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The Effects of Three Types of Instructor Posting on Critical Thinking and Social Presence: No Posting, Facilitating Discourse, and Direct Instruction

Jamie Costley
English Education Department, Kongju National University,
Kongju, South Korea

Abstract. As more and more institutions are using asynchronous forums as the main or only means for students to interact online, the need to understand the effects of instructor intervention on learner discourse in those types of learning environments has become more important. This study will describe the effects of different types of instructor intervention on learners' levels of critical thinking and social presence. The research involved taking 900 learner posts from three differing experimental conditions and analyzing those posts for social presence and critical thinking. The three experimental conditions were no instructor posting, posts containing facilitating discourse, and posts containing direct instruction. The results showed instructor posts that facilitate discourse generate higher levels of social presence when compared to the other two conditions, and instructor posts that contain direct instruction increase critical thinking. These results are important in general, because instructors must be aware of how their behavior may affect how learners interact (and therefore learn) online. More specifically, the types of discourse their learners create are of interest to many instructors. Therefore, the ways instructors can manipulate learner discourse is of great importance.

Keywords: Teaching presence; critical thinking; social presence; direct instruction; facilitating discourse

1. Introduction

Asynchronous online forums are the most commonly used medium of communication for learners in higher education settings (Johnson, 2007; Harman & Koohang, 2005). Asynchronous online forums are generally easy to use for general student-to-student communication and for more complex collaborative tasks (Reid, Katz and Jacobsen, 2006). Regardless of the fact that student-to-student interaction may be the purpose of many forums, instructors still have responsibility to oversee and in some cases intervene in the learning environment (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 and social presence in particular (Prasad, 2009;Swan & Shih, 2005). The way learners interact with each other is of core importance when assessing the quality of a learning environment (Martyn, 2005). To effectively allow learners to collaborate there needs to be some form of in depth interaction. This interaction is usually manifested in either some type of written or spoken dialogue or discourse. The underlying assumption that underpins this is that a community of learners is helpful for learning, and necessary for higher order learning (Garrison & Anderson, 2003). Online asynchronous forums, correctly administered and controlled, have the ability to develop insightful socially connected learners (Harman & Koohang, 2005). 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 idea can be further developed as showing that some degree of scaffolding and teacher control can raise the level of discourse. This parallels research offline which shows that support develops learners' motivation and ability to complete tasks to a high level (Baeten, Dochy, & Struyven, 2013).

This study investigates the effects of instructor posting on student discussion in online threaded asynchronous forums. Direct analysis of student discussions were used to develop a rich understanding of how instructor posting can effect learner discussion. Measurements of social presence and critical thinking within the learner discourse were used to evaluate the quality of the posts that learners were producing. 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.

2. Conceptual framework

2.1. Teaching presence, social presence and critical thinking

In an online environment, the way that a teacher interacts (or doesn't interact) is one of the key elements in manipulating the way that the learners within the online learning environment will behave. Teacher behavior has clear and direct relationships with satisfaction and learning (Shea, Fredrickson, Pickett & Pelz, 2003). Teaching behavior is best conceptualized by Anderson, Rourke, Garrison & Archer (2001) as "teaching presence". Teaching presence is defined as, "…..the design, facilitation, and direction of cognitive and social presences for realizing personally meaningful and emotionally worthwhile learning outcomes." (Anderson et al., 2001, pg 5). They note that individual learning without the aid of formal instruction can be effective. However, when using any kind of online interactive medium or cooperative learning some kind of guidance (teaching presence) is required. Anderson et al. (2001) seek to identify the differing types of teaching presence so as to further our understanding of how to smoothly run CSCL environments and how those different parts of teaching presence can be measured.

Anderson et al. (2001) criticize a laissez faire or "guide on the side" approach to online learning as not taking full advantage of the potential contributions of instructors in guiding the discourse and giving instruction. They argue for some degree of direct instruction and facilitation of learners as they progress through learning tasks. Direct instruction is the process by which instructors control pedagogical aspects of the learning environment. That is, the instructors delivering information to the learners in terms of their experience and knowledge. The facilitation of discourse as a part of teaching presence can be easily overlooked in online environments but it is of vital importance for keeping the course flowing and keeping the students committed to, interested in and motivated towards the learning objectives of the course. If instructors fail to adequately manage the interactions between learners, then those interactions can break down (Shin, 2008). Facilitating discourse is very much intertwined with the ways that learners interact with each other within the learning community (Rourke et al. 2001).

The conceptualization of social presence began with Mehrabian (1969) and his idea of *immediacy*. Immediacy refers to actions, which bring individuals together and increase the intensity and/or frequency of interactions between them. The concept of *affinity* is defined as an individual's positive attitude towards another individual, and high levels of it would increase levels of meaningful communication between people interacting together (McCroskey & Wheeless 1976). The lack of physical closeness or nonverbal behaviors would be detrimental to individual-to-individual communication, which brings about a problem when trying to develop most kinds of asynchronous communication mediums online, as they lack any kind of nonverbal social cues. Regardless of this, while nonverbal cues are lacking in asynchronous learning environments, social dimensions of interaction can be met in other ways. Learners and instructors tend to use a great deal of text introducing themselves, making jokes and attempting to relate to others within the learning community (Rourke et al. 2001). These forms of interaction are required for the development of in depth collaboration. It has been shown that higher levels of interaction lead to greater knowledge development and stronger social ties online (Tan, Tripathi, Zuiker and Seah 2010).

Critical thinking allows the learner to assess the quality of their current knowledge and incoming knowledge; it also allows the learner to develop knowledge of their own (Dewey, 1933). One of the main advantages of Dewey's framework of reflective thinking is that most forms of conscious cognition (critical, abstract, inference for example) can be explained by the theory (Garrison and Archer, 2000). The learner's experience in an online learning environment can also be modeled through the core of reflective thinking model. The learner moves through imagination, deliberation and action towards understanding of the material being covered (Garrison & Anderson, 2003). More specifically, asynchronous written discourse is more strongly weighted towards reflective thinking as opposed to most verbal discourse that is often spontaneous and lacking in reflection (Garrison et al. 2003). More directly and powerfully, a

discourse with high levels of critical thinking has a strong positive relationship with learning (Pilkington, 2001).

2.2 The effects of teaching presence on social presence and critical thinking

Instructor presence is important in developing the levels of social presence students feel in online courses and an instructor's style of intervention affects how learners feel and the degree that they participate online. This can be a positive experience, in that learners tend to judge instructors who intervene more often higher than those who don't. However, instructor intervention can also lead to discussions being cut short (Swan and Shih, 2005; Mazzolini and Maddison, 2002). Certain dimensions of social presence (social context, online communication and interactivity) can be enhanced by instructor interventions online. If instructors engage learners in social tasks and take steps to remove layers of formality between themselves, then social presence can be improved (Tu & McIsaac, 2002). More specifically some interventions instructors can use to promote social presence are: *contributing to discussion boards, promptly answering e-mail, providing frequent feedback, striking up conversations, sharing personal stories and experiences, using humor, using emoticons, addressing students by name, and allowing students options for addressing the instructor* (Aragon, 2003). Topics which are more focused around personal issues, induce higher levels of social presence and students with higher levels of social presence report that their instructors had a more "personal tone" in their online interaction and that those instructors spent time developing a sense of community. This is in contrast to learners with lower levels of social presence who can often feel passive and bored when trying to relate with the class content (Swan and Shih, (2005). Further to this, student's sense of community is also positively related to their levels of social presence. Learners with high levels of social presence report a stronger feeling of community toward the other learners they are interacting with (Shea, Li, Swan & Pickett, 2005). It has been shown that facilitating discourse increases a learner's sense of connection with the course (Dringus, Snyder and Terral, 2010).

In Dewey's (1933) work, 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. Specifically, he claimed that collaborative solutions tended to be introduced when the teacher or instructor of the online course prompted the learners to move towards those kinds of solutions. Teaching presence features, according to Dewey, contribute directly to students engaging in a positive and meaningful way. This ties in well with research that shows that teaching presence is positively correlated with critical thinking (Prasad, 2009). Learners clearly value responsiveness and clarity when trying to learn in an online environment (Sheridan & Kelly, 2010).This further shows the need for instructor intervention when developing learners' engagement with content online and their construction of a meaningful critical learning experience.

3. Research Questions

The goal of this study was to examine how different types of instructor posting affected the content of student posts within an asynchronous online discussion. More specifically, the goal of this study was to examine whether student posts that succeeded instructor posts of different types had higher or lower levels of critical thinking, or whether the levels remained the same. To gather information on this topic, posts were selected based on three different experimental conditions.

No instructor posting: The posts from this condition were taken from threads in which there was no instructor posting of any type.

Facilitating discourse: The posts from this condition were taken from threads containing instructor posts that were designed to facilitate discourse.

Direct instruction: The posts from this condition were taken from threads containing instructor posts that were designed to give direct instruction.

The following questions guided this study:

Do the differing types of instructor postings have an effect on the levels of social presence in the learners' discourse? If so, in what ways?

Do the differing types of instructor postings have an effect on the levels of critical thinking in the learners' discourse? If so, in what ways?

4. Methods

4.1. 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. 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 understanding 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 of the subjects.

	Total
Gender	
Male	77
Female	142
Major	
English	112
Special	14
Business	4
Pedagogy	6
Art	8
Life Skills	15
Ethics	6
Early Childhood	6
Literature*	5
Social Studies	9
Calligraphy	2
Korean	7
Music	2
Tourism*	1
Chemistry	9
History	4
Earth Science	5
Economics*	2
Geography	2
Total	219

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

4.2 Experimental Procedures

This study was conducted over the course of a year and a half (3 semesters) and involves varying the types of instructor posts that learners encountered. Instructor posting is defined and operationalized in Anderson, et al. (2001) along two of their constructs, instructor posts containing direct instruction, and instructor posts containing facilitating discourse. Furthermore, a third condition of instructor posting was investigated, which included cases where there was no instructor posting. In terms of delivering the posts of teacher presence in this experiment, there was a degree of qualitative judgment in each case. Instructor postings were made each Friday once a week for the duration of the experiment. The posts were made over the course of the day as a great deal of consideration had to be given to where each type of teaching presence would be appropriate. There could be a concern that delivery would have to fall into two categories. Either A) instructor posting would be somewhat haphazard, in that postings could not be regular in timing and number, or B) postings would have to be forced somewhat arbitrarily into the learning environment. The reason for this is that a great many of the instructor posting types require a

reaction to something that the learners have written. The unpredictability of this caused some concern at the outset. However, over the course of the experiment there were no cases where it was a challenge to make instructor postings that were appropriate.

To simplify my process in delivering the instructor postings, I simply opened up and read all threads for that particular group. Once that was done I made a judgment on which threads would most benefit from each particular type of posting, then made the post. Inter-rater reliability for the instructor posts were calculated using Cohen's Kappa. Three instructors with experience in online learning were asked to match 50 cases of instructor posting with the indictors for direct instruction and facilitating discourse. The resulting Kappa of .86 was considered acceptable, and we can accept that these posts represent examples of those cases of instructor presence.

4.3 Facilitating Discourse

There are six indicators based on Anderson et al. (2001) used in this experiment to base the researcher's facilitating posts around: identifying areas of agreement/disagreement; seeking to reach consensus/understanding; encouraging, acknowledging, or reinforcing student contributions; setting climate for learning; drawing in participants, prompting discussion; and assessing the efficacy of the process.

Identifying areas of agreement/disagreement: In this case the instructor was looking for cases where the learners disagreed and that such disagreement may be unnoticed and/or require addressing by the learners. Furthermore, this type of facilitating discourse was used when it seemed that learners agreed but the tone of the post was that of disagreement. Finally this type of post was injected when learners agreed on an issue when it would be somewhat unusual for them to do so.

Examples:

A) It seems like there are several issues regarding grade variation and between country variation.

B) I think you agree with Clovereat and your example really supports his/her idea. Also, I think you provided good advice for people looking to motivate students.

Seeking to reach consensus/understanding: This type of post is similar to the above case, but it involves the instructor attempting to build the discourse and connect learners together. It was used in similar circumstances but as can be seen from the examples below, it seeks to develop the learners' ideas further and move the discourse onwards.

Examples:

A) It is cool. Thighburger and Hyesoo are posting in the same threads together. It is good that you guys share similar ideas. Is there any ground where you disagree with one another?

B) I think in this case you both agree that Hanguel is important but for slightly different reasons. Your main points are the same and that is what matters. In

that case, why don't you see if there is a key area in which you both can agree on?

Encouraging, acknowledging, or reinforcing student contributions: These types of posts are pretty simple and were introduced in cases where learners were giving ideas that were different, posting for the first time, seemed to be unsure, and seemed to need some encouragement.
Examples:
A) Interesting perspective Cozy Sonya. I think you have good ideas on this topic.
B) It is good that you guys were happy to try something different.

Setting climate for learning: As with encouragement, this intervention type was introduced when learners required help or encouragement. It differs from the previous posting type in that its specific purpose is to demonstrate and show the type of learning environment the learners are participating in and what is and or isn't appropriate.
Examples:
A) You have said something useful; don't feel like you need to hold back.
B) Don't be embarrassed by your comment. I think it is a useful contribution to the discussion.

Drawing in participants, prompting discussion: This type of instructor post is similar to a type of direct instruction (presenting content/questions) however it differs in that it does not seek to introduce new information or ideas into the thread. This type of posting is used when learners have expressed an idea that the instructor thinks will be of interest to other learners and/or learners have expressed an idea that has a clear follow-up line of discussion. When students beg the question, this type of posting is also used.
Example:
A) Good answer. It is interesting that you changed your mind over time. Just so I can clearly understand you: Which test do you think is the most useful to study for, TOIEC or TOEFL?
B: Good way of thinking. Do you all think that is the most important factor though?

Assess the efficacy of the process: This type of facilitating discourse is focused around judgment of the discourse and how the learners are interacting. This was used in two main cases, where learners had very clearly developed an idea to its conclusion, and where learners' discourse had gone somewhat off track.
Examples:
A) It is OK to think outside the box, but remember, "facility" means something physical like a building or a room. It doesn't really include teachers or teaching methods. This is a case where we need to remember to keep our conversation focused on the issues.
B) I agree with all of you. This discussion has really exposed our ideas and conceptions of how teachers should behave.

4.4 Direct Instruction

There are six indicators based on Anderson et al. (2001) used in this experiment to base the instructor's direct instruction posts around: presenting content/questions, focusing the discussion on specific issues, summarizing the discussion, confirming understanding and giving feedback, diagnose misconceptions, and injecting knowledge. There is a seventh indicator for direct instruction that was not used in this experiment: responding to technical concerns. In this study, responses to technical concerns were handled offline.

*Present content/questions***:** This posting type was introduced in cases where the instructor had some insight or knowledge about the topic that could move the discussion forward. If the learners had reached an impasse or if there was some piece of information the instructor felt would further develop the ideas being expressed, then this type of post was delivered.
Examples:
A) Great responses everyone. I think it is clear that a useful distinction between intrinsic and extrinsic motivation depends on the context you try to apply it, as opposed to a strict definition. Nearly all behaviors will have a mixture of the two.
B) So oyster, teachers spend a lot of time standing up and presenting information to students. If that is the case, would you say a teacher should be extroverted?

Focus the discussion on specific issues: Posting of this type was introduced to the learning environment when the discussion became too broad or when focusing the discussion on a specific issue would bring the learners more understanding of the topic. This was usually done by asking a question that directed learners onto a more focused or specific issue.
Example:
A) This is good discussion but I would like to focus. Can anyone give an example where a specific technique motivated you or another student?
B) This is a good explanation. Can you think of how you would change your teaching style if you were in an ESL or EFL classroom?

Summarize the discussion: After the learners had contributed some ideas to the topic being discussed (usually around 7 posts). The instructor summarized what learners had written.
Examples:
A) To summarize what has been written: Classroom management techniques were mentioned as a good area to focus on. Particularly having a range of differing techniques, because of the range of possible situations a teacher may find him/herself in. An example of this would be using multimedia to keep students interested in class. Furthermore, it was mentioned that student-teachers need to maintain their level of respect. This can be done by clearly stating the position the teacher has in relation to the students. An example of this was acting as if you were already a teacher even though you haven't graduated. Also it was suggested that student teachers need to believe in themselves and be confident to help overcome difficulties. The usefulness of confidence has been emphasized.

B) To summarize what has been written: you guys all think that students shouldn't get A+s automatically. The main reason is that it would be unfair. If a student who works hard gets an A+ but a lazy student gets the same grade it would be unfair. High levels of attendance shouldn't be the criteria for grading; effort and ability should be. The point was also made that grades in general wouldn't be considered by employers if the grades aren't awarded based on knowledge. Fairness seems to be the main issue you guys are focused on.

Confirm understanding through assessment and explanatory feedback: Posting of this type was injected when learners had made posts that were unclear or requiring some kind of explanation. Furthermore, it was used when as issue was ambiguous and some unpacking by the instructor was required to ensure that learners were getting at the heart of the issue being discussed.
Examples:
A) So you are talking about soft skills right? For example, being able to make personal decisions and meta-cognitive skills?
B) I think what oyster is trying to say is that the teacher's personality or mood will affect the students and the class. For example, if I come into the class grumpy then the students will feel grumpy or at least sad.

Diagnose misconceptions: The instructor made interventions of this type when learners misunderstood the question or discussion topic or made erroneous posts. There were cases where the learners' understanding of the content was clearly off, and instructor intervention was required to put the learners back on the right track.
Examples:
A) I think that rating is not so much based on how hard Korean is in general, but more how hard Korean is for English speakers.
B) You are confusing EFL techniques with ESL techniques in this case.

Inject Knowledge from diverse sources, e.g., textbook articles, internet, personal experiences: When it was appropriate, the instructor made posts that were related to the contents of the discussion but provided a different perspective or a diverse opinion that was different from the main course of the learners' discussion.
Examples:
A) Donald Bligh wrote a great book What's the Use of Lectures? He notes that lectures are weaker than other methods if you want to develop students' understanding, thinking, attitudes and beliefs. Lectures also are less likely to inspire students than other methods of teaching. Even in terms of conveying information (the main benefit of lectures) lectures are not any stronger than independent study (reading a book for example). Bligh says the only area that lectures stand out in is cost, in that they are much cheaper than other instructional methods.
B) Just so this question isn't all negative. This is an article about Obama praising the Korean education system.
www.koreaherald.com/view.php?ud=20110309000191He talks about how Korea's attitude towards teaching helps Korea's education system.

4.5 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 randomly by randomly selecting a thread within the forum, then randomly selecting a post in that thread. The procedure for coding the posts follows a structure laid out more clearly in Costley and Han (2013) in which the data go through an 8 step process whereby 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, 8) repeating the process for clarity.

The method of measuring critical thinking is a coding scheme created by Newman, Webb, and Cochrane (1996). Newman et al. (1996) use 10 different categories of critical thinking: relevance, importance, novelty, outside knowledge, ambiguities, linking ideas, justification, critical assessment, practical utility, and width of understanding (see appendix 1). Each of the codes are designated with either a (+) or a (-) symbol. This represents whether or not the statement contributes to (+) or reduces (-) the creation of a discourse rich in critical thinking. However, this paper will use a modification of the Newman et al.'s critical thinking measuring tool. The ratio between 1 and -1 that is generated when implementing Newman, Webb, Cochrane's (1996) coding system is not compatible with Rourke et al.'s (1999) social presence tool, which is a scale from 0 to 9. Therefore, this research differs from Newman, Webb and Cochrane's coding scheme in that the ratio is converted into a scale between 0 and 10. Furthermore, the negative aspects of the coding scheme were not used in the analysis.

Social presence was measured using the coding scheme from Rourke et al. (1999) *Assessing Social Presence in Asynchronous Text-Based Computer Conferencing*. Rourke et al. lay out three base categories, which form the core of social presence: affective, interactive, and cohesive behaviors. Within each category there are three indicators, meaning there are 9 indicators total that define and operationalize the levels of social presence within each post (see appendix 2 for the full coding scheme and examples).

The posts were coded by 2 raters experience in blended learning to increase reliability. The first step was discussing the indicators for each tool, with ten posts coded together with discussion regarding the application of the codes to each post. After those first ten posts were completed and the codes discussed, 90 posts were given to both raters and coded. The Cohen's kappas generated from this first set of posts was 0.91 for social presence and 0.86 for critical thinking. These values are an acceptable level, so the full set of 900 posts were divided into two groups of 450 posts and given to each coder. Once the initial coding was completed, the already coded posts were rechecked with the codes included. Therefore, each post was coded, and then subsequently reread, with the codes included, by two more separate coders. Rater agreement in

regards to the checked codes was high 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.

5. Results

5.1 What are the effects of instructor posting types on critical thinking?

When examining the full 900 posts across the full 300 posts for each of the instructor posting types there were some clear differences among them when examining critical thinking. As can be seen in table 2, the no posting (2.01) and the facilitating discourse (1.95) have similar average levels of critical thinking, however direct instruction (3.17) has a much higher average level among the sampled posts.

Table 2. Average levels of critical thinking by instructor posting type

		Critical thinking	
Posting type	*N*	*Mean*	*SD*
No posting	300	2.01	1.613
Facilitating discourse	300	1.95	1.868
Direct instruction	300	3.17	1.937
Total	900	2.37	1.894

After the average levels of critical thinking for each of the experimental conditions were computed, ANOVA was used to establish if the differences were statistically significant. As can be seen in table 3, there was not a statistically significant difference between the facilitating discourse condition and the no posting condition, however, there was a statistically significant difference between the direct instruction condition and both the facilitating discourse and no posting condition.

Table 3. ANOVA for mean differences in critical thinking among the different posting conditions

	No posting	Facilitating discourse	Direct instruction
No posting	0	0.06	-1.33*
Facilitating discourse	-0.06	0	-1.39*
Direct instruction	1.33*	1.39*	0

*. The mean difference is significant at the .05 level.

Furthermore, the Scheffe test was used to see if both facilitating discourse and no posting condition belonged in the same group (that there were no meaningful statistical differences). As shown in table 4, direct instruction belongs in a distinct group, while the facilitating discourse and direct instruction conditions are most appropriately grouped together. This shows that they are, at least in terms of average levels of critical thinking, the same.

Table 4. Means for homogeneous subsets for critical thinking (Scheffe test)

Posting condition	Group 1	Group 2
Facilitating discourse	3.17	
No posting	3.23	
Direct instruction		4.56
Sig.	.937	1.000

Subset for alpha = 0.05

5.2 What are the effects of instructor posting types on social presence?

The differences between the no instructor posting, facilitating discourse and direct instruction conditions were then examined in regards to their differences in average level of social presence. As can be seen in table 5, the no posting condition had an average social presence level of 1.27, the direct instruction condition had an average social presence level of 1.46 and the facilitating discourse posting condition had an average social presence level of 1.99 per post.

Table 5. Average levels of social presence by instructor posting type

		Social presence	
Posting type	*N*	*Mean*	*SD*
No posting	300	1.27	1.317
Facilitating discourse	300	1.99	1.541
Direct instruction	300	1.46	1.347
Total	900	1.57	1.437

After the average levels of social presence for each of the experimental conditions were computed, ANOVA was used to establish if the differences were statistically significant. As can be seen in table 6, there were statistically significant differences between the facilitating discourse condition, the no posting condition, and the direct instruction condition. The biggest mean difference between the three conditions was between facilitating discourse and the no posting condition (+/- 1.10), while direct instruction lay between them (+/- 0.48 no posting, +/- 0.63 facilitating discourse).

Table 6. ANOVA for mean differences in social presence among the different posting conditions

	No posting	Facilitating discourse	Direct instruction
No posting	0	-1.10*	-0.48*
Facilitating discourse	1.10*	0	0.63*
Direct instruction	0.48*	-0.63*	0

*. The mean difference is significant at the .05 level.

The Scheffe test was also used to establish if some of the experimental conditions could be grouped together, as with the no posting and facilitating discourse conditions in the case of critical thinking. However, as can be seen in table 7, all the differing experimental conditions belonged to distinct groups and had statistically significant differences between them.

Table 7. Means for homogeneous subsets for social presence (Scheffe test)

Posting condition	Group 1	Group 2	Group 3
No posting	1.47		
Direct instruction		1.94	
Facilitating discourse			2.57
Sig.	1.00	1.00	1.00

Subset for alpha = 0.05

6. Discussion

6.1. The effect of instructor posting types on critical thinking

The instructor posting effects on critical thinking were clear-cut. The two conditions containing no instructor postings and facilitating discourse were very similar while the condition containing direct instruction had significantly higher levels of critical thinking. This shows that a lack of instructor posting or instructor posting that is focused on facilitating discourse will not have a meaningful effect on learner discourse. This can be contrasted with instructor postings that contain direct instruction, which raises the level of critical discourse among the learners.

The positive effect that direct instruction 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). While Fisher (2001) has shown that some students develop some level of critical thinking through general educational processes, Stern (2001) has demonstrated that supplemental instruction in the form of examples of abstract reasoning skills from instructors, increases students ability to process information critically. Furthermore, direct instruction is an important feature when predicting students' levels of knowledge construction (Ke, 2010).

More directly connected to learner discourse, Van Gelder (2005) has expressed the idea that learners do not express critical thoughts naturally and that they require some kind of guidance. His concept of "argument mapping", is for the instructor to help the learners see the underlying principles at play when a discussion is ongoing. The instructor's behavior can function as a discourse map to give students an exemplar for their own arguments. Paul and Elder (2000) have claimed that "Socratic questioning is at the heart of critical teaching" (p. 335). From this point of view, when an instructor engages with a learner online (as was done in this experiment), learners will respond in kind. That is, more directly, the learners will model the behavior of the instructor.

6.2. The effect of instructor posting types on social presence

In regards to social presence, there was also a clear effect, though in this case facilitating discourse had the effect of raising the level of social presence more than the other two instructor posting conditions. The direct instruction was higher than the no posting condition, and there were statistically significant differences between all three groups. Social presence is a key part of the learning experience in online environments when students interact (Akyol, Garrison, & Ozden, 2009). The results here show that that instructor posting of both types (direct instruction and facilitating discourse) will have a positive effect on learners' levels of social presence. This shows that if instructors wish to maximize the levels of social presence in their learners' discourse they should choose to use posts containing facilitating discourse.

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. Rovai (2007) points out that behavior that puts the instructor at the center of the discussion may have a negative effect on social presence. This emphasizes student to teacher interactions over student to student interactions will cause social presence to be limited. Facilitating discourse takes learners away from purely task focused or instructor centered activities. This may lead to the higher levels of social presence in the facilitating discourse condition found in this study.

There are four stages that learners should pass through before they start to model a behavior: attention, retention, reproduction, and motivation (Bandura, 1986). In this study, the posts instructors made were focused on a particular post by a particular learner. This process will have drawn the learner's attention to the instructor's posting style which may then be reflected in the learners' content. Retention is harder to establish, but the iterative nature of online writing has been shown to increase the amount learners will retain when posting in online forums (Han & Hill 2007, Jeong 2003). Learners had multiple

opportunities to post replies to each other but also to instructor posts which allowed them to reproduce not only posts in the instructors' style, but to also reinforce that style with more posts of that type. Every subject in this experiment posted multiple times on a variety of topics giving them ample opportunities to reproduce in the style of observed instructor postings. The use of the forum was a graded part of the class and learners were made aware that their post quality would be used as part of their final grades. For this reason, motivation could come from the learners' desire to improve their grade from improved posts, which they may perceive as mimicking the instructor's posts.

6.3 Conclusion and implications

The variation in social presence and critical thinking caused by differing instructor posting types has some tantalizing implications. While facilitating discourse can increase levels of social presence, the fact that those threads containing facilitating discourse have lower levels of critical thinking compared to threads containing direct instruction could cause concern for instructors who intend to intervene in learner discourse. Therefore, the objectives of any course using asynchronous interaction must be considered before an instructor posts on an online forum. Differing posting types by instructors will lead to changes in learners' posts; therefore instructors must produce posts of a type they wish learners to produce. These findings mimic the general findings in academia regarding the importance of instructor intervention in e-learning environments.

To fully realize the potential of learner interaction, a clear plan must be created and followed when learners first start engaging online. This research supports this basic assertion and takes the idea one step further. As can be seen from the results regarding the injection of posts of direct instruction, they will have a positive effect on the levels of critical thinking with the learners' discourse. This shows that instructors who wish to increase their learners' critical thinking should deliver posts containing direct instruction. As an example, for the participants at the university that this experiment took place, the goal is to do well on a highly academic focused exam. In that case, the instructor should tighten up the instructional environment to create a discourse that more closely follows the style learners will be expected to write in future work that they may be required to do. Furthermore, a more critical discourse will lead to greater uptake of the contents of the course, which is more in line with outcomes that will be to the learners' benefit. Instructors must look at ways they can give learners exemplars of the kind of writing they want, provide clear instructions, have linear content and give consistent feedback. Furthermore, when they intervene, they must read learners' posts and look for cases where direct instruction will benefit the learner discourse.

Careful consideration must be given to the instructor's goals when intervening in an online forum. This research has shown that if an instructor delivers posts that are of a certain type, the learner discourse will trend towards that type of discourse. If the instructor makes posts that contain direct instruction, then the learners will respond with a discourse that is more critical

in nature. On the other hand, if instructors use facilitating discourse when intervening in an online forum, the learners will tend to create posts containing higher amounts of social presence. Unlike the issues with design, it seems that introduction of differing types of instructor posts do not have a negative impact on other types of discourse. It seems that as with design, instructors must be wary of how they approach and interact with learners in online environments. In cases where instructors and instructional designers wish to maximize the amount of social discourse, instructors should focus on making posts that facilitate discourse as opposed to posts that contain direct instruction.

This research has given clear guidelines for instructors wishing to push their learners' discourse towards critical thinking or social presence. This can be done by a variety of intervention strategies. An issue that emerges from this research is that it seems to be challenging to create a learner discourse that is balanced between social presence and critical thinking. The conclusion drawn from the results in regards to balancing learner discourse is that a variety of intervention strategies should be used. If the instructor mixes posts of facilitating discourse and direct instruction throughout the discourse, this may move learners towards a more balanced and sustainable academic 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 interactions. It may be that critical thinking and interaction 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. Each of the constituent parts of each thread can be broken apart and subjected to further more detailed analysis. It is the intention of this author to take results here and the data analyzed in this study to create further more focused experiments on the effects of instructor posting types. Furthermore, studies should be carried out where instructor posting types are combined and varied to see if a more balanced student discourse is possible.

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Appendix 1 Newman et al. (1996) critical thinking indicators

Category	*Positive Indicator*
R+ Relevance	R+ Relevant statements
I+ Importance	I+ Important points/issues
N+- Novelty. New info, ideas, Solutions	NP+ New problem-related information 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 2. Rourke et al. (1999) social presence indicators

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	Referring 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 function; greetings, closures.	"Hi all" "Thaf s it for now" "We're having the most beautiful weather here"