoxon Negative and Positive Ranks

Ranks				
		N	Mean Rank	Sum of Ranks
Post-treatment - Pre-treatment	Negative Ranks	36[a]	51.75	1863.00
	Positive Ranks	66[b]	51.36	3390.00
	Ties	18[c]		
	Total	120		

a. Post-treatment < Pre-treatment
b. Post-treatment > Pre-treatment
c. Post-treatment = Pre-treatment

Results showed a statistically significant difference between the pre- and post-intervention assessment for perceived cognitive presence (Z = -2.586, p = .010) at the alpha level of 0.05.

Table 5. Wilcoxon Test Statistics

Test Statistics[a]	
	Post-treatment - Pre-treatment
Z	-2.586[b]
Asymp. Sig. (2-tailed)	.010

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Each sub-category of cognitive presence included three questions in the survey. Survey questions for cognitive presence sub-category included the following statements and examples:

Triggering event:

1) Recognizing the problem, question, or issue being discussed

    Example: David is trying to understand the topic/issue that is raised in the discussion forum. By relating the problem to his experiences and previous knowledge, he restates the issues/topic and expresses his interpretation of the issue being raised.

2) Clarifying the topic/issue being discussed

    Example: In order to make better sense of the topic and to form a preliminary opinion about the topic, Sarah is seeking clarification. She is asking clarifying questions to ensure that her understanding of the issue/topic is correct.

3) Utilizing a variety of information sources to explore the posed problem, question, or issue

    Example: Dianne is sharing personal narrations by relating a story, an incident, or a practice from her profession or from everyday life. In addition, to better explore the issue posed for discussion, she is providing information from reputable sources such as the course textbook, study guide, and literature.

Exploration:

4) Comparing information with other students

Example: To explore the topic and organize her understanding of the topic, Roxanne takes into consideration what is being said by the participants in the discussion forum and tries to compare the main points.

5) Brainstorming to find relevant information (i.e., adding to established points without defending, justifying, and developing additional ideas)

   Example: Lisa is adding to her own and other participants' established points. She is tossing around ideas to identify the relevant information to the topic.

6) Making tentative suggestions for consideration

   Example: To explore the topic of the discussion, Mickey provides suggestions for consideration. His suggestions would follow by questions such as "does that seem about right?" or "am I off the mark?"

Integration:

7) Connecting ideas from the group discussions through disagreement or agreement

   Example: Hazel has considered all the relevant information provided in the discussion forum and compared and contrasted the main points that were raised by the participants. She is trying to relate the main statements made in the discussion forum by supporting or opposing them.

8) Connecting ideas from the group discussions to create justified and

defensible assumptions/hypotheses

Example: Seth has identified and analyzed the main supporting reasons and objections that were raised by the participants. He has positioned his own supporting or opposing statements. He is trying to create a justified and defensible assumption by making judgments about the quality of the evidence provided in support of the assumptions.

9) Synthesizing new understandings from the ideas that are shared in the group discussions

Example: Cynthia is combining all the main information such as the relevant knowledge shared in the discussion, the analysis of the main statements made by herself and the other participants, the evaluation of the main claims and judgments, and the acceptance or rejection of the main statements. Based on her integration of ideas, she is forming a collection of justified statements that illustrate a new understanding of the topic.

Resolution:

10) Creating conclusions/solutions from the main points of the discussions

Example: Ian has evaluated the main statements made in the discussion forum and developed justified assumptions. He is logically linking the justified assumptions to illustrate the relationship between them.

11) Developing conclusions/solutions to the posed problems/issues that can be

applied in practice

Example: Francis has linked his own and other participants' prior inferences to conclusion. He is proposing a conclusion that can be applied in practice. He is considering the ideas or actions that might follow from the proposed conclusion.

12) Defending how the conclusions drawn from the discussions could be extended to real life

Example: Claire has integrated her own and other participants' perspectives and has considered the proposed conclusion(s) that can be applied in practice. She is judging the relevance of the proposed conclusion(s) and is trying to justify the effectiveness of the actions that might follow from the proposed conclusion.

Survey questions were first sorted by cognitive presence categories. Then, each category (i.e., Triggering Event, Exploration, Integration and Resolution) was analyzed individually for mean and standard deviation. The mean, standard deviations and range of scores for all four cognitive presence sub-categories were determined (see Table 6).

Table 6. Descriptive Statistics of the Categories of Cognitive Presence

	N	Sum	Mean	Std. Deviation	Variance
Triggering Event - Survey 2	30	242	8.07	1.964	3.857
Exploration - Survey 2	30	222	7.40	2.044	4.179
Integration - Survey 2	30	220	7.33	1.971	3.885
Triggering Event - Survey 1	30	211	7.03	2.282	5.206
Resolution - Survey 2	30	209	6.97	2.173	4.723
Integration - Survey 1	30	209	6.97	1.629	2.654
Resolution - Survey 1	30	205	6.83	1.510	2.282
Exploration - Survey 1	30	205	6.83	1.577	2.489
Valid N (listwise)	30				

As Table 6 demonstrates, the Triggering Event category of Survey 2 received the highest mean score ($M = 8.07$) while the Exploration category of Survey 1 received the lowest mean score ($M = 6.83$). Furthermore, Table 6 shows that the responses to the Resolution category of Survey 1 were the most homogeneous ($SD = 1.510$) whereas the responses to the Triggering Event of Survey 1 were the most heterogeneous ($SD = 2.282$).

In order to examine the relationship between the cognitive presence categories in the pre-intervention survey (i.e., Survey 1) and the post-intervention survey (i.e., Survey 2), a correlational analysis was performed. The results of Survey 1, as presented in Table 7, indicated high and positive correlation between the Integration and Resolution categories. However, the correlation between the other categories was not significant.

Table 7. Correlation Analysis of the Cognitive Presence Categories in Survey 1

Correlations					
		Triggering Event - Survey 1	Exploration - Survey 1	Integration - Survey 1	Resolution - Survey 1
Triggering Event - Survey 1	Pearson Correlation	1	.318	.325	.222
	Sig. (2-tailed)		.087	.080	.239
	N	30	30	30	30
Exploration - Survey 1	Pearson Correlation	.318	1	.078	.147
	Sig. (2-tailed)	.087		.681	.438
	N	30	30	30	30
Integration - Survey 1	Pearson Correlation	.325	.078	1	.474**
	Sig. (2-tailed)	.080	.681		.008
	N	30	30	30	30
Resolution - Survey 1	Pearson Correlation	.222	.147	.474**	1
	Sig. (2-tailed)	.239	.438	.008	
	N	30	30	30	30
**. Correlation is significant at the 0.01 level (2-tailed).					

On the other hand, the results from Survey 2, as presented in Table 8, showed that the correlation between these categories were significant. Additionally, the correlation coefficients among the categories of cognitive presence ranged from medium to large. The Triggering event had a high positive correlation with Exploration. Likewise, the Integration had a high and positive correlation with the Resolution category. On the contrary, the Exploration had moderate positive correlation with the Integration and Resolution category.

Table 8. Correlation Analysis of the Cognitive Presence Categories in Survey 2

Correlations					
		Triggering Event - Survey 2	Exploration - Survey 2	Integration - Survey 2	Resolution - Survey 2
Triggering Event - Survey 2	Pearson Correlation	1	.646**	.163	.348
	Sig. (2-tailed)		.000	.389	.060
	N	30	30	30	30
Exploration - Survey 2	Pearson Correlation	.646**	1	.428*	.383*
	Sig. (2-tailed)	.000		.018	.036
	N	30	30	30	30
Integration - Survey 2	Pearson Correlation	.163	.428*	1	.663**
	Sig. (2-tailed)	.389	.018		.000
	N	30	30	30	30
Resolution - Survey 2	Pearson Correlation	.348	.383*	.663**	1
	Sig. (2-tailed)	.060	.036	.000	
	N	30	30	30	30
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

Table 9 demonstrates the results from the Wilcoxon test for all four cognitive presence sub-categories of the pre-treatment survey. The results from comparing the sum of ranks in the Triggering Event and the Integration phases of the pre-treatment survey showed that although there were more cases where the Integration scores were lower than the Triggering Event scores, this difference was not statistically significant at the alpha level of 0.05 (Z = -.561, p = .575). Furthermore, the results from comparing the sum of ranks in the Exploration and the Integration phases of the pre-treatment survey showed that although there were more cases where the Exploration scores were lower than the Integration scores, this difference was not

statistically significant at the alpha level of 0.05 (Z = -.176, p = .861). Finally, the results from comparing the sum of ranks in the Exploration and the Resolution phases of the pre-treatment survey showed that although there were more cases where the Exploration scores were higher than the Resolution scores, this difference was not statistically significant at the alpha level of 0.05 (Z = -.055, p = .956).

Table 9. Wilcoxon Negative and Positive Ranks for Pre-Treatment Categories

		N	Mean Rank	Sum of Ranks
Integration - Survey 1 - Triggering Event - Survey 1	Negative Ranks	12[a]	11.96	143.50
	Positive Ranks	10[b]	10.95	109.50
	Ties	8[c]		
	Total	30		
Exploration - Survey 1 - Integration - Survey 1	Negative Ranks	11[d]	10.95	120.50
	Positive Ranks	10[e]	11.05	110.50
	Ties	9[f]		
	Total	30		
Exploration - Survey 1 - Resolution - Survey 1	Negative Ranks	11[g]	14.59	160.50
	Positive Ranks	14[h]	11.75	164.50
	Ties	5[i]		
	Total	30		

a. Integration - Survey 1 < Triggering Event - Survey 1
b. Integration - Survey 1 > Triggering Event - Survey 1
c. Integration - Survey 1 = Triggering Event - Survey 1
d. Exploration - Survey 1 < Integration - Survey 1
e. Exploration - Survey 1 > Integration - Survey 1
f. Exploration - Survey 1 = Integration - Survey 1
g. Exploration - Survey 1 < Resolution - Survey 1
h. Exploration - Survey 1 > Resolution - Survey 1
i. Exploration - Survey 1 = Resolution - Survey 1

Test Statistics[a]

	Integration - Survey 1 - Triggering Event - Survey 1	Exploration - Survey 1 - Integration - Survey 1	Exploration - Survey 1 - Resolution - Survey 1
Z	-.561[b]	-.176[b]	-.055[c]
Asymp. Sig. (2-tailed)	.575	.861	.956

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.
c. Based on negative ranks.

Table 10 demonstrates the results from the Wilcoxon test for all four cognitive presence sub-categories of the post-treatment survey. The results from comparing the sum of ranks in the Triggering Event and the Integration phases of the post-treatment survey showed that there were more cases where the Integration scores were lower than the Triggering Event scores. This difference was statistically significant at the alpha level of 0.05 (Z =-1.975, p = .048). Furthermore, the results from comparing the sum of ranks in the Exploration and the Integration phases of the pre-treatment survey showed that although there were more cases where the Exploration scores were higher than the Integration scores, this difference was not statistically significant at the alpha level of 0.05 (Z = -.552, p = .581). Finally, the results from comparing the sum of ranks in the Exploration and the Resolution phases of the pre-treatment survey showed that although there were more cases where the Exploration scores were lower than the Resolution scores, this difference was not statistically significant at the alpha level of 0.05 (Z = -.814, p = .416).

Table 10. Wilcoxon Negative and Positive Ranks for Post-Treatment Categories

		N	Mean Rank	Sum of Ranks
Integration - Survey 2 - Triggering Event - Survey 2	Negative Ranks	15[a]	10.50	157.50
	Positive Ranks	5[b]	10.50	52.50
	Ties	10[c]		
	Total	30		
Exploration - Survey 2 - Integration - Survey 2	Negative Ranks	9[d]	11.11	100.00
	Positive Ranks	12[e]	10.92	131.00
	Ties	9[f]		
	Total	30		
Exploration - Survey 2 - Resolution - Survey 2	Negative Ranks	12[g]	7.71	92.50
	Positive Ranks	9[h]	15.39	138.50
	Ties	9[i]		
	Total	30		

a. Integration - Survey 2 < Triggering Event - Survey 2

b. Integration - Survey 2 > Triggering Event - Survey 2

c. Integration - Survey 2 = Triggering Event - Survey 2

d. Exploration - Survey 2 < Integration - Survey 2

e. Exploration - Survey 2 > Integration - Survey 2

f. Exploration - Survey 2 = Integration - Survey 2

g. Exploration - Survey 2 < Resolution - Survey 2

h. Exploration - Survey 2 > Resolution - Survey 2

i. Exploration - Survey 2 = Resolution - Survey 2

Test Statistics[a]

	Integration - Survey 2 - Triggering Event - Survey 2	Exploration - Survey 2 - Integration - Survey 2	Exploration - Survey 2 - Resolution - Survey 2
Z	-1.975[b]	-.552[c]	-.814[c]
Asymp. Sig. (2-tailed)	.048	.581	.416

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

Cross-tabulation analysis was used to analyze the data from the different phases of cognitive presence. A cross-tabulation table compared the two variables "cognitive presence categories" with "pre-intervention ratings." The cells of Table 11 reported the frequency counts and the percentages for the number of ratings in each cell. In the pre-treatment survey, the Integration and Resolution phases received

the highest frequency of ratings (33.3%) followed by the Exploration phase (30.0%) and the Triggering Event phase (26.7%). In fact, on the 10 point Likert scale, Resolution was more frequently rated 6, Integration and Exploration 7, and Triggering Event 8 and 9.

Table 11. Pre-treatment Cognitive Presence Cross Tabulation Test

Pre-treatment * Cognitive Presence Cross-tabulation							
			Cognitive Presence				
			Triggering Event	Exploration	Integration	Resolution	Total
Pre-treatment	1	Count	1	0	0	0	1
		% within Pre-treatment	100.0%	0.0%	0.0%	0.0%	100.0%
		% within Cognitive Presence	3.3%	0.0%	0.0%	0.0%	0.8%
		% of Total	0.8%	0.0%	0.0%	0.0%	0.8%
	2	Count	1	0	0	0	1
		% within Pre-treatment	100.0%	0.0%	0.0%	0.0%	100.0%
		% within Cognitive Presence	3.3%	0.0%	0.0%	0.0%	0.8%
		% of Total	0.8%	0.0%	0.0%	0.0%	0.8%
	3	Count	1	1	0	0	2
		% within Pre-treatment	50.0%	50.0%	0.0%	0.0%	100.0%
		% within Cognitive Presence	3.3%	3.3%	0.0%	0.0%	1.7%
		% of Total	0.8%	0.8%	0.0%	0.0%	1.7%
	4	Count	2	2	3	1	8

		% within Pre-treatment	25.0%	25.0%	37.5%	12.5%	100.0%
		% within Cognitive Presence	6.7%	6.7%	10.0%	3.3%	6.7%
		% of Total	1.7%	1.7%	2.5%	0.8%	6.7%
	5	Count	1	3	4	4	12
		% within Pre-treatment	8.3%	25.0%	33.3%	33.3%	100.0%
		% within Cognitive Presence	3.3%	10.0%	13.3%	13.3%	10.0%
		% of Total	0.8%	2.5%	3.3%	3.3%	10.0%
	6	Count	3	4	2	10	19
		% within Pre-treatment	15.8%	21.1%	10.5%	52.6%	100.0%
		% within Cognitive Presence	10.0%	13.3%	6.7%	33.3%	15.8%
		% of Total	2.5%	3.3%	1.7%	8.3%	15.8%
	7	Count	4	9	10	6	29
		% within Pre-treatment	13.8%	31.0%	34.5%	20.7%	100.0%
		% within Cognitive Presence	13.3%	30.0%	33.3%	20.0%	24.2%
		% of Total	3.3%	7.5%	8.3%	5.0%	24.2%
	8	Count	8	7	4	3	22
		% within Pre-treatment	36.4%	31.8%	18.2%	13.6%	100.0%

		% within Cognitive Presence	26.7%	23.3%	13.3%	10.0%	18.3%
		% of Total	6.7%	5.8%	3.3%	2.5%	18.3%
	9	Count	8	4	7	5	24
		% within Pre-treatment	33.3%	16.7%	29.2%	20.8%	100.0%
		% within Cognitive Presence	26.7%	13.3%	23.3%	16.7%	20.0%
		% of Total	6.7%	3.3%	5.8%	4.2%	20.0%
	10	Count	1	0	0	1	2
		% within Pre-treatment	50.0%	0.0%	0.0%	50.0%	100.0%
		% within Cognitive Presence	3.3%	0.0%	0.0%	3.3%	1.7%
		% of Total	0.8%	0.0%	0.0%	0.8%	1.7%
Total		Count	30	30	30	30	120
		% within Pre-treatment	25.0%	25.0%	25.0%	25.0%	100.0%
		% within Cognitive Presence	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	25.0%	25.0%	25.0%	25.0%	100.0%

On the other hand, a cross-tabulation table was used to compare the two variables "cognitive presence categories" with "post-intervention ratings." The cells of Table 12 reported the frequency counts and the percentages for the number of ratings in each cell. In the post-treatment survey, the Triggering Event phase received the

highest frequency of ratings (43.3%) followed by the Resolution phase (33.3%), and Integration and Exploration phase (26.7%). In fact, on the 10 point Likert scale, the Triggering Event phase was more frequently rated 8, Resolution 7, Integration 7, and Exploration 6.

Table 12. Post-treatment Cognitive Presence Cross Tabulation Test

Post-treatment * Cognitive Presence Cross-tabulation							
			Cognitive Presence				Total
			Triggering Event	Exploration	Integration	Resolution	
Post-treatment	1	Count	1	1	0	0	2
		% within Post-treatment	50.0%	50.0%	0.0%	0.0%	100.0%
		% within Cognitive Presence	3.3%	3.3%	0.0%	0.0%	1.7%
		% of Total	0.8%	0.8%	0.0%	0.0%	1.7%
	2	Count	0	0	0	1	1
		% within Post-treatment	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Cognitive Presence	0.0%	0.0%	0.0%	3.3%	0.8%
		% of Total	0.0%	0.0%	0.0%	0.8%	0.8%
	3	Count	1	0	1	3	5
		% within Post-treatment	20.0%	0.0%	20.0%	60.0%	100.0%
		% within Cognitive Presence	3.3%	0.0%	3.3%	10.0%	4.2%
		% of Total	0.8%	0.0%	0.8%	2.5%	4.2%
	4	Count	0	0	2	0	2
		% within Post-treatment	0.0%	0.0%	100.0%	0.0%	100.0%

		% within Cognitive Presence	0.0%	0.0%	6.7%	0.0%	1.7%
		% of Total	0.0%	0.0%	1.7%	0.0%	1.7%
	5	Count	1	2	2	0	5
		% within Post-treatment	20.0%	40.0%	40.0%	0.0%	100.0%
		% within Cognitive Presence	3.3%	6.7%	6.7%	0.0%	4.2%
		% of Total	0.8%	1.7%	1.7%	0.0%	4.2%
	6	Count	0	8	4	6	18
		% within Post-treatment	0.0%	44.4%	22.2%	33.3%	100.0%
		% within Cognitive Presence	0.0%	26.7%	13.3%	20.0%	15.0%
		% of Total	0.0%	6.7%	3.3%	5.0%	15.0%
	7	Count	1	5	8	10	24
		% within Post-treatment	4.2%	20.8%	33.3%	41.7%	100.0%
		% within Cognitive Presence	3.3%	16.7%	26.7%	33.3%	20.0%
		% of Total	0.8%	4.2%	6.7%	8.3%	20.0%
	8	Count	13	4	4	4	25
		% within Post-treatment	52.0%	16.0%	16.0%	16.0%	100.0%
		% within Cognitive Presence	43.3%	13.3%	13.3%	13.3%	20.8%
		% of Total	10.8%	3.3%	3.3%	3.3%	20.8%
	9	Count	8	4	3	0	15
		% within Post-treatment	53.3%	26.7%	20.0%	0.0%	100.0%

		% within Cognitive Presence	26.7%	13.3%	10.0%	0.0%	12.5%
		% of Total	6.7%	3.3%	2.5%	0.0%	12.5%
	10	Count	5	6	6	6	23
		% within Post-treatment	21.7%	26.1%	26.1%	26.1%	100.0%
		% within Cognitive Presence	16.7%	20.0%	20.0%	20.0%	19.2%
		% of Total	4.2%	5.0%	5.0%	5.0%	19.2%
Total		Count	30	30	30	30	120
		% within Post-treatment	25.0%	25.0%	25.0%	25.0%	100.0%
		% within Cognitive Presence	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	25.0%	25.0%	25.0%	25.0%	100.0%

The distribution of responses for each category of cognitive presence is illustrated in Figure 4. The bar chart shows the most and the least frequently rated phases of cognitive presence in the pre-treatment and post-treatment surveys.

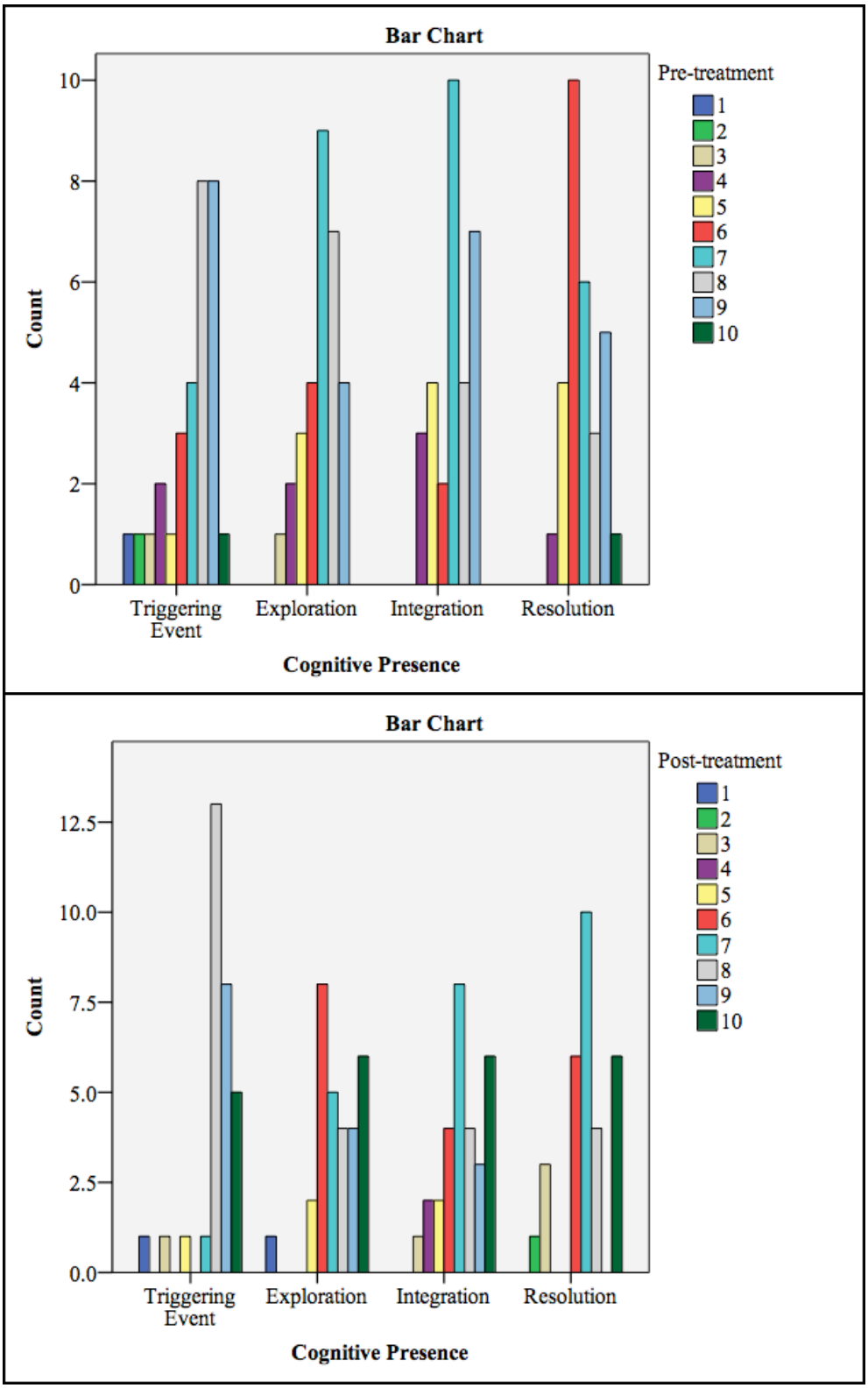


Figure 4. The Distribution of Pre-treatment and Post-treatment Responses for the 10 Points of the Likert Scale in Cognitive Presence Phases

Summary

In this chapter, data from the Likert scale questions were presented and analyzed. The Likert data were treated with the Wilcoxon analysis. Results from the quantitative statistical analysis will be examined in the next chapter.

CHAPTER V

DISCUSSION

The results suggested that there was a statistically significant effect of the direct instruction of argument mapping strategies on participants' perceived level of cognitive presence at the alpha level of 0.05. Therefore, the null hypothesis was rejected. When comparing the ratings of the pre-test and post-test surveys, the higher ratings in the post-test survey were assumed to show that there was a change of perception toward the level of engagement in the cognitive presence phases and that there was an improvement in participants' perceived critical thinking skills. On the other hand, similar ratings were assumed to indicate that the intervention had no effect on respondent's perceived level of cognitive presence. Lastly, lower ratings in the second survey were assumed to show a change of perception without an improvement in certain skills. Since students cannot unlearn a skill, lower ratings for post intervention could mean that the respondents were not realistic about their skills before the intervention. This finding facilitated the discussion that the argument mapping intervention changed participants' perceptions of their own metacognitive skills, improving their self-awareness and thus paving the first step towards improved cognitive skills. This significant change to pre-intervention perception of discussion skills following the lesson on argument mapping strategies indicated that without grasping the fundamental components of critical thinking skills, realistic self-evaluation is not maintained. These findings were consistent with past research (i.e., Dwyer, 2011; Wu & Wang, 2012), which suggested that argument mapping is positively correlated with critical thinking at post-testing.

Furthermore, largest frequency of rates in the pre-intervention survey represented the Triggering Event and Integration phases followed by the Exploration, and finally followed by the Resolution phase. With regards to the post-intervention survey, largest frequency of rates was represented in the Triggering Event, followed by the Resolution, followed by the Exploration, and finally followed by the Integration phase. This observation only assumed relevance when compared to the findings of other studies that claim higher engagement level in the first two phases of the cognitive presence (i.e., Triggering Event and Exploration) and lower level of engagement in the last two phases of the cognitive presence (i.e., Integration and Resolution) in the online community of inquiry. Community of Inquiry framework has taken the very important processes for potential knowledge construction and placed a parsimonious structure around it that is usable for an online community of inquiry. The question arises as to whether the last two phases of cognitive presence (i.e., Integration and Resolution) demand the lower level skills of the first two phases of cognitive presence (i.e., Triggering Event and Exploration phases). Research studies conducted by Mayer (2003), Garrison et al. (2000), and Park (2003) revealed more than 50% of postings in the Exploration phase and the smallest percentage of postings in the Resolution phase. The results of this study were inconsistent with the aforementioned research studies and with Rourke and Kanuka's claim of a low degree of engagement in higher level phases of the practical inquiry process (i.e., integration and resolution). However, in Mayer's (2004) study, in which the participants were doctoral students, the data illustrated a predominance of postings in the Integration phase. Unlike the data in Mayer (2003), Garrison et al.

(2000), and Park (as cited in Park, 2009) studies, the data in Mayer's (2004) illustrated a 59.4% of postings in the Exploration and Integrating phases. The difference between the results of this study and the previous studies could be due to the type of data collection. The data from the previous studies were based on the content analysis of the discussion transcripts while the data gathered for this study were based on respondents' perception of their cognitive presence. However, the answer remained unclear to the question of why did the students in the post-intervention survey display higher frequency ratings of the Resolution phase after the Triggering Event phase without progressing through previous phases of cognitive presence. Therefore, it is suggested that the objective should be to help students improve the overall complexity level of their cognitive presence.

Participants' overall improvement in post-intervention ratings of the perceived cognitive presence might be due to their awareness of the cognitive presence processes and the strategies that could influence their assessment of their cognitive presence. Complex learning activities require the use of several cognitive skills and each cognitive skill can be engaged at a simple or complex level. For example, the Triggering Event phase, which is assumed to be the lowest level of cognitive presence, could involve a complex level of thinking in order to identify the problems and the main claims of the text-based group discourses and to construct sound claims. All phases of cognitive presence are important as long as students are made aware of the text-based critical discourse process and are taught to apply deliberate strategies to cause critical discussion to happen. This requires them to learn about argument strategies in general and acquire argument-mapping skills to

construct critical discussions and to monitor the progress of the group critical discourses.

CHAPTER VI

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The Community of Inquiry framework represents a process of creating a collaborative-constructivist learning experience through the development of three interdependent elements - social, cognitive and teaching presence. In this study, students' independence is not valued over collaboration in a community of inquiry. By contrast, from the results of this study, it is suggested that learners' text-based group discourse competencies could lead to more complex collaborative mental models (i.e., to better collaborative thinking). Community of inquiry thrives through sufficiently developed teaching presence, social presence, and cognitive presence. Teaching presence is a teaching process in which it is possible that sometimes students co-facilitate discourses (Garrison, 2011). Furthermore, the nature of the CoI framework is described as a learning-centered approach, which is a "unified process where teachers and students have important, complementary responsibilities" (Garrison, 2011, p. 54). The question is: can a community of inquiry be effective without identifying the competences of its individuals (teachers and students) as cognitive agents? Discourses develop through each and every individual in the community of inquiry. The power of individual learning competencies and the power of collaborative thinking are co-dependent in a community of inquiry. Shea and Bidjerano (2010) suggest that another presence (i.e., learning presence) is needed to complement the CoI framework. Learning presence takes into account individuals' self-efficacy and self- and co-regulatory skills (Shea & Bidjerano, 2010). In this study, it is suggested that text-based group discourse competence, as one of the

indicators of learning presence domain, could affect the complexity level of cognitive presence in a community of inquiry. Learning presence could have a mediating role in the development of cognitive presence. In other words, community of inquiry participants' (i.e., the students' and the instructor's) awareness of discourse processes and argument mapping strategies as well as Shea and Bidjerano's (2010) elements of learning presence (i.e., self-efficacy and self- and co-regulation skills) could have a positive impact on cognitive presence. In this thesis, it is suggested that if the individuals in a community of inquiry want to increase their cognitive presence, they need to learn and apply deliberate strategies to cause critical discussion to happen. Individuals who are involved in an online community of inquiry should be aware of the process of constructing text-based critical discourses. This requires them to learn about argument strategies in general and acquire argument-mapping strategies for monitoring the progress of the group critical discourses and developing critical discussions.

This study used direct instruction of argument mapping strategies to examine the extent to which it results in higher engagement level in terms of the four phases of cognitive presence. The purpose of the experiment was to determine whether these strategies exceed the limitations of text-based discourse competence of the learners' participating in an educational online community of inquiry. It is reasonable to argue that the fusion of objectivist and constructivist approaches to learning and instruction for teaching argument mapping strategies is hardly compatible with the most fundamental requirement of online communities of inquiry, which is a constructivist approach to learning and instruction. However, in

this study, it is suggested that providing direct instructions of argument mapping strategies before allowing participants to engage in the community of inquiry could enhance and/or change participants' perception of their cognitive presence. In this study, the students volunteered from different online Master of Distance Education courses, each of which consisted of discussion forums with possibly different levels of teaching presence and social presence. If argument mapping is used as a component of learning presence, it could empower students and instructors to generate, select and organize ideas as they examine the group discourses of an online community of inquiry.

The results of this study may have the potential to enhance the quality of cognitive presence in distance education, to provide a better understanding of students' critical thinking competency and to detect the weaknesses that are not improved through the stages of cognitive presence. Moreover, the results of this study could provide the basis for more future hypotheses. More studies need to be carried out to measure the effectiveness of argument mapping strategies and to prove that explicit teaching of argument-mapping strategies in the context of online, distance courses improves learners' text-based group critical discourses. Furthermore, to make teaching argument-mapping strategies in subject context work, more support should be given to teachers and learners. This may mean more instructional support is required in the process of implementing these strategies into the design and organization of the course and more workshops and experience sharing for teachers are needed. This study should be replicated to affirm the results.

One of the limitations worth noting is that the one hour devoted time to

teaching argument mapping strategies was insufficient to bring about more positive changes in participants' perceived cognitive presence. It is important to provide students the time to process the information on argument mapping strategies, considering that developing critical thinking skills is rigorous and time intensive (Dawson, 2008; Halpern, 2003; King & Kitchener, 1994; Kuhn, 1999). Time constraint did not allow for more activities and exercises. Although the current research study is unique in the sense that it sought to examine changes in perceived cognitive presence associated with direct instruction of argument mapping strategies, the results of this study lack in statistical power due to the small sample size. At the same time, capturing the changes without evaluating participants' discussion transcripts pre-to-post intervention suggests caution in the interpretation of the results.

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APPENDIX A

COGNITIVE PRESENCE CODING PROTOCOL

Phase	**Indicators**	**Socio-cognitive processes**
Triggering Event	Recognize problem	Presenting background information that culminates in a question
	Sense of puzzlement	Asking questions; Messages that take discussion in a new direction
Exploration	Divergence - within the online community	Unsubstantiated contradiction of previous ideas
	Divergence - within a single message	Many different ideas/ themes presented in one message
	Information exchange	Personal narratives/ descriptions/ facts (not used as evidence to support a conclusion)
	Suggestions for consideration	Author explicitly characterizes message as exploration
	Brainstorming	Adds to established points but does not systematically defend/ justify/ develop addition
	Leaps to conclusions	Offers unsupported opinions
Integration	Convergence - among group members	Reference to previous message followed by

		substantiated agreement (e.g., "I agree because...") Building on, adding to others' ideas
	Convergence - within a single message	Justified, developed, defensible, yet tentative hypotheses
	Connecting ideas, synthesis	Integrating information from various sources - textbooks, articles, personal experience
	Creating solutions	Explicit characterization of message as a solution by participant
Resolution/Application	Vicarious application to real world testing solutions	Providing examples of how problems were solved
	Defending solutions	Defending why a problem was solved in a specific manner

Source: Adapted from Garrison, Anderson, and Archer (2000)

APPENDIX B

PRE-TREATMENT AND POST-TREATMENT QUESTIONNAIRE

TO THE RESPONDER: Obtaining a fully completed questionnaire is mandatory for the researcher since the data obtained in Questionnaire 1 will be compared to that of Questionnaire 2. However, participants may opt out from answering any questions. The participant, as a volunteer, has the right to refuse to answer any question, and to terminate participation at any time. Please rest assured that your identity and your responses to be reported in the thesis will be kept strictly confidential.

Question

To what extent do you engage in the following skills during your participation in the discussion forums?

Please read the statements and the examples carefully.

On a scale of 1 (very low engagement level) to 10 (very high engagement level) place your rating at the end of each statement.

1) **Recognizing the problem, question, or issue being discussed**

   Example: David is trying to understand the topic/issue that is raised in the discussion forum. By relating the problem to his experiences and previous knowledge, he restates the issues/topic and expresses his interpretation of the issue being raised.

   To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

2) **Clarifying the topic/issue being discussed**

Example: In order to make better sense of the topic and to form a preliminary opinion about the topic, Sarah is seeking clarification. She is asking clarifying questions to ensure that her understanding of the issue/topic is correct.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

3) **Utilizing a variety of information sources to explore the posed problem, question, or issue**

Example: Dianne is sharing personal narrations by relating a story, an incident, or a practice from her profession or from everyday life. In addition, to better explore the issue posed for discussion, she is providing information from reputable sources such as the course textbook, study guide, and literature.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

4) **Comparing information with other students**

Example: To explore the topic and organize her understanding of the topic, Roxanne takes into consideration what is being said by the participants in the discussion forum and tries to compare the main points.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

5) **Brainstorming to find relevant information (i.e., adding to established points without defending, justifying, and developing additional ideas)**

Example: Lisa is adding to her own and other participants' established points. She is tossing around ideas to identify the relevant information to the topic.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

6) **Making tentative suggestions for consideration**

Example: To explore the topic of the discussion, Mickey provides suggestions

for consideration. His suggestions would follow by questions such as "does that seem about right?" or "am I off the mark?"

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

7) **Connecting ideas from the group discussions through disagreement or agreement** *Example: Hazel has considered all the relevant information provided in the discussion forum and compared and contrasted the main points that were raised by the participants. She is trying to relate the main statements made in the discussion forum by supporting or opposing them.*

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

8) **Connecting ideas from the group discussions to create justified and defensible assumptions/hypotheses**

Example: Seth has identified and analyzed the main supporting reasons and objections that were raised by the participants. He has positioned his own supporting or opposing statements. He is trying to create a justified and defensible assumption by making judgments about the quality of the evidence provided in support of the assumptions.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

9) **Synthesizing new understandings from the ideas that are shared in the group discussions**

Example: Cynthia is combining all the main information such as the relevant knowledge shared in the discussion, the analysis of the main statements made by herself and the other participants, the evaluation of the main claims and judgments, and the acceptance or rejection of the main statements. Based on her integration of ideas, she is forming a collection of justified statements that illustrate a new understanding of the topic.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

10) **Creating conclusions/solutions from the main points of the discussions**

Example: Ian has evaluated the main statements made in the discussion forum and developed justified assumptions. He is logically linking the justified assumptions to illustrate the relationship between them.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

11) **Developing conclusions/solutions to the posed problems/issues that can be applied in practice**

Example: Francis has linked his own and other participants' prior inferences to conclusion. He is proposing a conclusion that can be applied in practice. He is considering the ideas or actions that might follow from the proposed conclusion.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

12) **Defending how the conclusions drawn from the discussions could be extended to real life**

Example: Claire has integrated her own and other participants' perspectives and has considered the proposed conclusion(s) that can be applied in practice. She is judging the relevance of the proposed conclusion(s) and is trying to justify the effectiveness of the actions that might follow from the proposed conclusion.

To what extent do YOU engage in this skill during your participation in the discussion forums?

	1	2	3	4	5	6	7	8	9	10
Your level of engagement in this skill during participation in the discussion forums										

APPENDIX C

LETTER OF INVITATION

Deadline for Volunteering: June 7, 2015

Dear MDDE Student,

My name is Teeba Obaid and I am a graduate student at Athabasca University's Master of Distance Education Program.

This letter is to invite you to participate in a study that I'm conducting for my thesis. The following information is provided for you to decide whether you wish to participate in the present study.

The purpose of this research is to examine your experiences of participation in the discussion forums. The benefit gained from participating in this research is to acquire argument mapping skills and to participate in a quantitative research study.

To participate, you need to be:

- Taking an MDDE course that requires participation in discussion forums.

The amount of time it will take you to complete this study is maximum of 80 minutes – approximately 20 minutes to complete two online surveys as well as 60 minutes for attending a presentation. The first online survey, consisting of 12 Likert scale questions and to be completed prior to conducting the research, will require 10 minutes to complete. Then, one hour long presentation on argument mapping strategies will be held synchronously through online Adobe Connect. The online synchronous presentation will be arranged at a time convenient for each volunteer. Finally, the second online survey, consisting of 12 Likert scale questions and to be completed by the end of the course, will require 10 minutes to complete. Overall, your participation in this study will require 1 hour and 20 minutes of your time.

Please be assured that your involvement in this research is completely voluntary. The data collected will include no identifying information and your name will not be presented on any document. There will be no consequences from deciding to withdraw your participation and no need to explain your withdrawal. You have the right to refuse to participate and to withdraw at any time during this research, without prejudice.

There are no known risks and/or discomforts associated with this study. This study has been reviewed by and received ethics clearance from the Athabasca Research Ethics Board. Should you have any comments or concerns regarding your treatment

as a participant in this study, please contact the Office of Research Ethics at 1-800-788-9041, ext. 6718 or by e-mail to rebsec@athabascau.ca

If you decide you are willing to take part in this study, please contact Teeba Obaid via e-mail [redacted].

Thank you in advance for your interest in this project.

Sincerely,
Teeba Obaid

Researcher: Teeba Obaid; [redacted]
Supervisor: Tom Jones (Associate Professor); [redacted]

APPENDIX D

INFORMED CONSENT FORM

Principal Investigator (Researcher):
Teeba Obaid
[redacted]

Supervisor:
Tom Jones (Associate Professor)
[redacted]

Dear Participant,

My name is Teeba Obaid and I am doing my thesis in the Master of Distance Education program. I am asking you to take part in my research study for my thesis.

This form is part of the process of informed consent. The information presented should give you the basic idea of what this research is about and what your participation will involve, should you choose to participate. It also describes your right to withdraw from the project.

The purpose of this research is to examine your experiences of participation in the discussion forums. The expected benefit associated with your participation in this research is the opportunity to acquire argument mapping skills and to participate in a quantitative research study. There are no known risks and/or discomforts associated with this study.

To participate, you need to be:

- taking an MDDE course that requires participation in discussion forums

The amount of time it will take you to complete this study is maximum of 80 minutes – approximately 20 minutes to complete two online surveys as well as 60 minutes for attending a presentation. The first online survey, consisting of 12 Likert scale questions and to be completed prior to conducting the research, will require 10 minutes to complete. Then, one hour long presentation on argument mapping strategies will be held synchronously through online Adobe Connect. The online synchronous presentation will be arranged at a time convenient for each volunteer. Finally, the second online survey, consisting of 12 Likert scale questions and to be completed by the end of the course, will require 10 minutes to complete. Overall, your participation in this study will require 1 hour and 20 minutes of your time.

Please be assured that your involvement in this research is completely voluntary. Your answers to Online Surveys 1 and 2 will be identified with a token identifier number that has been generated for you; your name will not be presented on any documents. If you change your mind about taking part, you can withdraw at any

time. To do this, simply contact Teeba Obaid. If you decide to withdraw after submitting the questionnaires and before the research is completed and the report is written (August 1, 2015), please contact Teeba Obaid, and the researcher will remove your data and not include them within the study. There will be no consequences from deciding to withdraw your participation and no need to explain your withdrawal. You have the right to refuse to participate and to withdraw at any time during this research, without prejudice.

Online survey tool (i.e., LimeSurvey) will be used in order to avoid having questionnaires emailed back and forth. The LimeSurvey open source survey company (https://www.limeservice.com/en/) does not transmit any of its data (existing or entered) to any third-party. The security and privacy policy for the web survey company can be found at the following link: https://www.limesurvey.org/en/about-limesurvey/license#privacy

The data, with no personal identifiers, collected from this study will be maintained on a password-protected computer database. As well, the data will be electronically archived after completion of the study and maintained for five years and then erased.

The existence of the research will be listed in an abstract posted online at the Athabasca University Library's Digital Thesis and Project Room and the final research paper will be publicly available.

If you decide you are willing to take part in this study, please contact Teeba Obaid via e-mail [redacted] as your consent with full knowledge of the nature and purpose of the study. Please reply to this email by adding the following statement in the body of your email: "Yes, I accept to participate in this research study."

If you have any questions about this study, please feel free to contact Teeba Obaid or my supervisor [redacted]. The researcher would be happy to share the findings of the study with you after the research is completed.

Thank you for taking the time to participate in my research.
Sincerely,
Teeba Obaid

This study has been reviewed by and received ethics clearance from the Athabasca University Research Ethics Board. Should you have any comments or concerns regarding your treatment as a participant in this study, please contact the Office of Research Ethics at 1-800-788-9041, ext. 6718 or by e-mail to rebsec@athabascau.ca

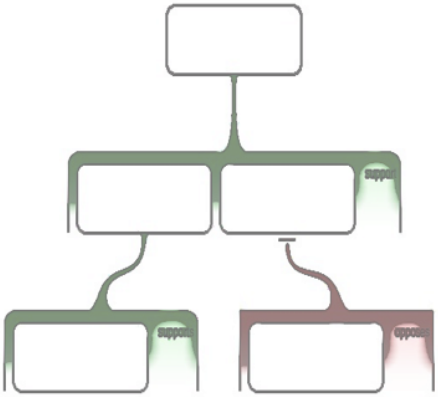
APPENDIX E

LESSON ON ARGUMENT MAPPING STRATEGIES

LESSON ON ARGUMENT MAPPING STRATEGIES

How comfortable are you participating in the course discussions? (Please circle one):

1. Not at all
2. To little extent
3. To some extent
4. To a moderate extent
5. To a large extent

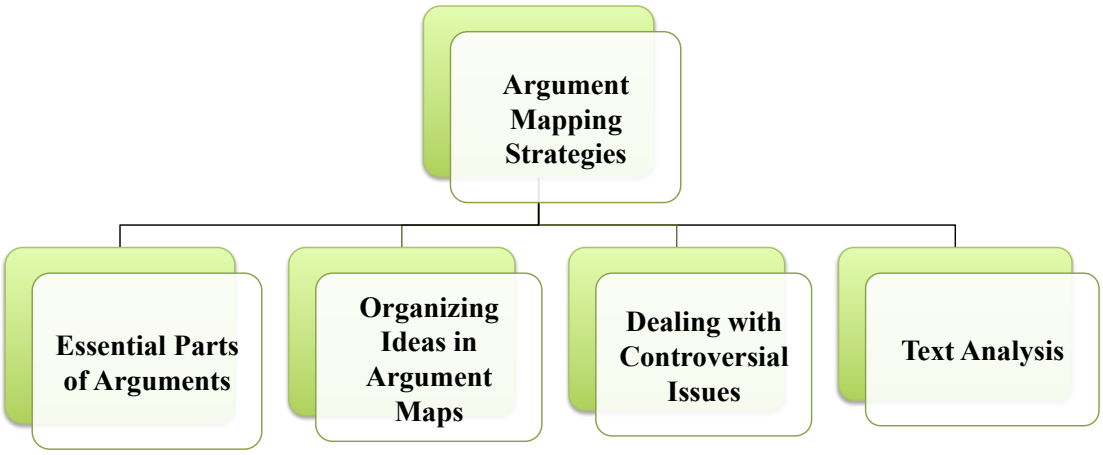


www.rationaleonline.com

Have you come across posts in discussion forums that did not make sense? Have you tried to explain your thinking but you weren't able to demonstrate your thinking? In order to collaboratively engage in purposeful critical discussions, developing certain necessary critical skills are important. One way to master the basics of critical thinking is through argument mapping.

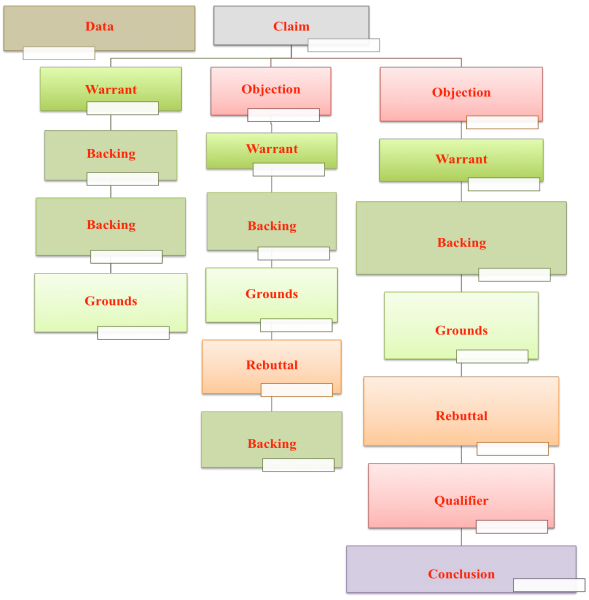
The overall goal of this lesson is to help you develop clear and persuasive arguments through the process of argument mapping. This lesson is a learning path that will allow for cognitive strategies and will familiarize you with:

- The essential parts of arguments
- Text analysis
- The organization of ideas in diagrams



Objectives

1. Distinguish the difference between: data, claims, warrants, grounds, backing, rebuttal, and qualifiers
2. Analyze a text-based discussion Identify and re-evaluate claims and arguments
3. Support the main claims Generate counterarguments
4. Put together all the elements of an argument in an argument map in order to draw a conclusion
5. Respond reasonably to the given claims in the discussion forums



Dilemmas:

Murphy and Coleman (2004) recorded graduate students' experiences of challenges in online asynchronous discussions:

One Distance Education (DE) student talked about the low quality posts in discussion forums and believes that not all students offer responses that contribute to a high-quality collaborative learning experience. The student complained:

> It seems like there are only a handful of students willing to respond meaningfully to someone else's post rather than simply stating their opinion

to meet the participation requirement.

Another DE student associated the lack of quality in postings to the depth and precesion of responses. The student complained:

> Vague comments, agreeing with my points without critique, or simply stating opinion, didn't really count, in my estimation, as valid response. Although an individual thread may contain many messages, the majority of the posts are often not responding in any depth to previous posts – they'd make more sense as new threads.

One DE student mentioned the pressure to keep up with participants' numerous, lengthy postings. The student complained:

> I would check the site and see some people made numerous contributions and went on and on and then it took so much time to read them all, catch up and also I felt pressured to make more comments.

In collaborative and inquiry approaches to learning in online settings, argumentation is one of the fundamental factors for practicing and developing critical thinking skills (van Gelder, 2003).

Becoming a critical thinker requires skills that involve the processes of building arguments to support a claim, analyzing and evaluating the evidence and counter-evidence in developing supporting arguments (van Gelder, 2003). Presenting information in a hierarchical visual-verbal format (i.e., argument maps) could facilitate the organization of information in working memory and long-term memory and decrease cognitive load, which in turn facilitates critical thinking processes (van Gelder, 2003).

Essential Parts of Arguments

Toulmin's (2003) model of argument used for analyzing arguments and producing arguments.

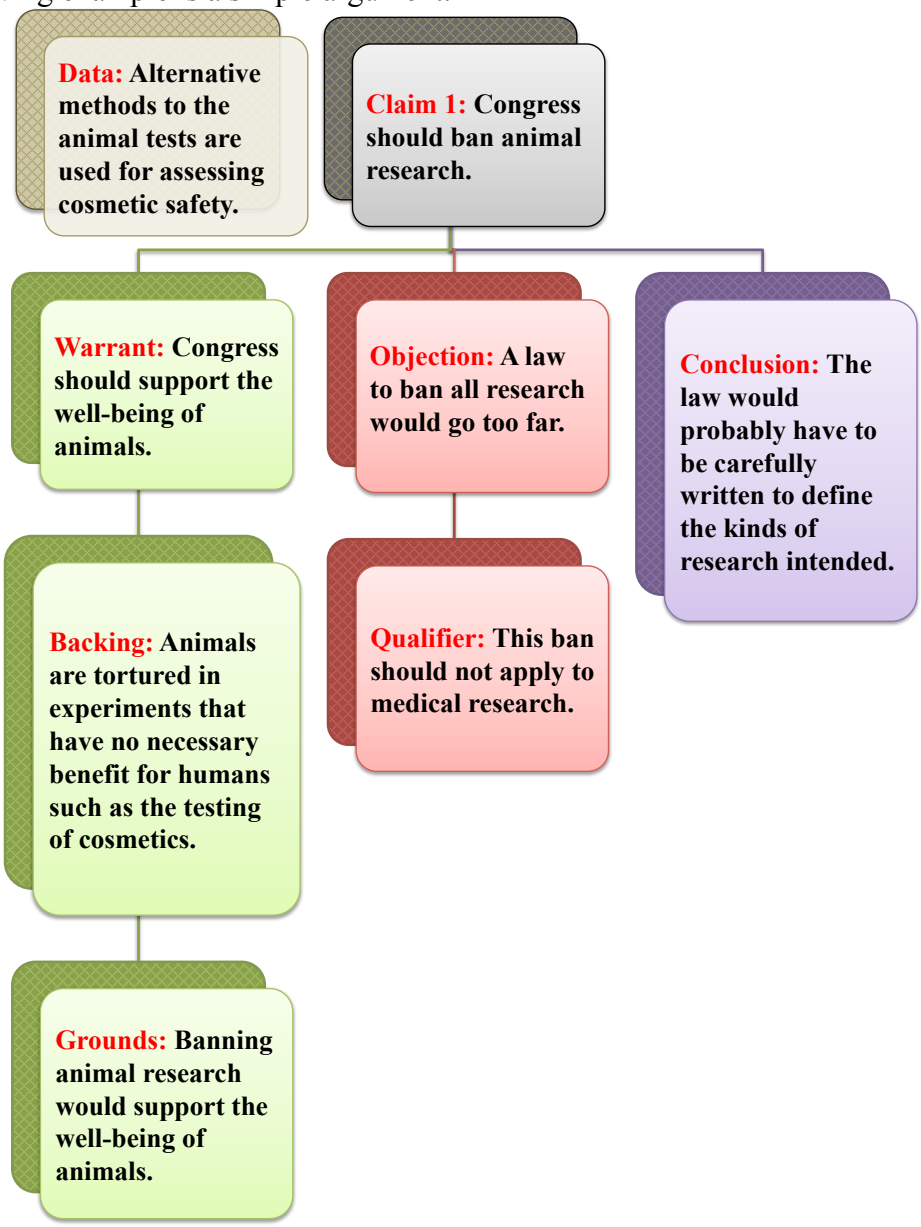
Arguments may draw on many organizational patterns. Definition, analogy, cause and effect, comparison and contrast, even narration and description have their place in argumentative writing. Although the structure of an argument may take a variety of forms, many arguments follow a standard form, composed of nine basic parts.

The key elements of arguments are: data, claim, warrants, grounds, backing, objection, rebuttal, qualifier, and conclusion. All parts interact and depend on each

other in order to form a complete argument.

Example 1:

The following example is a simple argument.



1. **Data** – serving as a foundation for the claim (evidence that can be accepted as factually true)

2. **Claim** – asserting what you want to prove. Claim consists of three parts: noun, "should" as a modal verb, action (e.g., Congress should ban animal research)

Types of Claims	
Fact Claim	Seeks to establish an arguable idea as a fact. Makes a quantifiable assertion; in other words, it is a claim about a measurable topic (fact). ❖ True/False ❖ What happened/didn't happen ❖ What exists/doesn't exist *Example*: All learning derives from the social environment.
Value Claim	Makes a qualifiable assertion. ❖ Offer an evaluation of an idea, policy, or action. ❖ Offer a comparison (x is superior to y) ❖ Offer an absolute value to rate or categorize something (x is good, helpful, etc.) *Example*: Advanced technology for collaborative learning has an inherent advantage over other methods of teaching and learning.
Policy Claim	Argue for a particular course of action. They include a responsible agent, the word "should", and an action. *Example*: Online educational institutions should make full use of Web 2.0 technologies to allow learners to control what and how they learn instead of limiting themselves to the use of LMSs, such as Blackboard and Moodle.

✧ **Writing a policy claim:** Congress should ban animal research.

- Responsible agent
- The word "should"
- The action that should be carried out by the responsible agent

3. **Warrant** – explaining how the evidence supports the claim. Warrant is more than just a piece of evidence. It should be your analysis and should show your opinion. The common types of warrant are:

Types of Warrant	
Authority	Reasons from a qualified resource or a common consensus in the mutual agreement of multiple authorities in the desired topic. ➢ Claim: handguns should be banned. ➢ Warrant: handguns cause needless death, according to the experts.
Principle	Reasons from overall values (connects the evidence to the claim as an application of a broader, relevant principle). ➢ Claim: congress should ban animal research ➢ Warrant: Congress should support the well-being of animals
Causal	Reasons from a cause to effect (or effect to cause). ➢ Claim: government should tax companies for the pollution that they produce. ➢ Warrant: government should prevent health harms caused by pollution.
Generalization	Reasons from a small number (a sample) to a larger amount (all or most). Note: pay attention to the sample size. ➢ Claim: dinosaur bones can survive millions of years. ➢ Warrant: probably all dinosaur bones are more than 65 million years old ✧ Evidence: all dinosaur bones so far discovered have been more than 65 million years old.
Analogy	Reasons from similar attributes. ➢ Claim: there should be an abolition of gun ownership in the United States. ➢ Warrant: there are strict gun ownership in France
Sign (clue)	Reasons from an indication of the concurrence of two events – to show that one is the sign or symptom of another. Note: it's not a causal argument (i.e., the claim did not cause the warrant). ➢ Claim: the patient should take antibiotics. ➢ Warrant: the patient has an infection (evidence: the patient has a fever)

✧ **Writing a principle warrant:** Congress should support the well-being of animals.

- The responsible agent
- The word "should"
- The overall value that your action will achieve (i.e., a relevant principle)

4. **Backing** – evidence supporting the warrant

5. **Grounds** –linking the warrant and the claim and confirming the claim (providing relevant conclusion for the claim and the grounds)

   ✧ **Writing a policy grounds:** Banning animal research would support the well-being of animals.

   - The action
   - The word "would"
   - The value

6. **Objection** – refuting the claim or the warrant

7. **Rebuttal** – attacking on opposing arguments and defending one's own argument (i.e., objection of objection). This simple example does not include a rebuttal.

8. **Qualifiers** – putting limit on the claim; limiting the scope of warrant's application. You don't always have a qualifier. Sometimes the author or the speaker might be very firm in their position. For example, "congress bans animal research" does not have a qualifier. If, however, the author believes that there are exceptions that make the animal research acceptable (e.g., in cases of lifesaving medical research), the author needs a qualifier.

9. **Conclusion** – formulating the last statement when the supporting data warrant it and when the argument is weighed against the opposition statements. For any argument, you can use the same steps of building an argument to consider and defend the practicality of the conclusion.

Organizing Ideas in Argument Maps

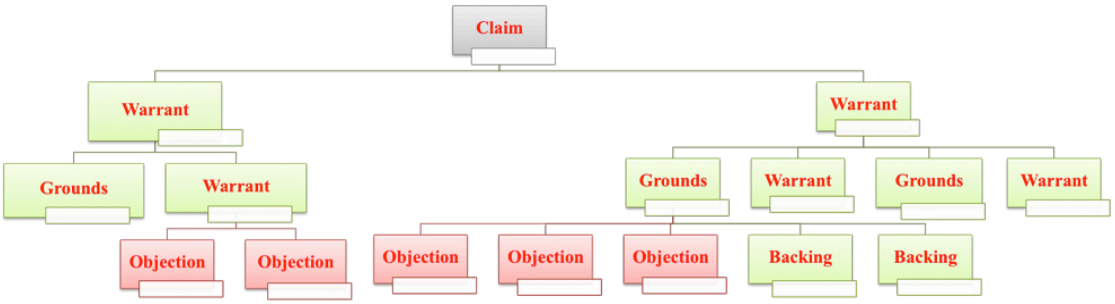
Argument maps consist of box and line diagrams created to visualize, clarify and organize thinking by showing the logical relationships between ideas that are communicated in a text form.

Key Points

1. Ask yourself: "How do we know that the claim [insert the claim] is true?"
2. Respond with a reason to show the claim is true.
3. Claims and reasons must be full single-sentence statements (avoid phrases or sentence fragment).

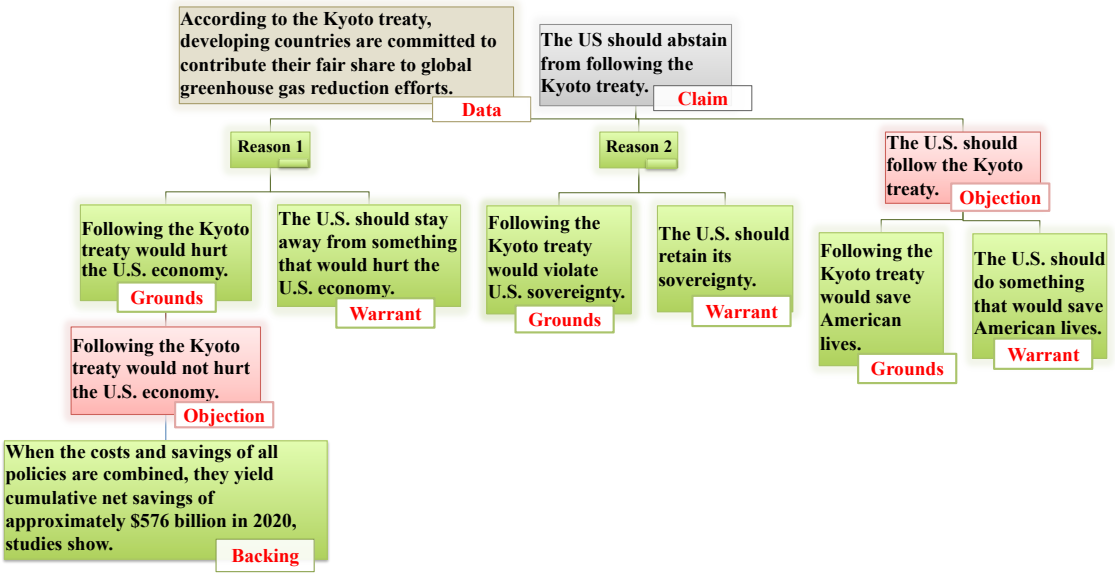
4. Even if unstated, every reason should be made up of at least two statements (warrant and grounds).
5. Make a connection between the statements of each reason and the claim.

- David likes tomato (Claim)
  - David eats tomato all the time (warrant)
  - People who eat tomato all the time like tomato (grounds)



Example:

The following argument map is a multi-layer argument, which includes several objections.



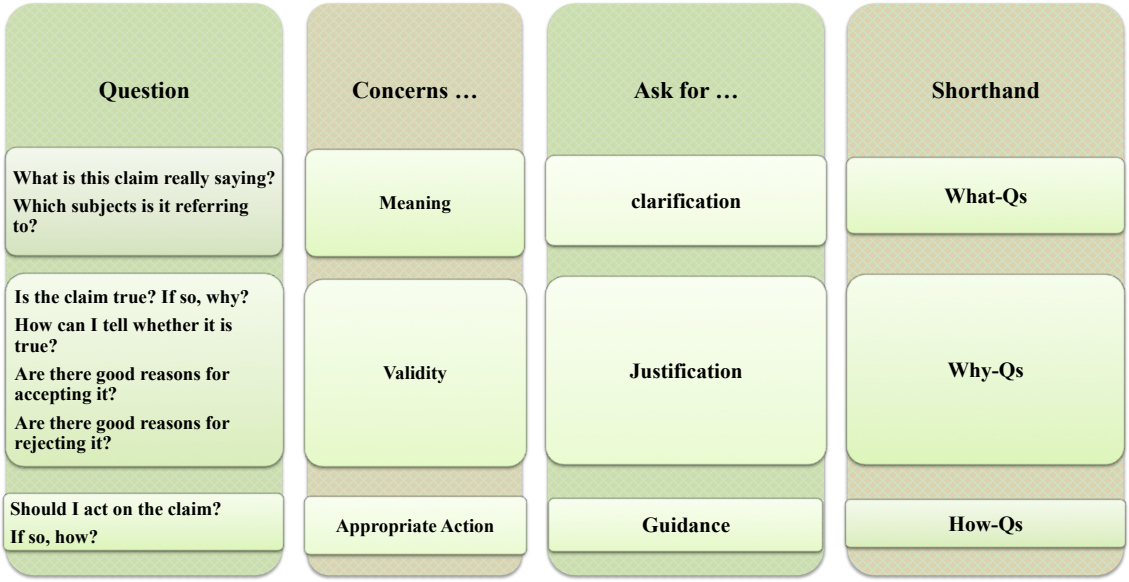
Source: adopted from Ostwald (2007)

Dealing with Controversial Issues

Petrina (2007) believes that controversies "challenge students' beliefs and worldviews, and . . . provide students and teachers with opportunities to comprehend, reflect, practice, and make commitments and act" (p. 133).

Asking the Right Questions

When you are presented with a claim or you want to present a claim, examine the claim with "what", "why", and "how" questions. Here is a short list of questions:



Source: adopted from Norman & Sanders (2005)

Example:

This map is created based on students' discussion in MDDE 603 course. The resolution before us is that "the research on the neuroscience of learning shows that there is no basis for the concept of individual learning styles." The task is to define and advance this position while at the same time show why the position, so defined, cannot hold.


The research on the neuroscience of learning shows that there is no evidence for the concept of individual learning styles.
Data
Adopting learning styles theory, regardless of empirical evidence, contributes to student learning.
Claim
Individuals have different preferences for their learning which is associated with their receptivity of the teaching methods.
Warrant
Different parts of the brain may be ready to learn at different times.
Backing
Matching teaching methods with individuals' different learning preferences would enhance students' receptivity of the teaching methods.
Grounds
It is misunderstanding of the learning process to say that "because this person prefers visual stimuli, they can only ever learn that way."
Objection
The process of learning is one which impacts the organization of the entire brain and not just nodes of activity.
Backing
Educators can enhance each learner's attention by designing activities that fit each student's learning preference.
Warrant
Adopting learning styles theory would allow educators to enhance each learner's attention by designing activities that fit each student's learning preference.
Grounds
Teaching to each person's learning style is impractical.
Objection
The cost of obtaining information about students preferences outweighs the benefits obtained.
Backing
Absence of evidence is not the same as evidence of absence.
Warrant
There is no evidence from double-blind, controlled experiments that knowing one's learning style harms learning.
Backing
Lack of evidence for the absence of learning styles would validate the use of learning styles theory.
Grounds
Neuroscience should be allowed to properly evaluate and replicate its research so that they can make decisions based on sound research.
Objection
Falling for the "neuromyths" perpetuates misconceptions about the brain
Backing

Text Analysis

To analyze participants' texts from the discussion forums, first get rid of anything unnecessary - mere rhetorical flourishes, repetitions, and irrelevancies. Second, identify the claims. Third, try to put the presented ideas into a standard form; often, you'll have to add statements that are implied but not stated.

Asking the Right Questions

You can use a long list of questions as the following table in order to analyze texts from the discussion forums and formulate an argument map.

Topic	Question 1	Question 2	Question 3	Question 4
Claims	What's the main idea, thesis, or conclusion? (Begin by listing important statements in the text, and then ask what idea is supported by most of the rest of the text).	Is the main idea stated in one T/F sentence? (If not, state it in one T/F sentence. If this seems difficult, perhaps what has been found is a theme or issue instead).	Is the main idea clear or can I make it clear? (Try to make it clear – define terms as specifically as possible and seek a coherent understanding of its meaning).	(1) What interpretations of the claim (implications/critique) seem possible or reasonable to me? (2) What interpretations seem unlikely, impossible, or unreasonable? What are the differences between 1 and 2?
Arguments	What claims support the main claim? (This process can continue – the argument might contain claims that support its supporting statements).	How do supporting claims (premises) work together to provide an 'argument' for the conclusion?	Does the argument make the conclusion necessarily true, likely (or even highly likely), or does the argument really not support the conclusion at	Can the argument be made stronger or clearer? On the other hand, what objections or counterarguments might be raised?

			all?	
Implications	What ideas or actions might follow from the main idea?	What argument might be given that these implications truly follow from the main claim?	What objections might be raised to the implications of the main idea? How might the claim be defended against these objections?	What implications might follow from the claim's being false? Assess these implications.
Critique	Whose perspective, voice, or feelings are upheld, strengthened, or made dominant by this claim? Who wins or loses if the claim is true?	What "obvious" truths are taken for granted in this claim? What "common sense" but otherwise hidden assumptions are required to make this claim true and its argument work?	What ideas are upheld, strengthened, or weakened by this claim and its argument or implications?	What happens when we apply the claim and its "logic" (interpretations, arguments, counterarguments, and implications) to itself?

Source: adapted from Keller (2008)

Example:

The following texts are parts of postings in a discussion forum, selected from an MDDE course:

- Student A:
  A short excerpt from the book *Handbook of Counseling Psychology* (2003) states that an empathetic provocateur combines "sensitive understanding with timely challenge." According to Mezirow, in order for students to undergo transformative learning the adult educator must take on the role of empathetic provocateur, rather than one of subject authority, in order to challenge students to uncover hidden assumptions through critical reflection. Critical

reflection allows the individual to gain an awareness of other perspectives, their own and the perspectives of others, which in turn, can help foster empathy for others. I would venture to guess that the reverse is also true in that demonstrating empathy for others helps to foster a safe learning environment that is supportive of critical reflection.

- Student B:
  Choosing appropriate language for the text-medium is very important in the "thin" online forum where body language can't accompany, enrich, or soften the effect of what is being said.

- Student C:
  I can be quite sarcastic in my 'sense of humor' which in some instances, especially in Bermuda - a different culture, my sarcasm comes across as something other than intended - which is humour. I think many of us would agree that sometimes things come across harsher in a written email exchange than was intended.

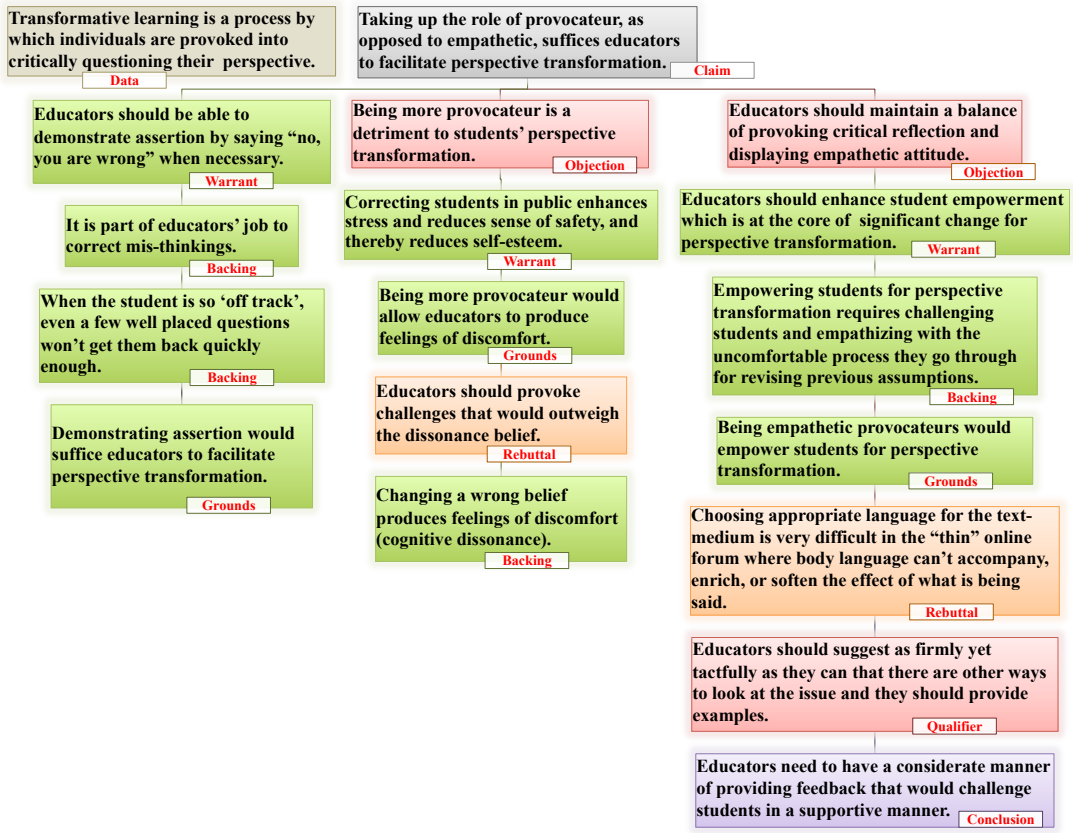
- Student D:
  Discussion forum is platform where our instructors invite us to share our thoughts and musings so that they can assess our direction in growth and development. How often has an instructor answered a post by saying "no, that is not correct"?

- Student E:
  Corrections in both written and oral form can perhaps hurt the feelings of those being corrected. And I can only assume that it is someone's feelings getting hurt that this comes up. Surely, they would feel the way I do - that they would want to be corrected! Although maybe not in public.

- Student F:
  I would say it IS part of your job to correct mis-thinkings. Sometimes that can be done empathetically with probing questions and sometimes the concept is so 'off' you can't let it sit out there until the wrongs are righted, discussed and uncovered. Sometimes the student is so 'off track' that even a few well placed questions won't get them back quickly enough.

- Student G:
  I cannot tell my students that they are wrong. I suggest as firmly yet tactfully as I can that there are other ways to look at the issue and I provide examples. I cannot ram it down their throats. However, I CAN address their misunderstanding of concepts in written assignments! That is also my job.

These ideas could be put together as the following argument map:



Exercise

1. Identify the claim, warrant, grounds, and the counter argument in these four statements and draw an argument map for it:

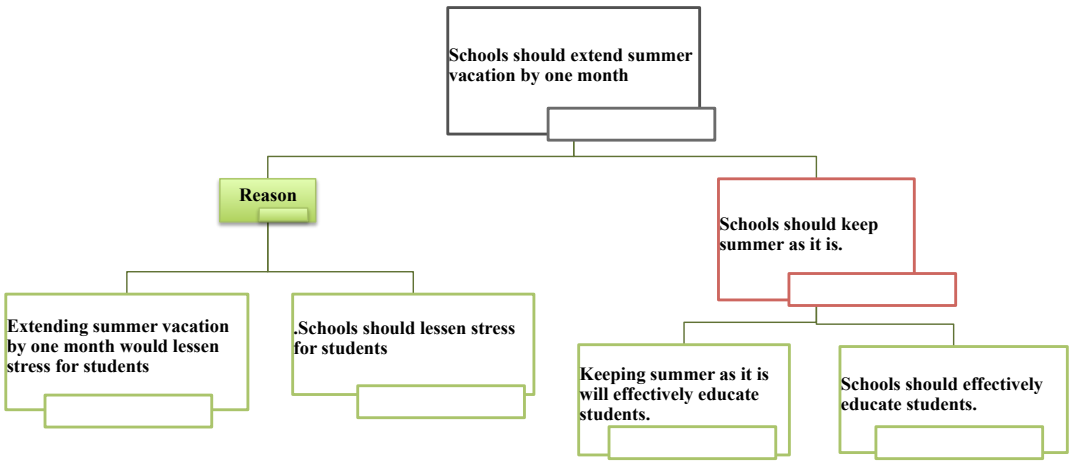
    a. The United States Federal Government should illegalize smoking.

    b. The United States Federal Government should protect the health of its citizens.

    c. Illegalizing smoking would protect the health of US citizens.

    d. Illegalizing smoking would violate citizens' privacy rights.

2. Identify the claim, warrant, grounds, and the counter argument in this argument map.



Conclusion

To enhance critical thinking skills among students who participate in discussion forums, this lesson provides guidance in developing arguments. This lesson helps students with recognizing the essential elements of argument and helps them put the elements together in an argument map.

FURTHER RESOURCES

1. Argument Mapping Tutorials
   http://austhink.com/reason/tutorials/index.htm

2. Argument Mapping
   http://jostwald.com/ArgumentMapping/

3. Argument Mapping: Objections
   http://www.jostwald.com/ArgumentMapping/ArgMap5-Objections.pdf

4. The Theseus Learning System: A Practical Guide to Mastering Essential Thinking Skills
   https://www.academia.edu/434514/The_Theseus_Learning_System_A_Practical_Guide_to_Mastering_Essential_Thinking_Skills

"Engaging with arguments is a lot like learning to play the guitar. If you practice and get the right feedback, you can improve" — Simon Cullen (as cited in Noden, 2015, On the Campus section, para. 5)

APPENDIX F

REB APPROVAL MEMO

MEMORANDUM
Office of the Vice President Academic

March 30, 2015

TO: Miss. Teeba Obaid
Other Academic Centres/Depts\Centre for Distance Education , Graduate Student
Athabasca University

SUBJECT: Institutional Permission - REB File No. 21779

You have been approved to contact Athabasca University staff, students and systems for your research proposal 'Investigating the Effect of Direct Instruction of Argument Mapping Strategies on Cognitive Presence among Participants in the Online Community of Inquiry' subject to the following conditions:

1. Your research proposal has been approved by the Athabasca University Research Ethics Board (AUREB);
2. Staff and student information is used solely for the purpose outlined in the research proposal submitted to the AUREB;
3. Secondary uses of data or subsequent research proposal(s) will require additional approval of the AUREB, permission of the staff or former staff, students or former students and institutional permission if the individual is still an Athabasca University staff or student;
4. Staff and student participants will be provided with information about how information will be represented in documentation, reports and publications;
5. Staff and student information will not be shared with a third party;
6. The nature of communication with staff and students is that outlined in the research proposal submitted to the AUREB;
7. Staff and student demographic information will be used solely within the research project;

8. Documentation such as staff and student responses to questionnaires, interview responses (written or taped), observations of individual staff or student behaviors, etc. will not be used for any purpose other than that outlined in the research proposal submitted to the AUREB;
9. Staff and student information will be kept confidential until it is destroyed after a period not in excess of 10 years;
10. Use of personal information will be in compliance with the **Freedom of Information, Protection of Privacy (FOIP)** legislation of the province of Alberta, Canada.

As outlined in your approved ethics application (Excerpt from Tabs 3, 6 and 7 below), you are seeking to access, for research purposes, AU systems and the **following student data**:

Tab 3. Data Identifiers**:**

3.1 Email Address

3.6 "After the data collection, participants' surname and first name will be removed. Also, participants' e-mail addresses will be removed after informing them of the results of the study (if requested)."

Tab 6. Participant Information

6.1 "From the population of communities of inquiry of online higher education students, a convenience sample of distance learners will be drawn from a Master of Distance Education program that is offered completely online at Athabasca University**.**"
6.2 "For the purpose of investigating the effect of argument mapping strategies on the level of cognitive presence in an online community of inquiry, this study will be delimited by including participants that are restricted to distance learners of a leading Canadian online university, Athabasca University. It will also be delimited by the inclusion of students who are registered in online graduate-level program of Master of Distance Education (MDDE)."
6.5 "20 participants."
Tab 7. Recruitment
7.1 - "With nonprobability convenience sampling, the sample for this study will be selected on the basis of students' availability. A permission from the Review of Ethics Board and an institutional permission will be sought. After receiving permission from the REB and the institution, a letter of invitation will be broadcasted by the Graduate Student Program Administrator (Center for Distance Education) through email to all students enrolled in the Master of Distance Education (MDDE) program. From the population of 40,000+ students studying at Athabasca University, a convenience sample of distance learners will be drawn from a Master of Distance Education program that is offered completely online at Athabasca. The estimated sample size is N=10. The sample size of 8 is ideal for the quantitative analysis of this research**.**"
Please reference your **REB File Number and Project title** on all correspondence requesting data from AU Departments/Systems/Staff.
I wish you every success with your research project. As a further note for your information, Athabasca University researchers have access to Lime Survey, an online survey tool based in Canada, which has no privacy issues. Using this would be preferable to using Survey Monkey.

Dr. Cindy Ives
Vice President Academic (Interim)