The Effects of Instructor Control on Critical Thinking and Social Presence: Variations within Three Online Asynchronous Learning Environments

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Abstract

In a world in which online interactions are becoming the norm, an understanding of how three fundamental aspects of online learning (teaching presence, social presence and cognitive presence) interact is important. This paper will look at how these three presences interact with each other in an online forum. More specifically it will describe the effects of instructional design on learners' levels of critical thinking and social presence. The research involved taking 900 learner posts from differing experimental conditions and analyzing those posts for social presence and critical thinking. The experimental conditions varied in three different ways in regards to the level of instructor control over the learning environment. The first learning environment had a low level of instructor control while the second and third had progressively high levels of instructor control over the learners' contributions to the forum.

The results showed that increasing the amount of control an instructor has over a learning environment increases the amount of cognitive presence but decreases the amount of social presence within the learners' posts. In general, these results are important because instructors must be aware of how their behavior may affect how learners interact (and therefore learn) online. More specifically, many instructors are interested in the types of discourse their learners create. Therefore, the ways instructors can manipulate learner discourse is of great importance.

Keywords: Asynchronous forum, critical thinking, instructor control, social presence, task design

INTRODUCTION

Many universities are moving towards offering courses with significant online components. These courses often combine some type of live brick and motor instruction with an asynchronous learning platform (Holenko & Hoić-Božić, 2008; Precel, Eshet-Alkalai, & Alberton, 2009). Asynchronous discussion boards are the most commonly used tool to generate learner-centered discussions in higher education settings (Johnson, 2007). The technology allows university students to ask questions, discuss issues, and observe how their peers are

interacting with the content of any particular course. Their type of interaction is also important, with social interaction being shown to support learning (Kozan & Richardson, 2014). Knowledge of how instructors should use asynchronous online forums is important, as implementation has been haphazard in some cases (US Department of Education, 2010). This new form of interaction gives instructors new options and challenges in how to construct learning events for their students. These new challenges of how to construct and administer learning environments requires an understanding of how instructors can design and administer instruction to the growing number of learners who participate on asynchronous learning networks.

The effects of instruction on learner behavior is an important component of understanding online learning and certain types of instruction have been shown to develop learners' levels of critical thinking and increase learner confidence (Heijltjes, van Gog, Leppink & Pass, 2015). Furthermore, regardless of the learner orientated nature of most educational discussion forums, the role of the teacher remains of great importance, as the teacher still has responsibility to: design the learners' educational experience, facilitate the learning experience, and to provide scaffolding in the form of direct instruction as needed (Anderson,

Rourke, Garrison, & Archer, 2001). Furthermore, studies have established the importance and effectiveness of instructor behavior when students interact online (Andresen, 2009; Shea, Chun, & Pickett, 2006) and the effect of teaching presence on critical thinking in particular (Prasad, 2009). Individual learning without the aid of formal instruction can be effective online, however some kind of guidance (teaching presence) is required (Anderson et al., 2001).

The ability of e-learning, particularly asynchronous online forums, to develop both private reflection and higher order discourse through collaborative learning shows that e-learning has the characteristics to develop independent critical thinkers (Nui, Behar-Horenson & Garven, 2013). Effective collaboration requires at least some level of discourse, and the more in depth the discourse the more in depth the collaboration.

This study investigates the effects of instructional design and instructor posting on student discussion in online threaded asynchronous forums. To gather a rich understanding of learner behavior in relation to instructor behavior, direct analysis of student discussions is needed to develop a comprehensive understanding of how instructor behavior can effect learner discussion. The two tools used to understand student

discussions are the concepts of social presence and critical thinking. This paper will describe the effects that varying types of instructor behavior have on the levels of social presence and critical thinking within learner discussions.
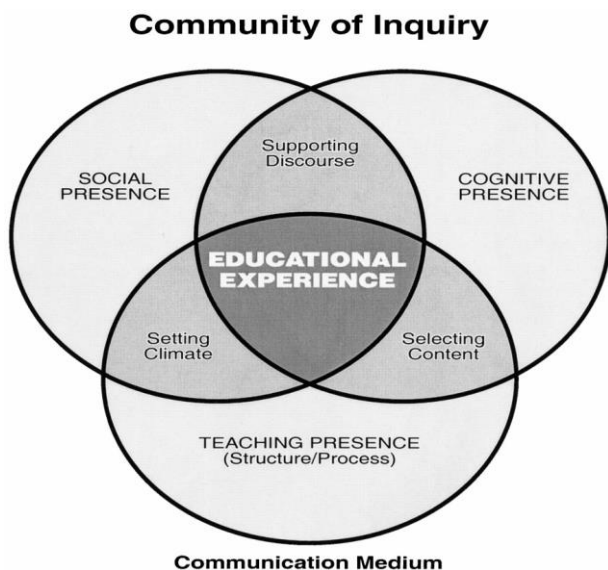
CMC in Education

While effective learning communities exist offline, the power of e-learning is its ability to easily bring together diverse communities of learners. E-learning in general and the Internet specifically is a powerful tool to reach deeper layers of understanding, raise participation, and promote motivation. This is because of its potential social diversity (learners can interact with nearly anyone) and content depth and diversity (learners can find information about nearly anything).

Asynchronous online discussion forums have been used to facilitate online learning and, according to Harman & Koohang (2005), are one of the primary tools of CMC in education. The use of online discussion forums can be used in three fundamentally separate ways: as the only method of interaction for learners, as a method along with other online computer based interactions, or as a method used in conjunction with offline interactions. In all three cases, online discussion forums are an effective, simple way to facilitate collaboration and interaction

(Harman & Koohang, 2005; Reid, Katz & Jacobsen, 2006). Students have been shown to prefer asynchronous offline interactions when compared to online or offline synchronous. This is because the slow pace allows the students to respond in their own time and in their own way (Callan, 2006; O'Neill et al., 2006; Wang & Woo, 2007). Furthermore Hara, Bonk, and Angeli (2002) claimed that, asynchronous online responses were of a higher quality (in that they were longer, more in-depth, and thoughtful) than face-to-face responses of similar problem types. Nearly all asynchronous online forums are in written form. Writing in and of itself encourages learners to reflect not only on whatever environment, artifact or actor they are interacting with, but also on the learner's own thoughts and beliefs (Hiemstra, 2002; Spalding & Wilson, 2002).

Learner engagement and feelings of belonging are core issues when designing any learning community and learning communities online are no exception (Vesely, Bloom, & Sherlock, 2007). Simply speaking, a teacher will be unable to deliver effective instruction and learners will be unable to meet learning goals if the learning environment doesn't meet learners' basic social needs (Kozan & Richardson, 2014).

The Community of Inquiry (CoI) is one of the most commonly used and validated models in online education research (Lee, 2013). According to Lipman, Sharp, and Oscanyan (1980), a community of inquiry has 3 core prerequisites: 1) Readiness to reason; 2) Mutual Respect (among learners and between the learners and teachers); 3) An absence of indoctrination. These concepts have been applied to the e-learning environment most notably in a paper by Garrison, Anderson and Archer (2000), which laid out a model for understanding how the pieces of the community of inquiry worked together. Their paper provides a conceptual tool for understanding computer-mediated communication and a model of a community of inquiry. Their model, shown in figure 1 is made up of three main parts: social presence, cognitive presence and teaching presence.

Community of Inquiry

Supporting Discourse

SOCIAL PRESENCE

COGNITIVE PRESENCE

EDUCATIONAL EXPERIENCE

Setting Climate

Selecting Content

TEACHING PRESENCE
(Structure/Process)

Communication Medium

Figure 1. Elements of an educational experience. (From Garrison, Anderson and Archer, 2000, p 88.)

The element in the model that is core to the traditional view of "learning" is that of cognitive presence, which Garrison et al. define as, the extent to which the participants "…… are able to construct meaning through sustained communication" (Garrison et al., 2000, p. 89). The second element in the model is social presence. The authors define social presence as when learners are able to show their personal characteristics to the community of inquiry. The nature of social presence is what divides a CoI from normal learning. Garrison et al. state that, "it affects the quality of the message; the tone is questioning but engaging, expressive but responsive, skeptical but respectful, and challenging but

supportive" (pg. 96). The third element of the model, teaching presence,

consists of three parts: design, facilitation, and instruction. According to

Garrison et al. (2000) teaching presence is essentially a method of

balancing the social and cognitive presences and moving them towards

educational objectives. This may require a "teacher", but teaching

presence is not only encapsulated in that individual. Within the

framework of the CoI, the element that can be most easily manipulated

by those seeking to improve education is teaching presence. According to

Garrison and Anderson (2003), the role of teaching presence in the

community of inquiry includes design and organization, facilitating

discourse and direct instruction. More recent research by Lee (2013), has

found that there are strong relationships between the constituent parts of

the CoI, and that each part has a role to play in an effective learning

environment.

Teaching Presence

The student's view of the teacher and how the teacher behaves is

of great importance. In Midgley, Feldlaufer and Eccles (1989), they

showed that the relationship that a student had with his or her teacher was

highly correlated with that student's feeling about the subject and

achievement in the subject. They found that when students felt high

levels of teacher support, their attitudes towards the subject and results in the subject dramatically improved. Pianta (1999) found that, while external influences and individual characteristics did affect student/teacher information sharing, the defining feature of the relationship was the process by which the student and teacher engaged with each other. This has been shown more recently in research that has demonstrated the instructors influence on many aspects of learner behavior (Heijltjes, van Gog, Leppink & Pass, 2015; Jarvela & Hadwin, 2013; Kim, 2015). In Raider-Roth's (2005) detailed examination of 6th grade learners, she found that students engagement with and ability to understand classroom material was based on their relationships with the teachers and their peers. More specifically, there was a complex but clear relationship between the teacher student relationship and affective disposition towards education and knowledge.

Anderson et al. (2001) have come up with three categories that directly define the role of teaching presence in a community of inquiry: *instructional design* and *organization*, *facilitating discourse*, and *direct instruction*. Instructional design and organization involves 5 indicators: setting curriculum, designing methods, establishing time parameters, utilizing the medium effectively and establishing netiquette. They note

that students need a clear idea of the overall plan of the course so as to

maintain focus and direction. While Anderson et al.'s (2001) model is

useful in describing differing instructional design and organization, their

conceptualization is operationalized as instructor utterances. While it is

sometimes the case that the parameters of design and instruction will be

delivered by the instructor in the online learning environment, the

information may be delivered in a syllabus package or email in the case

of fully online classes, or offline during in-class instruction in the case of

blended learning environments (Arbuagh & Hwang, 2006).

Other methods of understanding learning environments have been

developed, most notably Reeves and Reeves (1997) who develop 10

dimensions that can be used to understand pedagogic differences in web-

based instructional environments. These 10 dimensions are: (1)

pedagogical philosophy, (2) learning theory, (3) goal orientation, (4) task

orientation, (5) source of motivation, (6) teacher role, (7) metacognitive

support, (8) collaborative learning, (9) cultural sensitivity, and (10)

structural flexibility. Each of these dimensions can vary along a

continuum, and a particular learning environment can be pedagogically

described by placing them at each point on the continuum for each of the

10 dimensions. Reeves and Reeves (1997) use this model to describe two

differing learning environments from each other. This model allows a more precise description of learning environments than Anderson et al.'s (2001) model by not only having more dimensions, but by giving guidelines as to how those dimensions can vary.

A modified version of Reeves and Reeves' (1997) model was taken up by Siragusa, Dixon and Dixon (2007). Their mode, the Instructional Design for Online Learning model (IDOL), uses three differing categories: analysis, strategy and evaluation, with these three categories being developed into 24 varying dimensions of design and organization. There are 11 dimensions for analysis: underlying pedagogical philosophy, instructional design analysis, content provided, student motivation, unit formation / delivery mode, lecturers role / availability, lecturer's perception of importance, lecturer's online abilities, lecturers online support / training, lecturers decision making input, and lecturers development activities. There are a further 11 dimensions within the category of strategy which are: structure and organization, development of learning strategies, content guiding learning strategies, accommodation of learning styles, study flexibility – when, where and pace, web based design principles, interaction, collaborative learning, automated online learning activities, internet based information,

and online learning management. Within the final category of evaluation there are two categories, which are feedback and online learning evaluation. Siragusa et al. (2007) describe two differing learning environment among the 24 dimensions, this gives a clear framework for our understanding the nature of these online communities. This paper will use a modified version of the IDOL model for describing the three differing learning environments used in this study, which will be described in greater detail in the methods section of this paper.

The Effects of Teaching Presence on Social Presence

Conceptions of social presence began with Mehrabian (1969) and his idea of *immediacy*. Immediacy is those actions by individuals, which bring them together and/or increase the interactions between individuals. Mehrabian was focused on non-discourse related social behaviors such as voice tone, volume and body language. McCroskey and Wheeless (1977) introduced the concept of *affinity*, defined as an individual's positive attitude towards another individual. Affinity would, in McCroskey and Wheeless' view, increase levels of communication between members of a community. Mehrabian (1969) along with McCroskey and Wheeless (1976) hypothesized that a lack of physical closeness or nonverbal behaviors would be detrimental to individual-to-individual

communication. This brings about a problem when trying to develop

most kinds of asynchronous communication mediums online, as they lack

any kind of nonverbal social cues.

Gunawardena (1995) is based around a set of 17 Likert scale

items that measured the degree of social presence learners felt in CMC

learning environments. These items asked learners to score where on the

scale they felt the learning environment was. For example, student

perceptions of how active or passive or stimulating or dull they found the

learning environment created an overall measure of the level to which a

learning environment contained social presence. Gunawardena's (1995)

scale was further developed (Gunawardena & Zittle, 1997) with 14 items

that asked participants their level of agreement with statements made

about the learning environment. In 2002, Tu developed The Social

Presence and Privacy Questionnaire (SPPQ). This survey was initially

developed by 5 content experts. Then, in an experiment with 310 learners

to test construct validity, factor analysis showed that five features stood

out as being important. These features, which were social context, online

communication, interactivity, system privacy, and feelings of privacy

made up the core of measuring social presence. In further work, Tu and

McIssac (2002) found that more variables may impact social presence

and that the dimensions of social presence may need to be weighted for more accurate measurement. Rourke, Anderson, Garrison and Archer. (1999) took an important step in the measurement of social presence by looking at learner discourse directly as opposed to using a survey. This measurement of social presence was tested by analyzing student discourse in the form of transcripts from an asynchronous online learning class. This measurement tool is what is being used in this research and the full scheme can be seen in appendix 2. More recent research has shown that social presence is important because it can potentially improve levels of cognitive presence (Kozan & Richardson, 2014; Lee, 2013).

Jarvela and Hadwin (2013) claimed that for learners to interact and collaborate online, support should not only target critical thinking, but also develop learners' motivation, social development and emotional development. Mazzolini and Maddison (2002) investigated the different ways instructors guide their learners online. They showed that instructors' styles of interaction affected how learners felt and the degree that they participated online. Mazzolini and Maddison found that frequent posting by instructors led to discussions being cut short and did not lead to more posts by learners in the discussions. Learners who

experienced more facilitation from their instructors did rate their instructors higher and judged that the instructors were more enthusiastic than those who interacted less online. In their quantitative and qualitative investigation of social presence Tu and McIsaac (2002) found that the three dimensions of social presence (social context, online communication and interactivity) could be enhanced by certain types of instructor behaviors. They recommend that instructors engage learners in social tasks and take steps to remove layers of formality between themselves and learners in order to promote social engagement. Swan and Shih (2005) demonstrated that instructor presence was important in developing the levels of social presence students felt in online courses. They found that topics which were more focused around personal issues induced higher levels of social presence. They also found that there were meaningful differences in levels of social presence when learners' instructors behaved in different ways. Students with higher levels of social presence reported that their instructors had a more "personal tone" in their online interaction and that those instructors spent time developing a sense of community. Students who felt that their instructor didn't "facilitate" much, often felt passive and bored when trying to relate with the class content. In further research by Shea, Chun and Pickett (2006)

into the effects of teaching presence on sense of community students'

perception of teaching presence was correlated with a survey of online

community along with other demographic information. Their results

showed strong relationships between teaching presence and learners'

sense of community. They propose two categories: design and

organization and directed facilitation. They found that many of the

features of direct instruction did not correlate with sense of community.

In Shea, Fredrickson, Pickett and Pelz (2003), they investigated the

components of teaching presence students are most likely to perceive.

They used a survey of learners and found that certain features of teacher

behavior were more highly correlated with student satisfaction and

reported learning. In regards to instructional design and organization,

Shea et al. (2003) found that there was a strong correlation between

students perception of design and organization with satisfaction (r = .635)

and reported learning (r = .588). Interestingly, Shea et al. found that

facilitating discourse had the same relationship with satisfaction (r = .64)

and learning (r = .58). The effects of direct instruction on satisfaction (r =

.64) were the same as the relationship between organization and design,

and facilitating discourse. However, direct instruction had a slightly

higher effect on reported learning (r = .61) than facilitating discourse or

design and instruction had. While this research was indirect, as it used

student perceptions to measure both the independent variables (teaching

presence) and the dependent variables (satisfaction and reported

learning), it shows that the central construct of teaching presence does

have a significant effect on learners.

The Effects of Teaching Presence on Critical Thinking

Dewey (1933) believed that the main benefit of critical thinking

was that it helps the learner develop and deepen the picture of their

experiences. For this reason, critical thinking is important at every stage

of learning. Critical thinking allows the learner to assess the quality of

their current knowledge and incoming knowledge. It also allows the

learners to develop knowledge of their own. As Dewey notes, learners

and the communities they hail from cannot be meaningfully separated.

According to Garrison and Archer (2000), the advantage of Dewey's

framework of reflective thinking is that most forms of active cognition

(critical, abstract, or inference for example) can be explained by the

theory. The core principle of the model, which moves through

imagination, deliberation and action, can be linked easily to most

learners' experiences of e-learning. This is even more the case when the

e-learning is asynchronous and written. This creates a discourse that is heavily weighted towards reflection, as opposed to most verbal discourses that tend to be spontaneous and lack reflection (Garrison et al. 2000). Research involving the analysis of discourse has shown the relationship between features of online discourse that make up critical thinking and learning (Pilkington, 2001). Pilkington's analysis allows us to indirectly understand how the process of discussion intersects with processes inside learner's minds. Within the community of inquiry, critical thinking can be considered to be synonymous with with cognitive presence (Garrison & Archer, 2000; Garrison & Akyol, 2013). Other authors have suggested that cognitive presence facilitates or occurs in conjunction with critical thinking (Gasevic, Adesope, Joksimovic & Kovanovic, 2015; Lee, 2013). Furthermore, the CoI along with cognitive presence has been modeled together conceptually with critical thinking as an effective way to understand student behavior (Goh, Dexter, & Self, 2014).

In Prasad's (2009) study of the effects of teaching presence on critical thinking, he found that levels of teaching presence were positively correlated with levels of critical thinking. This clearly connects with

Dewey's (1933) work, where he discussed the idea that the development of higher order critical thinking skills " appeared in student discussions only when prompted by specific instructional techniques" (pg. 9). He claimed that collaborative solutions tended to be introduced when the teacher prompted the learners to move towards those kinds of solutions.

In Dringus, Snyder and Terral's (2010) examination of the effects of facilitating discourse on student participation, satisfaction and content understanding, they measured learner's perceptions of the instructors' audio contributions. They found that the learners felt more connected to the course and that learners felt that facilitation managed to improve their understanding of the content. A further study by Sheridan and Kelly (2010), investigating which parts of teaching presence students felt were valuable, found that responsiveness and clarity were the features that were most valued by learners. Shea, Hays, Uzuner-Smith, Gozza-Cohen, Vickers, and Bidjerano (2014) have further established the relationships between teaching presence and cognitive presence and that relationship with learning. In research by Kim (2015), she found that enhancing scaffolding resulted in higher levels of critical thinking and more even

participation among study participants when compared to minimal

scaffolding.

METHODS

Subjects and Context

The 219 participants for this experiment were taking English

classes focused on preparing them for the Korean teachers entrance exam

(im-yong-gyo-shi) over three semesters in 2013 and 2014. Permission

was given by the college of education to experiment on the students

involved in this study. Furthermore, participants filled out a consent form

giving their consent for their posts to be used for research purposes (see

appendix 1). This study takes the posts generated by the users of an

online forum as part of a blended learning environment, with the online

posting meant to support and further develop the students' offline

discourse and writing skills in the hope that this will develop their ability

to generate meaningful understand of issues pertaining to class

management and delivering instruction. Offline course activities included

lectures, group work and presentations. The main online component of

the course was the students' use of an asynchronous message board

where they could post their ideas and respond to others' ideas related to

the course materials. The gender and major breakdown for the classes can

be seen in Table 1.

Table 1

The Gender and Majors for the Three Forums

	Semester one	Semester two	Semester Three	Total
Gender				
Male	24	26	27	77
Female	46	46	50	142
Major				
English	37	35	40	112
Special	6	6	2	14
Business	1	2	1	4
Pedagogy	3	1	2	6
Art	2	2	4	8
Life Skills	5	5	5	15
Ethics	1	3	2	6
Early Childhood	2	2	2	6
Literature*	1	2	2	5
Social Studies	2	2	5	9

Calligraphy	0	2	0	2
Korean	2	2	3	7
Music	0	0	2	2
Tourism*	0	1	0	1
Chemistry	5	2	2	9
History	2	1	1	4
Earth Science	1	1	3	5
Economics*	0	1	0	2
Geography	0	1	1	2
Total	70	72	77	219

All majors were part of the college of education except those marked with an *

Experimental Procedures

This study was conducted over the course of a year and a half (3 semesters) and involved varying the nature of the learning environment in which learners interacted. To formulate the instructional design aspects of the experiment, a modification of the Instructional Design for Online Learning model (IDOL) designed by Siragusa, Dixon and Dixon (2007) was used. Again, three experimental conditions were created with

progressively higher levels of instructor control over the learning

environment.

Defining the Learning Environments

A modified version of the Instructional Design for Online

Learning model (IDOL) designed by Siragusa, Dixon and Dixon (2007)

to understand the variations in the learning environments. This paper

takes seven instructional design decisions for three different learning

communities (online forums) and shows their variation (fig. 2).

Content source is the amount to which students or instructors

generate the content. In the first forum, the content was totally free.

Participants in the forum were able to post on whatever topics they

wished. This contrasts with the second and third forums, which had

specific instructor generated topics.

Linear content is the degree to which the content follows a set path in

terms of narrative, difficultly or some other criteria. In the first and

second forum, the content followed no clear linear pattern, while in the

third, there was a clearly mapped out path from more difficult questions

to simpler ones.

Instructor posting is the degree to which the instructor interacts and

guides the interactions and discourse in the learning environment. On the

first two forums, there were few posts made by any instructors. However, on the third forum, an instructor is actively involved in controlling interactions and moderating the discourse.

Structure and organization refers to the amount that the learners' discourse and interactions are structured and controlled. This could be in the form of being given examples to follow or word limits. In the first forum, there was no structure. Learners were not given examples and were told that any style of writing was appropriate. In the second forum, specific questions were given to students and the types of responses they were asked to give were clearly defined (examples were given of strong and weak posts). Further to this, in the third forum, participants were restricted in that their replies must make clear contributions to the topic being discussed and posts should focus on the issues brought up by other posters.

Study flexibility (when, where) is how free the learners are to contribute in regards to time and space. On all three forums, there were no spatial limitations (the learning environment supported all OSs). On the first forum, timing was not an issue; students would be assessed based on their total production at the end of the course. This differs from the second forum and the third forum on which students were assessed

monthly. Furthermore, on both the second and third forum, learners were encouraged throughout the experiment to continue to post.

Interaction is the amount of instructor control over learner interaction. On the first forum students were able to interact with whomever they liked, moreover students were told that they didn't have to interact if they chose not to. In the second forum, the learners could interact with whomever they wanted, however they were told that interaction was compulsory. These can be contrasted with the third forum, in which learners were put into 6 equally sized sub-forums and asked to interact only with learners in their group.

Feedback is the number of times that their online contributions were commented on by their instructor. On the first forum, this was not done systematically (at the learner's request). On the second forum and on the third forum, feedback was provided every two weeks.

The purpose of Figure 2 is to visually show the differences in levels of instructional design based on the seven proceeding elements. If the forums are tagged to the left of the spectrum, then one can think of them as being freer and more learner controlled. When the forums are tagged to the right, it indicates that the forum is more instructor controlled in regards to that particular indicator. The points at which each forum sits

on the indicator is subjective. The figure's purpose is to give a visual

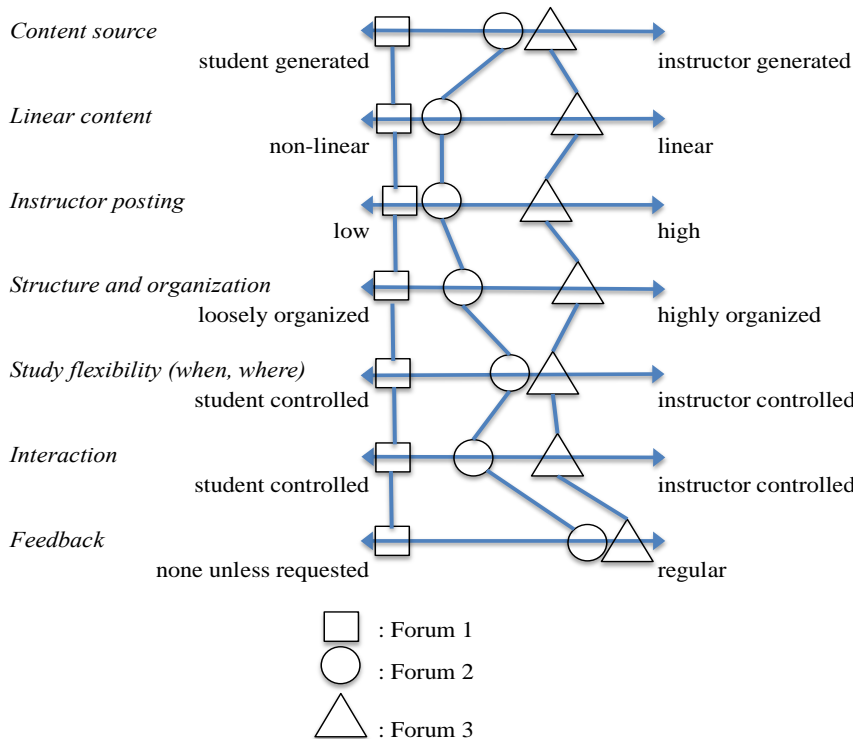representation of qualitative differences among the three forums.

Figure 2. Modeling the three forums in terms of instruction design features

Coding Critical Thinking and Social Presence

In the learning environments studied in this research, there were

more than nine thousand posts and nearly two thousand threads. It was

necessary to reduce the data set to be coded. For this reason, 900 posts

were randomly selected to be analyzed for levels of critical thinking and

social presence. The sample was generated by randomly selecting a

thread within the forum, then randomly selecting a post in that thread.

Sampling was done at the level of the thread first because, while analysis

was going to be conducted at the level of the post, for each individual

post's context (the posts around it) would be required for the coder to

make correct coding choices. The procedure for coding the posts follows

a structure laid out more clearly in Costley and Han (2013) in which the

data goes through an eight step process where by the 1) sample is chosen,

2) the unit size decided, 3) coding scheme is implemented, 4) the method

of implementing the coding scheme is chosen, 5) representing the data in

a form it can be analyzed, 6) analyzing the data, 7) interpreting the

analysis, and 8) repeating the process for clarity.

The coding scheme used for measuring critical thinking in this

paper is based on Newman, Webb, and Cochrane's (1996) model for

assessing the levels of critical thinking in online environments. Newman

et al. (1996) describe 10 categories of critical thinking: relevance,

importance, novelty, outside knowledge, ambiguities, linking ideas,

justification, critical assessment, practical utility, and width of

understanding (see appendix 2). Each of the varied codes can be

designated by a (+) or a (-) symbol. This represents whether or not the

statement enriches (+) or detracts from (-) the creation of a discourse rich in critical thinking. However, this paper will use a modification of the above critical-thinking coding scheme. The reason for this is the ratio between 1 and -1 created by Newman, Webb, Cochrane's (1996) coding system is difficult to connect with the outputs of Rourke et al.'s (1999) coding scheme, which is a scale from 0 to 9. For this reason, this research breaks from Newman, Webb and Cochrane's method in that the resulting data would be in the form of a number of events to represent critical thinking as opposed to a ratio. This was done so that it was more in line with the coding scheme used to analyze social presence, which made the resulting analysis easier and more useful.

Social presence was measured using the coding scheme from Rourke et al.'s (1999) *Assessing Social Presence in Asynchronous Text-Based Computer Conferencing.* This paper lays out three categories, which form the basis of teaching presence: affective, interactive, and cohesive. There are nine indicators from that coding scheme used in this research to generate the social presence score: (see Appendix 3 for the full coding scheme and examples).

Two raters, the author and one other university professor,

experienced with online learning coded the data. Initially, the indicators for each construct were discussed, and then ten posts were coded together with discussion about each post. Once that initial stage of discussion was complete, 90 posts were coded by both raters to examine the level of inter-rater reliability. The resulting Cohen's kappas were 0.91 for social presence and 0.86 for critical thinking. Both of these values were considered acceptable and the full set of 900 posts were split in half and coded. After the initial coding, to further check the reliability of the coding scheme, two more coders checked the already coded samples. This meant that each post was initially coded, and each post was subsequently reread, with the codes included, by two more separate coders. There was a high degree of rater agreement from the checked codes with a Cohen's kappa of 0.96 for social presence and 0.92 for critical thinking. Internal reliability was also measured with the social presence construct having a Cronbach's alpha of .78. The internal reliability of the critical thinking construct was slightly lower with a Cronbach's alpha value of .75. Both of these values are considered acceptable in research of this kind (Streiner, 2003) and the constructs of critical thinking and social presence was considered reliable enough for analysis.

RESULTS

The overall levels of social presence and critical thinking were dissimilar in that the average level of critical thinking per post was 3.66, while the average level of social presence per post was 1.99 (see table 2).

Table 2

Mean Levels of Critical Thinking and Social Presence Per Post

	N	Minimum	Maximum	Mean	Std. Deviation
Social presence	900	0	9	1.99	2.168
Critical thinking	900	0	9	3.66	2.134

To answer the two research questions asked in this study, a comparison of means was used. In terms of social presence, as can be seen in table 3, the learning environment with the highest level of social presence was the low control learning environment (2.95 social presence average per post), then the medium control (1.99), and finally the high control learning environment (1.04).

Table 3

Mean Social Presence for the Three Conditions

	N	Mean	SD
Low control	300	2.95	2.64
Medium control	300	1.99	1.94
High control	300	1.04	1.25

When examining the means for critical thinking, the ranking was reversed, with the highest level of critical thinking occurring in the high control learning environment (4.54 average critical thinking per post), then the medium control learning environment (3.83), and finally the low control learning environment (2.06).

Table 4

Mean Critical Thinking for the Three Conditions

	N	Mean	SD
Low control	300	2.06	1.72
Medium control	300	3.83	1.96
High control	300	4.54	2.22

As can be seen from the previous two tables, there is a clear difference between the levels of critical thinking and the levels of social presence depending on which learning environment they were in. To further examine whether these differences are statistically significant, ANOVA was used. As Table 5 shows, when comparing average levels of social presence between all three learning environments, there is a statistically significant difference.

Table 5

ANOVA (Scheffe test) for Comparing Social Presence Means

	Low control	Medium control	High control
Low control	0	0.96*	1.91*
Medium control	- 0.96*	0	0.95*
High control	- 1.91*	- 0.95*	0

*. The mean difference is significant at the 0.05 level

The same comparison was done with the average levels of critical thinking per post in each learning environment. Table 6 shows that, as with social presence, each learning environment has a statistically significant mean difference from the other learning environments.

Table 6

ANOVA (Scheffe test) for Comparing Critical Thinking Means

	Low control	Medium control	High control
Low control	0	- 1.23*	-1.94*
Medium control	1.23*	0	-0.71*
High control	1.94*	0.71*	0

*. The mean difference is significant at the 0.05 level

To further examine the effects from the experimental conditions, the individual indicators that make up social presence and critical thinking are displayed in Tables 7 and 8. As can be seen in Table 7, the most common indicator of social presence in all three learning environments was not consistent. Within the low and medium control environments the most common indicator was *expressing emotions*, while in the high control environment the most common indicator was *expressing agreement*. Looking at Table 7, this seems to be caused by *expressing agreement* not lowering as much as the other indicators across the 3 learning environments. Regardless of that, every indicator was lower in the medium control than the low control, and lower still in the high control environment.

Table 7

Individual Indicators that Generate Social Presence

	Low control	Medium control	High control	Total
Expressing Agreement	136	122	117	375
Expressing Emotion	160	139	71	370
Complimenting	134	79	31	244
Self disclosure	120	72	27	219
Asking questions	87	54	15	156
Phatics	84	36	21	141
Referring to others' messages	65	51	13	129

Using inclusive pronouns	46	22	14	82
Using humor	52	22	4	78

As with social presence, the individual indicators that are used to generate the critical thinking score were examined (see table 8). *Relevance* was the most common indicator in all three learning environments, though in the high control environment there were 268 cases of both *relevance* and *importance*. For most indicators, there were more cases of each particular code in the medium control environment than in the low control environment, and in the high control environment than in the medium control environment. However, there were some indicators that didn't follow that trend. The indicator *linking ideas* was more common in the low control environment than the medium control environment. This showed that the students were more likely to link ideas together when they were given a more structured environment, and that the less controlled environment had fewer ideas that were directly linked together. Furthermore, two indicators, *bringing in new information* and

critical assessment were more common in the medium control

environment than the high control environment.

Table 8

Individual Indicators that Generate Critical Thinking

	Low control	Medium control	High control	Total
Relevance	243	253	268	764
Importance	214	250	268	732
Linking ideas	110	96	195	401
Practical utility	85	98	166	349
New information	66	153	126	345
Justification	75	94	170	339
Outside knowledge	33	102	132	267
Critical assessment	26	90	69	185
Width of understanding	16	66	76	158
Clearing up ambiguities	22	42	87	151

DISCUSSION

The Effect of Design Control Level on Critical Thinking

The learning environments differed significantly from one another in terms of critical thinking. The first forum, which had the least instructor focused design features, had the lowest level of critical thinking. This was followed by the second forum, which had a moderate (for this experiment) level of critical thinking. The third forum, which had the highest level of instructor focus among the differing forums examined in this study, had the highest level of critical thinking. These differences where statistically significant between all three forums.

The positive effect that instructor control has on critical thinking meshes well with other research on this topic, which has shown that when students attempt to broaden their ideas and make judgments, direct instruction is more effective than indirect discovery learning (Klahr and Nigam, 2004). Fisher (2001) has shown that some students develop levels of critical thinking through general educational processes. However, supplemental instruction in the form of examples of abstract reasoning skills from instructors increases students' ability to process information critically. Ke (2010) also showed that direct instruction is the most important feature when predicting reported knowledge construction.

Furthermore, Ke (2010) demonstrated that clear written assignments are found to contribute more than any other task to learners' construction of knowledge. In this study, as the environment became more controlled, templates were provided and became progressively more detailed and emphasized, which could allow learners the clarity to write in a way more conducive to critical thinking.

Akyol and Garrison's (2008) paper showed that learners responded to collaborative regular tasks with higher levels of cognition. They claimed that when students were required to engage together on a schedule, they were more likely to develop complex and well thought out solutions to problems. Diaz, Swan, Ice, and Kupczynksi (2010) have shown that asynchronous discussions that gave students the opportunity to work together led to higher levels of cognitive presence when their instructor had created an environment for them to interact effectively in. Both of these studies support the idea of collaboration being a gateway to developing cogitative presence or critical thinking. The fact that the low control environment had no collaboration required, the medium control environment had forced collaboration and interaction, and the high control environment had forced collaboration and interaction within set

groups, may explain the increase in critical thinking as the learning environments became more controlled.

The Effect of Design Control Level on Social Presence

There were clear differences among the learning environments in regards to social presence as well. Forum 3 had the lowest level of social presence, forum 2 had a moderate amount (for this experiment) and forum 1 had the highest level of social presence among the three different learning environments. These differences in regards to the levels of social presence were statistically significant. It seems clear that more instructor focused levels of instructional design positively affect critical thinking and negatively affect social presence.

As mentioned above, Akyol and Garrison (2008) and Diaz, Swan, Ice, and Kupczynksi (2010) have shown the positive effects that more control may have on critical thinking. However, they both mention that forced regular interaction may at best be neutral or at worst negative for social presence among learners. Shea and Bidjerano (2009) also commented that when tasks were clearly directed in online learning, social presence effects could be non-existent. Shea and Bidjerano (2009) also noted that learners sometimes experienced low social presence in conjunction with high teaching presence, though their teaching presence

measures were not clearly delineated between differing instructor presence types.

The results from this research break with Aragon's (2003) work describing the methods by which an instructor can develop and maintain social presence in an online environment. He claimed that a wide variety of instructor behaviors would induce higher levels of social presence. These would include both instructor posts that would fall into the categories of direct instruction and facilitating discourse used in this experiment. While this explains the benefits from facilitating discourse found in this experiment, it does not explain the lack of effect direct instruction has when compared to no instructor posting.

CONCLUSION

This research has shown that the amount of social presence will decrease as learning environments become more instructor controlled, and that learners will have a more critical discourse if the learning environment is more controlled. The lowering of the amount of social presence as the environments became more teacher-controlled could be a concern. As is the lack of critical thinking when the environments are free from instructor control. The variation in social presence and critical thinking caused by instructor intervention also has some tantalizing

implications. If an instructor wishes to maximize critical thinking he/she may only do so to the detriment of social presence. On the flip side, less control can increase levels of social presence. The fact that those learning environments have lower levels of critical thinking may be a concern for instructors intending to manipulate student discourse in one direction or another. There is an implication that unlike previous research, there may be no relationship or a negative relationship between critical thinking and social presence. This has been seen in criticisms of the CoI in other research, which suggest that the effect of social presence on cognitive presence (and vice versa) has been exaggerated and that other factors related to the learning environment and the students themselves are more important (Annand, 2011; Nagel & Kotze, 2011).

This leads to the conclusion that the goals of any learning environment must be taken into consideration when designing a forum for learners to use. Modification can lead to changes in outputs; therefore instructors must focus on what design decisions will best suit the students under their charge. The tension between social presence and critical thinking further demonstrates the importance of care when setting up and delivering online instruction. Consideration must be given to the idea that

higher levels of interaction are favorable to lower levels (Tan, Tripathi, Zuiker and Seah, 2010).

These findings mimic the general findings in academia regarding the importance of instructor intervention in e-learning environments. When asked, learners respond that instructor involvement is crucial to academic success and engagement (Hughes & Daykin, 2002; Rourke & Anderson, 2002; Salmon 2002; Shea, 2003). This shows the importance of design choices when developing online learning environments for students to interact on.

Limitations and Further Research

This study's subjects represent a subsection of learners using online environments, which limits the ability to generalize from the results of this study. Furthermore, the 3 differing learning environments have been spread over 3 different semesters. This means that there may be some differences between the groups, even though they are drawn from the same population and have similar profiles in terms of age, gender, and grades. For this reason, the results of this study are not generalizable to all learner-to-learner interactions online, but provide a basis for further study into the effects of differing learning environments and learner discourse.

Of great interest and in need of further study is the question whether there is a more intimate relationship between levels of critical thinking and social presence. It may be that critical thinking and social presence levels may be in direct tension with one another, which will cause a quandary when designing online learning tasks. This research and the tensions it describes must be considered when designing online learning environments. It is the intention of this author to take the framework proposed here and the data analyzed in this study and subject it to other more developed forms of analysis.

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The Journal of Educators Online-JEO January 2016 ISSN 1547-500X
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Appendix 1.

Research Participant Information and Consent Form and
Demographic Data

1. EXPLANATION OF THE RESEARCH

You will be involved in a study investigating the effects of teaching in an online environment. The posts you will produce, as part of this class will be analyzed to understand how different types of learning environments affect how and what you post. Your information will remain confidential and you will never be identified.

2. YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW

Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. Whether you choose to participate or not will have no effect on your grade or evaluation.

3. CONTACT INFORMATION FOR QUESTIONS AND CONCERNS:

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury or a great deal of stress, please contact the researcher:

Jamie Costley, 010 2974 6014, costley@kongju.ac.kr

4. DOCUMENTATION OF INFORMED CONSENT.

Your signature below means that you voluntarily agree to participate in this research study.

Name (in Korean): _____

Sign:_____

Date: _____

Research Questionnaire (Demographics)

1) What is your gender? _____

2) What is your age? _____

3) What year are you in at your university? _____

4) What is your Major? _____

What is your online username? _____

Appendix 2

Newman, Webb and Cochrane's (1996) coding schema

Category	Positive Indicator
R+ Relevance	R+ Relevant statements
I+ Importance	I+ Important points/issues
N+- Novelty. New info, ideas,	NP+ New problem-related information

Solutions	NI+ New ideas for discussion
	NS+ New solutions to problems
	NQ+ Welcoming new ideas
	NL+ learner (student) brings new things in
O+ Bringing outside knowledge or experience to bear on problem	OE+ Drawing on personal experience
	OC+ Refer to course material
	OM+ Use relevant outside material
	OK+ Evidence of using previous Knowledge
	OP+ Course related problems brought in
	OQ+ Welcoming outside knowledge
A+ Ambiguities: clarified or confused	AC+ Clear, unambiguous statements
	A+ Discuss ambiguities to clear them up
L+ Linking ideas, interpretation	L+ Linking facts, ideas and notions

	L+ Generating new data from information collected
J± Justification	JP+ Providing proof or examples
	JS+ Justifying solutions or judgments
	JS+ Setting out advantages and disadvantages of situation or solution
C± Critical assessment	C+ Critical assessment/evaluation of own or others' contributions.
	CT+ Tutor prompts for critical evaluation
P± Practical utility (grounding)	P+ relate possible solutions to familiar situations
	P+ discuss practical utility of new ideas

| W± Width of understanding (complete picture) | W+ Widen discussion (problem within a larger perspective. Intervention strategies within a wider framework.) |

Appendix 3
Indicators of Social Presence

Category	Indicators	Definition	Example
Affective	Expression of emotions	Conventional expressions of emotion, or unconventional expressions of emotion, includes repetitious punctuation, conspicuous capitalization, emoticons.	I just can't stand it when ...!!!!" "ANYBODY OUT THERE!"
	Use of humor	Teasing, cajoling, irony, understatements, sarcasm.	The banana crop in Edmonton is looking good this year)

	Self-disclosure	Presents details of life outside of class, or expresses vulnerability.	"Where I work, this is what we do ..." "I just don't understand this question"
Interactive	Continuing a thread	Using reply feature, rather than starting a new thread.	Software dependent, e.g., "Subject: Re" or "Branch from"
	Quoting from others' messages	Using software features to quote others entire message or cutting and pasting selections of others' messages.	Software dependent, e.g., "Martha writes:" or text prefaced by less-than symbol <.
	Referring explicitly to others' messages	Direct references to contents of others' posts.	"In your message, you talked about Moore's distinction between ..."
	Asking questions	Students ask questions of other students or the moderator.	"Anyone else had experience with WEBCT?"

	Complimenting, expressing appreciation	Complimenting others or contents of others' messages.	"I really like your interpretation of the reading"
	Expressing agreement	Expressing agreement with others or content of others' messages.	"I was thinking the same thing. You really hit the nail on the head."
Cohesive	Vocatives	Refering to group members by name	"I think John made a good point."
	Addresses or refers to the group using inclusive pronouns	Addresses the group as, "us, we, our".	"Our textbook refers to...""I think we veered off track ..."
	Phatics, salutations	Communication that serves a purely social	"Hi all" "Thaf s it for now" "We're having

function;	greetings,	the	most	beautiful
closures.			weather here"	

Rourke et al. (1999) pg. 61