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The relationships between higher order thinking skills, cognitive density, and social presence in online learning

Sangmin-Michelle Lee [1]

Global Communication Dept. 220, College of Foreign Languages and Cultures, Kyung Hee University, Kiheung 1, Yongin, Republic of Korea

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ABSTRACT

Despite a considerable amount of research about online learning presences, the quality of cognitive presence, the value of social presence, and the relationship between them have yet to be comprehensively studied. The purpose of the current study was to investigate the correlation between cognitive presence density and higher order thinking skills as well as the relationship between cognitive and social presences. The study examined online discussion board messages ($N = 672$) posted by two groups of college students ($N = 23$) using quantitative content analysis. The Community of Inquiry (CoI) model was used as a framework to classify and analyze the data. By comparing the cognitive and social presences of the two groups' messages, the study confirmed that high cognitive presence density did not guarantee the promotion of higher order thinking skills but that social presence was positively related to the quality of cognitive presence.

1. Introduction

Within the framework of constructivism, it is impossible to separate learning from the concepts of collaboration, interaction, and community. As Akyol and Garrison (2011a,b) articulated, "learning in an educational context is socially situated and therefore involves community and sharing thinking" (p. 189). Within the community, the participants learn from each other, negotiate meaning, and co-construct knowledge. Thus, collaboration, interaction, and the learning community are the driving forces to sustain motivation for learning and even the paths to learning. In other words, the social domain is as important as the cognitive domain in learning, and the social context influences the learner's cognitive development.

These key constructivist concepts are also critical considerations in online learning. Merely using an online tool does not guarantee meaningful interactions that can induce higher-order thinking skills and ultimately lead to learning. Thus, previous research has investigated important variables and identified the factors that influence the effectiveness and success of online collaborative learning, including pedagogical strategies, facilitator roles, the technological interface, the nature of the tasks and group interaction processes (Arbaugh, 2008; Archibald, 2010; Daradoumis, Martinez-Mones, & Xhafa, 2006; McKenzie & Murphy, 2000). A variety of models and conceptual frameworks have been proposed to explain and interpret online learning by using these five variables, such as Gunawardena, Lowe, and Anderson's (1997) interaction analysis model and Harasim's (2007) model of conceptual change.

Among the various models, Garrison, Anderson, and Archer's (2001) Community of Inquiry (CoI) framework has been the most frequently researched, tested, and cited in studies. The authors proposed that learning occurs in a community of inquiry as a result of the interaction between three essential elements: cognitive presence, social presence, and teaching presence. Cognitive presence refers to the extent to which the participants in a community are able to construct meaning through sustained communication. Social presence refers to the ability of participants in the community to project their personal characteristics, thereby presenting themselves to the other participants as real people. Teaching presence refers to the design of the educational experience and facilitation. Garrison et al.'s model proposes that these elements should be combined with each other in any community of inquiry, stating that the interaction among the elements brings a distinct experience to the teaching and learning outcomes.

Many studies have investigated the relationships among the three elements of the CoI model, but the results appear contradictory. In particular, the relationship between cognitive presence and social presence has not been yet fully defined, and the value of social presence in online learning is still uncertain. Given the uncertainty about these presences, the present study investigated cognitive and social presences in online discussion boards developed by two college student groups and examined the relationship between the two presences. This study employed Garrison et al.'s (2001) CoI model because CoI has been widely and empirically tested in various learning contexts by many researchers and thus has gained a certain amount of reliability and validity. The study addressed the following questions:

- Does the group with higher cognitive presence density have better quality learning experiences and promote higher order thinking skills?
- What is the correlation between cognitive and social presences?
- Is CoI a viable means to evaluate cognitive and social presences in online learning?

E-mail address: sangminlee@khu.ac.kr.
[1] Tel.: +82 2 10 3455 7537.

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2. Theoretical perspectives

Garrison and Arbaugh (2007) defined cognitive presence as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse" (p. 161), rooted in Dewey's (1933) construction of practical inquiry. Dewey viewed reflection as essential to learning and proposed the idea of a model of inquiry and reflective thinking. Dewey explained that the learning cycle is initiated with the perception of a problem and, through exploration of relevant knowledge, moves forward to construction of meaningful explanations and a solution. Based on Dewey's practical inquiry model, Garrison, Anderson, and Archer (2000) and Garrison et al. (2001) further developed the CoI model. The model is split into the private world (where reflection mostly occurs) and the shared world (where discourse occurs). These two worlds are shaped by the interactions between the two dimensions. One dimension includes deliberation (applicability) and action (practice) as points on the axis, and the other dimension includes perception (awareness) and conception (ideas). This model categorizes cognitive presence into four phases: a triggering event (an issue is identified for inquiry), exploration (exploring the issue through discussion and critical reflection), integration (constructing meaning from the ideas developed through exploration), and resolution (applying new knowledge into a real world context). Garrison et al. (2001) further suggest descriptors for each phase (see Appendix A).

McKlin, Harmon, Evans, and Jones (2002) analyzed cognitive presence displayed in an online discussion board based on linguistic cues using their own neural network analysis model, which is similar to the CoI model. The majority of messages fell into the exploration phase with fewer messages in the integration phase, some messages in the triggering phase and none for resolution. Other studies also found that students had difficulty moving beyond the exploration phase (Celentin, 2007; Vaughan & Garrison, 2005). Previous studies (Garrison & Arbaugh, 2007; Garrison et al., 2001; Luebeck & Bice, 2005; Meyer, 2003) have pointed to teaching presence as a crucial element in promoting student learning at the highest levels of inquiry, indicating that the instructor should play a major role in the process, including facilitating, directing, and designing effective tasks.

In addition to teaching presence, social presence also supports cognitive objectives through the ability to instigate, sustain, and support critical thinking in a community of learners. Social presence, therefore, tends to correlate with successful learning outcomes (Arbaugh & Hwang, 2006; Lambert & Fisher, 2013). Social presence is defined as the ability of learners to project themselves socially and affectively into a community of inquiry (Rourke, Anderson, Garrison & Archer, 2001). Gunawardena (1995) describes social presence as "the degree to which a person is perceived as a real person in mediated communication" (p.151). Garrison and Arbaugh (2007) explain it as "the ability of learners to project themselves socially and emotionally, thereby being perceived as 'real people' in mediated communication" (p. 159).

Many researchers view social presence as essential to promoting knowledge-building and collaborative learning and as a predictor of learner satisfaction (Annand, 2011; Gunawardena, 1995; Tu, 2002). Garrison (2003) also emphasized the importance of social presence in the CoI model. He viewed social presence as "an essential element of any educational experience, since, by definition, it is a socially sanctioned and shared process" (p. 54). Garrison et al. (2000) also argued for the importance of social presence because it functions as "support for cognitive presence, indirectly facilitating the process of critical thinking carried on by the community of learners…and is a direct contributor to the success of the educational experience" (p. 89). Akyol, Garrison, and Ozden (2009) expanded Garrison, Anderson, and Archer's idea of social presence and considered it as "an important antecedent to collaboration and critical discourse because it facilitates achieving cognitive objectives by instigating, sustaining, and supporting critical thinking in a community of learners" (p. 67). Boston et al.'s (2009) analysis of survey results found social presence to be positively linked to some aspects of online learning experiences. According to Garrison et al. (2000), "the primary importance of this element is its function as a support for cognitive presence, indirectly facilitating the process of critical thinking carried on by the community of learners" (p. 89). Social presence, hence, should be considered a mediating variable between teaching and cognitive presence (Garrison, Anderson, & Archer, 2010).

In addition, prior studies also developed diverse sets of social presence constructs. Tu (2001) identified three main variables: social context Computer-Mediated Communication (CMC) users' characteristics and their perceptions of the CMC environment, online communication (language used online and attributes of CMC), and interactivity (active communication and learning activities used in CMC). In his later study, Tu (2002) expanded his previous idea on the construct of social presence and included system privacy, feelings of privacy, online paralanguage, and emoticons. Garrison et al. (2001) divided social presence into three categories (affective, interactive, and cohesive) in the CoI model and suggested indicators for each category (see Appendix A).

Lambert and Fisher (2013) investigated the existence of the three elements of CoI by examining student perceptions of and preference for community in online learning, concluding that the elements were adequately addressed in the online courses. Akyol and Garrison (2011a) utilized CoI strategies to design an online course and then explored the development of cognitive presence in online and blended learning contexts. The authors found a strong correlation between cognitive presence and collaborative constructivism. In another study, Akyol and Garrison (2011b) analyzed metacognitive presence in online learning, also by using the CoI framework. In this study, they confirmed that CoI is a reliable tool to assess metacognition in an online community of inquiry.

Various research methods have been used to investigate online learning presences. Quantitative content analysis is the most popular method because it makes the systematic, objective and replicable examination of symbols of CMC possible (Rourke, Anderson, Garrison & Archer, 1999; Rourke & Anderson, 2002). Content analysis, "when conducted with an aim to understanding the learning process, provides information on the participants as learners, and on their ways of dealing with a given topic" (p.118, Henri, 1992). Akyol and Garrison (2011a), Boston et al. (2009), and Shea et al. (2010) also adopted quantitative content analysis in their studies. Other popular methods in this area include questionnaires and surveys. Garrison and Cleveland-Innes (2005) administered the Study Process Questionnaire to assess the nature and depth of online interactions by graduate students in four treatment groups. Garrison, Cleveland-Innes, and Fung (2010) conducted the CoI survey and structural equation modeling to examine the causal relationships among teaching, cognitive, and social presences. Shea and Bidjerano (2009a) used data from a large-scale survey to investigate whether one of the presences might be a predictor of the others by using chi-square automatic interaction detection (CHAID) model.

There are, however, discrepancies in the findings among studies. According to Shea and Bidjerano (2009b), social presence served only small or ancillary functions in learning. They further reported that social presence could not be a predictor of learner satisfaction, as claimed in other studies. Ke (2010), in his study on the relationships among cognitive, social, and teaching presences, also argued that social presence was perceived merely as a superficial and overemphasized bonus. Diaz, Swan, Ice, and Kupczynksi (2010) similarly found that social presence functioned as the least important of the three presences after examining students' perceptions of the presences.

In addition to discrepancies in results, other problems also arise in the existing studies of social presence. Researchers have questioned the reliability of social presence constructs. Shea et al. (2010) intended to define constructs of social presence through a quantitative content analysis of online interactions and concluded that "social presence construct is somewhat problematic and requires further articulation and clarification if it is to be of use to future researchers seeking to inform our understanding of online teaching and learning" (p. 17). Annand (2011) also addressed the