CHAPTER 1: INTRODUCTION

An Introduction to the Research Problem

Lloyd, Byrne, and McCoy (2012) pointed to the highly growing amounts of request for, and interest in online higher education or online courses offered at the higher education level. Similarly, Allen and Seaman (2013) reported that according to 69.1 % of “chief academic leaders”, online education is of crucial importance to their long term strategy in 2012 (p. 4), and referred to the number of over 6.7 million students enrolled in at least one online course, which aligns well with the earlier increasing rates for online education (Allen & Seaman, 2006, 2007, 2010, 2011). Moreover, compared to the overall increase rate of higher education enrollments in fall 2011, the overall increase rate in online education (9.3%) has been a lot greater (Allen & Seaman, 2013). A similar trend has also held true for K-12 education as well (Means, Toyama, Murphy, Bakia, & Jones, 2010). Consequently, Means et al. (2010) claimed that policy makers and practitioners need to have more knowledge about the effectiveness of online education. This suggests that the increasing growth of online education has naturally led to concerns about its effectiveness in terms of learning processes and consequences.

In the ever-growing market of online education in higher education where the growth rate is almost ten times higher than traditional higher education (Shea & Bidjerano, 2009a), it seems to be important to increase effectiveness of learning. Previous research also indicated that drop-out rate is higher in distance education compared to traditional higher education (Bernard, Abrami, Lou, & Borokhovski, 2004; Boston et al., 2009; Carr, 2000; Ice, Gibson, Boston, & Becher, 2011; Parker, 2003; Wilson, 2008). In addition, there has been research showing that some factors positively affect student persistence including quality interaction and feedback (Ivankova & Stick, 2007; Ojokheta, 2010) as well as the relevance of the content and learner satisfaction (Ivankova & Stick, 2007; Levy, 2007; Müller, 2008; Park & Choi, 2009).

Further, given that earlier research on distance education using technologies including educational television and videoconferencing revealed no better effectiveness of these compared to traditional in-class learning (Means et al., 2010), concerns about effectiveness appear to be totally legitimate. Allen and Seaman (2013) reported that: (a) there has been an increase in the number of academic leaders (77%) who consider learning outcomes associated with online learning to be the same or better than those with face-to-face; (b) there is still 23% of leaders who view face-to-face learning superior over online learning at higher education level. Among these chief academics in higher education, the same report also stated that only 30.2 % of leaders claimed that faculty members of their institutions accepted “the value and legitimacy of online education.” (p. 6).

All these seem to warrant gaining further insights into the effectiveness of online education. To this end, two theoretical frameworks can effectively inform future research attempts: Community of inquiry framework (Garrison & Akyol, 2013a, 2013b; Garrison, Anderson, Archer, 2000, 2001, 2010; Garrison & Arbaugh, 2007) and cognitive load theory (Sweller, 1988, 1994, 2005, 2010; Sweller, Ayres, & Kalyuga, 2011; Sweller, van Merriënboer, & Paas, 1998). Focusing on three presence types, teaching presence, cognitive presence, and social presence, community of inquiry framework aims at creating and sustaining effective learning environments. Similarly, cognitive load theory purports to produce instructional guidelines that bypass the limitations of human cognitive architecture in order to foster learning outcomes. As a result, using both theories while evaluating effectiveness of an online learning environment might provide complementary results that would help us diagnose how to enhance online learning outcomes.

Speaking of these two theories, the concept of presence is at the heart of community of inquiry framework (CoI framework): (a) Social presence; (b) teaching presence; (c) cognitive presence. Social presence is the extent to which members of a community can reflect themselves into the group dynamics thereby participating in group work as actual people (Garrison et al., 2000). Further, cognitive presence refers to the extent a group of learners are able to build and validate meaning or understanding continuous critical communication and thinking (Garrison et al., 2000, 2001). Finally teaching presence encompasses designing and facilitating necessary cognitive and social processes in order to enhance learning consequences (Garrison et al., 2000; Anderson, Rourke, Garrison, & Archer, 2001).

According to Garrison et al. (2000), learning happens in a critical community of inquiry where all presences, social, cognitive, and teaching, exist and interacts with each other. In other words, meaningful learning experiences occur in the common intersection of social presence, cognitive presence and teaching presence, which entails the existence of the three types of presences in a learning environment. Therefore, naturally, one basic tenet of the CoI framework is that higher levels of social, cognitive and teaching presence can result in better learning. That is, increasing levels of presence may be associable with increasing levels of learning.

As for cognitive load theory (CL theory), it depends on the construct of “cognitive load”. Cognitive load is created and taxed to human cognition by performing specific tasks (Sweller et al., 1998). There are three types of cognitive load: intrinsic, extraneous, and germane (Sweller, 1994). Intrinsic load is imposed by the inner structure of learning materials, which is based on the number of interacting information elements. According to Leahy, Chandler and Sweller (2003), working memory can process an information element alone which is an information piece or unit. Extraneous load, on the other hand, is created by poor instructional characteristics (Sweller, 2010) that include presentation styles and the like. Germane load, finally, refers to the amount of resources allocated for dealing with intrinsic load (Kalyuga, 2011; Sweller et al., 2011).

Moreover, CL theory assumes that learning in general occurs through a limited working memory capacity that processes and briefly holds information, and an unlimited long term memory that stores processes information. Similarly, according to Baddeley (1992), what is learned or stored in long-term memory is firstly processed by working memory. Human working memory seems to be limited to a certain extent though. For instance, Miller (1956) speculated that we may not be able to handle more than about seven minus or plus two information chunks at a time. Recently, Cowan (2001, 2010) argued that central working memory capacity limit can be three to five chunks in adults. As a result, one of the basic assumptions of CL theory is that in order to lead to effective learning, working memory limitations should be addressed by instructional design. These suggest that when the total cognitive load is beyond the limited working memory capacity, learning may not occur due to the lack of enough amounts of resources that can be allocated for it (Sweller et al., 2011).

Therefore, combining these presence and cognitive load insights, would provide us with more insights into how to increase effectiveness of online learning environments as well as CoI framework and CL theory. Having more to say on this point, the next section presents the research problem more specifically.

Statement of the Research Problem

Given that previous CoI framework research pointed to the existence of the presences in effective learning environments (Garrison, et al., 2010), and that CL theory has informed numerous experimental studies that resulted in evidence-based instructional guidelines leading to better learning (Sweller et al., 2011), it is reasonable to expect that social, teaching and cognitive presences can help to keep cognitive load at an effective level. That is, learning activities enriched by social, teaching and cognitive presences may both impose a certain amount of cognitive load and reduce it to a certain extent whereby enhancing learning. This study purports to focus on this theoretically plausible relationship between presence and cognitive load in a graduate level fully online learning environment at a large Midwestern university in the USA.

From a theoretical perspective, Garrison (2013) pointed to the need for further examination of the CoI framework thus increasing its “credibility”, which in turn contributes to its power of informing future “online and blended learning” research (p. 1). In this regard, Garrison (2013) stated “Explicating and validating such a comprehensive framework is an ongoing challenge.” (p. 2). Therefore, the current study also aimed at examining the CoI framework from a new perspective, a cognitive load perspective. To the best of the author’s knowledge, such an attempt would be the first one. Specifically speaking, this study seeks to explore possible interrelationships that might exist between social, cognitive, and teaching presences, and cognitive load. Moreover, it is also aimed at examining the possible relationships that may exist between presences, cognitive load, and perceived learning and satisfaction in online learning environments. This study`s findings would provide further insights into both theoretical and practical accountability of the CoI framework and CL theory, in the context of online learning.

Additionally, some previous research focused on perceived learning, satisfaction and the presences (e.g., Akyol & Garrison, 2008; Arbaugh, 2008; Shea, Li, Swann & Pickett, 2005). There has also been research suggesting that learner satisfaction relates to perceived learning as well (Fredericksen, Pickett, Shea, Pelz and Swan, 2000; Richardson & Swan, 2003).These studies, however, did not handle the relationship between the presences and perceived learning and satisfaction by taking cognitive load into account.

Among these, Akyol and Garrison (2008) stated that they employed perceived satisfaction and learning as variables assuming that this would help differentiate between the “roles of social and cognitive presence” (p. 14). In addition to this, there are several other reasons for employing a perceived but not a measured learning outcome including but not limited to: (a) possible incompatibility of assignments among courses and instructors (Arbaugh 2005, 2008; Rovai, 2002); (b) “the enormous challenge of identifying valid and cost effective proxy measures of latent higher-order thinking” (Akyol et al, 2009, p. 127); (c) different grading regimes employed in different courses leading to comparability problems (Paechter, Maier, & Macher, 2010).

As such, the purpose of the present study is to address the following main research questions:

* Which is the best predictor of cognitive load at the beginning of an online learning experience: social presence, teaching presence or cognitive presence?
* Which is the best predictor of cognitive load at the end of an online learning experience: social presence, teaching presence or cognitive presence?
* Which is the best predictor of perceived learning: social presence, teaching presence, cognitive presence or cognitive load?
* Which is the best predictor of perceived learner satisfaction: social presence, teaching presence, cognitive presence or cognitive load?

Significance of the Study

Possible presence and cognitive load relationships regarding perceived learning and satisfaction may be beneficial from both a theoretical perspective and practical perspective: (a) we can gain more insights into how presence and cognitive load relate to perceived learning and satisfaction thereby improving existing theoretical insights; (b) closely related to theoretical gains, presence and cognitive load relationships may inform online learning and teaching in terms of how to promote learning and satisfaction. In other words, more knowledge about presence and cognitive load relationships may provide a better understanding of how to design and manage online learning on the one hand, and how to enhance online learning outcomes on the other. These may further help us decrease the high drop-out rates in online learning environments.

Key Terms

This section provides the definitions of the key terms used in the present study assuming that a brief clarification would help understanding the content better. All these definitions can be found in Table 1 below:

Table 1

*Definitions of Key Terms Used in the Current Study*

|  |  |
| --- | --- |
| Term | Definition |
| Community | “A group of individuals who are connected and communicate with regard to mutual interests and similar expectations as to process and outcomes.” (Garrison, 2013, p. 10). |
| Learning community | A collaborative group of learners who involve in “*intellectual interaction”* in order to learn (Cross, 1998, p. 4). |
| Inquiry | “A process of critical thinking and problem solving based on the generalized scientific method leading to resolution and the growth of personal and collective knowledge.” (Garrison, 2013, p. 11). |
| Community of Inquiry | “A learning community where participants collaboratively engage in purposeful critical discourse and reflection (cognitive presence) to construct personal meaning and shared understanding through negotiation.” (Garrison, 2013, p. 10). |
| Discourse | “A collaborative and critical process for clarifying and resolving cognitive conflict through an open and disciplined (reflective and reasoned) form of dialogue or discussion with the potential for mutual agreement.” (Garrison, 2013, p. 11). |
| Metacognition | It is “the set of higher knowledge and skills to monitor and regulate manifest cognitive processes of self and others.” (Akyol & Garrison, 2011a, p. 184). |
| Cognitive load | Cognitive load refers to “the load that performing a particular task imposes on the cognitive system.” (Sweller, et al., 1998, p. 266). |
| Extraneous cognitive load | It is the type of load “imposed by instructional procedures that are less than optimal.” (Sweller, 2010, p. 125). That is, it emanates from poor instructional design aspects including presentation of information.  |
| Intrinsic cognitive load | It “is concerned with the natural complexity of information that must be understood and material that must be learned, unencumbered by instructional issues such as how the information should be presented” (Sweller, 2010, p. 124). |
| Germane cognitive load | It “can be better understood as working memory resources that are devoted to information that is relevant or germane to learning.” (Sweller et al., 2011, p. 57). |
| Working memory | It is “a brain system that provides temporary storage and manipulation of the information necessary for such complex cognitive tasks as language comprehension, learning, and reasoning.” (p. 556).  |
| Information element  | “An element is a learning item in its simplest form and processed as a single unit in working memory.” (Leahy et al., 2033, p. 402). |
| Element interactivity | “Interacting elements are defined as elements that must be processed simultaneously in working memory because they are logically related.” (Sweller et al., 2011, p. 58). |

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