

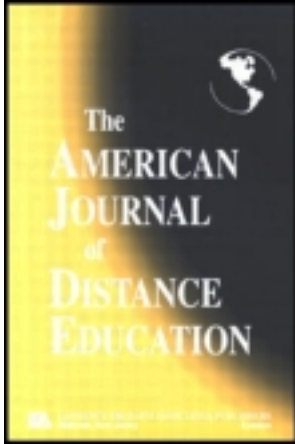
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### Presence Over Time in Synchronous Communities of Inquiry

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## Presence Over Time in Synchronous Communities of Inquiry

Constance E. Wanstreet and David S. Stein

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**Abstract:** This study investigated the small-group, learner-led discussion process in synchronous discussions. Transcripts from online chats and face-to-face discussions were analyzed within the context of the Community of Inquiry framework to examine the relationship of teaching presence, social presence, and cognitive presence to one another and for evidence of changes in frequency of teaching, social, and cognitive presence over time. Findings suggest that social presence and cognitive presence are highly positively correlated and that teaching presence and social presence are moderately positively correlated in learner-led synchronous environments. The frequency of teaching, social, and cognitive presence did not change over time for either group. Findings also indicate that neither the group meeting online nor the group meeting face-to-face attained high levels of cognitive presence integration or resolution.

Constructivist educators generally agree that communities of inquiry create knowledge and contribute to higher-order thinking (Buraphadeja and Dawson 2008; Garrison, Anderson, and Archer 2000). One of the foremost conceptual frameworks to inform research and practice related to communities of inquiry was developed by Garrison, Anderson, and Archer (2000) in the context of online learning. The Community of Inquiry (CoI) framework identifies three core elements necessary for a worthwhile educational experience: teaching presence, social presence, and cognitive presence. The premise behind the framework is that all three elements are necessary for a worthwhile educational experience. However, the relationship of the elements to one another has only recently been explored (Arbaugh, Bangert, and Cleveland-Innes 2010; Diaz et al. 2010; Garrison, Cleveland-Innes, and Fung 2010; Shea and Bidjerano 2009; Shea et al. 2010), and how the relationship develops over time is still unknown.

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Originally applied to asynchronous inquiry-based discussions, the CoI model has been extended to include blended and synchronous environments (Garrison and Vaughan 2008; Ling 2007; Stein et al. 2007). Although a growing body of literature is beginning to investigate how learners use synchronous discussion tools (Cox, Carr, and Hall 2004; Hrastinski 2006; Orvis et al. 2002; Schönfeldt and Golato 2003; Strømsø, Grøttumt, and Lycke 2007), few studies explore synchronous discussions in the context of the CoI framework (Ling 2007; Stein et al. 2007).

In addition, how time influences online learning communities has not been fully investigated despite general acceptance that time is a fundamental issue of group research (Bordia, DiFonzo, and Chang 1999). Thus, the effect of time on communities of inquiry has not been adequately considered (Meyer 2004; Stein et al. 2007).

Given that the CoI framework has been widely used to assess asynchronous discussions but that its applicability to synchronous discussions requires further investigation, this study examined variations in the CoI elements as evidenced through the synchronous discussion process. In addition, groups meeting in person change over time (Arrow et al. 2004), but little is known about the effect of time on online groups (Smith 2008). Therefore, this study investigated how synchronous groups developed over time. The purpose of this quasi-experimental study was to investigate how well the CoI model explains the interactions among teaching presence, social presence, and cognitive presence over time in synchronous, learner-led discussions with minimal instructor involvement.

## REVIEW OF THE LITERATURE

The CoI framework assumes that higher-order learning occurs through the interaction of teaching presence, social presence, and cognitive presence (Garrison, Anderson, and Archer 2000). Most early research into the CoI framework addressed the individual elements of teaching, social, or cognitive presence without reference to how they work with one another (Anderson et al. 2001; Garrison, Anderson, and Archer 2001; Rourke et al. 1999; Shea, Li, and Pickett 2006; Shea, Pickett, and Pelz 2003; Swan and Shih 2005). Research into the model in its entirety has now become more prevalent (Akyol and Garrison 2008; Garrison, Cleveland-Innes, and Fung 2004; Perry and Edwards 2005; Shea and Bidjerano 2009; Shea et al. 2010).

### Teaching Presence

Research suggests that teaching presence helps learners achieve a sense of learning community (Shea, Li, and Pickett 2006) and attain the resolution

phase of cognitive presence (Vaughan and Garrison 2005). Garrison and Cleveland-Innes (2005) note that teaching presence is the responsibility of all learners, not only the instructor. Nevertheless, it appears to be an assumption of much of the teaching presence research that instructor teaching presence is required during online discussions (Anderson et al. 2001; Arbaugh et al. 2008; Conrad 2005; Shea et al. 2010; Swan et al. 2008). The present research departs from that assumption. Educators of adults in particular often incorporate learner-led discussions to help learners become critically informed about a topic or issue, take responsibility for their learning, question their assumptions, develop skills in time management and goal-setting, and gain more insight into themselves as learners (Brookfield and Preskill 2005; Vella 2002). To that end, the course under study employs learner-led chats to empower learners toward greater self-direction.

### **Social Presence**

Shea et al. (2010) explored the relationship between teaching presence and social presence. They found that when instructor teaching presence is relatively high, there is a strong correlation with student social presence; when instructor teaching presence is low, the correlation with student social presence is lower. Swan (2002) found that greetings and social sharing declined over time whereas agreement or disagreement increased.

Course design may affect the development of social presence. Swan and Shih (2005) report that online discussions based on course readings elicited fewer personal responses than discussions asking for opinions on issues or practical experiences.

### **Cognitive Presence**

In a study of cognitive presence, Vaughan and Garrison (2005) found more triggering events in face-to-face discussions and more integration comments in online discussions. Exploration was the dominant phase in both discussion modes (60% face-to-face and 61% online), and the resolution phase was nonexistent in both forums, prompting Vaughan and Garrison to recommend an emphasis on teaching presence to encourage participants to achieve resolution.

Cognitive presence studies acknowledge the importance of the instructor and teaching presence in helping learners attain integration and resolution (Meyer 2004; Pawan et al. 2003; Richardson and Ice 2010; Shea and Bidjerano 2009; Shea et al. 2010). However, how cognitive presence changes over time or in relation to social presence as learners move through the inquiry process is only beginning to be explored (Shea et al. 2010).

### Synchronous Learning Environments

Foreman (2003) defines *synchronous* as “same-time” communication (1). A. Dennis et al. (2006) characterize face-to-face learning environments as synchronous because they promote direct interaction between learners and instructors and provide for immediate feedback. Online synchronous communication is similar to face-to-face communication in that it creates real-time interaction (Strømsø, Grøttumt, and Lycke 2007), which mirrors how interactions typically occur in workplace and other settings (Orvis et al. 2002). However, some of the mechanics differ, such as conventions for turn taking and correcting misunderstandings (Strømsø, Grøttumt, and Lycke 2007). Although text-based chat interactions do not capture as many visual cues as in face-to-face conversations (Foreman 2003), they tend to occur with the pace of a face-to-face conversation (Hudson and Bruckman 2002) and read almost like a transcript of spoken language (Schönfeldt and Golato 2003).

Although differences between chats (perceived as primarily task based) and face-to-face conversations are well documented in the literature (Lipponen et al. 2003; Schönfeldt and Golato 2003; Strømsø, Grøttumt, and Lycke 2007), similarities have received less attention. For example, Orvis et al. (2002) found that chat problem-solving outcomes do not differ from face-to-face results and that social interaction follows trends seen in face-to-face groups. In addition, J. K. Dennis (2003) reported no difference in problem-based learning outcomes between synchronous and face-to-face groups.

### Time and Group Development

Although some theories hold that groups change systematically over time (Poole et al. 2000), others posit that groups are characterized by complex, non-linear dynamics (Arrow, McGrath, and Berdahl 2000). Arrow et al. (1996) found that time and group mode (face-to-face or computer mediated) have substantial effects on the development, interaction, and performance of small groups. Essays written by groups using computer-mediated communication demonstrated greater integrative complexity over time than those written by groups meeting face-to-face (Cummings, Schlosser, and Arrow 1996). Integration represents a higher-order thinking skill. Therefore, Cummings, Schlosser, and Arrow (1996) suggest that CMC groups will achieve higher levels of cognitive presence over time than groups meeting in person.

Research into CoI elements over time is just beginning (Akyol and Garrison 2008; Shea et al. 2010). Although Akyol and Garrison (2008) suggest no significant time effect on the CoI model as a whole, their transcript analysis found that the direct instruction category of teaching presence increased over time, as did the social presence category of cohesion. Affective expression, another category of social presence, decreased significantly over time (Akyol

and Garrison 2008). The current study anticipated that teaching, social, and cognitive presence would be fluid in responding to the needs of those in the learning community over time.

## METHOD AND PROCEDURES

This study examined the following research questions: (1) What is the relationship of teaching presence, social presence, and cognitive presence to one another? (2) What is the effect of group mode, time, and their interaction on teaching presence, social presence, and cognitive presence?

A content analysis (Krippendorff 2004) of transcripts from one group that met via chat and one group that held face-to-face discussions was used to determine frequencies of teaching, social, and cognitive presence indicators. The teaching presence indicators were developed by Anderson et al. (2001), the social presence indicators were developed by Rourke et al. (1999) and Garrison and Arbaugh (2007), and the cognitive presence indicators were developed by Garrison, Anderson, and Archer (2001). Statements in the transcripts were transformed to quantitative data for analysis within the framework of a MANOVA design.

### Research Context

Learners at a large university in the midwestern United States who were enrolled in a course about the philosophical and historical roots of adult education in America generated the discussion transcripts. The entire class met in person three times during a ten-week period. The primary means for learning, however, were small learner-led discussion groups that met online or in person during the intervening weeks. Group members addressed issues around weekly readings and developed a response to questions posed by the instructor. For example, in discussing the role of adult education and democracy, learners considered whether civic engagement should be the primary focus for adult education, among other questions. Each week featured a similar type of inquiry-based question. After the small-group discussion, each moderator posted the group's response to the online discussion board.

The instructor provided guidance for learners to facilitate discourse but did not facilitate the chat discourse directly. The instructor also visited chat groups briefly to observe the process and challenge learners before leaving the chat. So that the instructor's teaching presence in the course as a whole was neither too dominant nor too reserved, the instructor joined the rest of the class in providing feedback after the moderator for each group posted the outcome of each chat on the asynchronous discussion board.

On the first day of the course, learners ( $N = 26$ ) were randomly assigned to six groups. Members then negotiated among themselves the mode in which they would conduct their discussions: either face-to-face or online. One group ( $n = 4$ ) was randomly selected to participate from the five groups that met online. The sole face-to-face group ( $n = 5$ ) agreed to participate in the study and tape-record its meetings at weeks four and seven.

The online group had four members: two men and two women. Both men were graduate students. One woman was a graduate student; the other was an undergraduate. The face-to-face group had five members, all women. Four of the members were graduate students.

### Research Design

A two-factor multivariate analysis of variance (MANOVA) design was chosen for two reasons: the elements of the CoI model are conceptually interrelated, and together they reflect the underlying CoI construct. There are three dependent variables: teaching presence, social presence, and cognitive presence. The between-groups independent variable is group mode (online or face-to-face), and the within-group independent variable is time in course (week four and week seven). A transcript for the first online chat was available for week three. However, we obtained the consent of the face-to-face group to record its discussions during week four. In addition, the final online chat occurred during week eight. However, week seven was the last week the face-to-face group remembered to record its discussion. Nevertheless, the design measured frequencies of CoI indicators in the first half of the course and related them to frequencies of indicators in the second half of the course. CoI categories and selected indicators are shown in Table 1.

### Measurement

To obtain the precision necessary to differentiate among the three interrelated dependent variables, content was reduced to syntactical meaning units. Specifically, statements and paralinguage were identified. A statement is a complete thought, which normally means it has a subject and predicate (Husselbee and Stempel 1997). Using statements rather than completely formed sentences more accurately represents the syntax in chat transcripts and oral conversations; thus, more content was available for coding. Statements also included greetings and closures because they are indicators of social presence. Another indicator of social presence that was coded is paralinguage—that is, punctuation, emoticons, and verbal utterances that convey meaning.

Two coders worked independently to tally the units of meaning and assign them to teaching, social, or cognitive presence according to the templates by



**Table 1.** Community of Inquiry Categories and Selected Indicators

Element	Categories	Indicators
Teaching presence <sup>a</sup>	Instructional design	Setting curriculum, establishing netiquette
	Facilitating discourse	Encouraging contributions
	Direct instruction	Present content/questions, focus the discussion
Social presence <sup>b</sup>	Affective	Expression of emotions, humor, self-disclosure
	Open	Risk-free expression, simple agreement
	Cohesive	Vocatives, inclusive pronouns, phatics, salutations
Cognitive presence <sup>c</sup>	Triggering events	Recognizing the problem, sense of puzzlement
	Exploration	Information exchange, brainstorming
	Integration	Connecting ideas, synthesis, creating solutions
	Resolution	Defending solutions

<sup>a</sup>Anderson, Rourke, Archer, and Garrison (2001). <sup>b</sup>Rourke, Anderson, Garrison, and Archer (1999); Garrison and Arbaugh (2007). <sup>c</sup>Garrison, Anderson, and Archer (2001).

Anderson et al. (2001), Garrison, Anderson, and Archer (2001), and Rourke et al. (1999). Because of the overlapping nature of the CoI framework, there is sometimes more than one presence and more than one category to which a unit of meaning may be assigned (Garrison et al. 2006). The coders resolved the issue of overlapping categories through a heuristic informed by inquiry-based learning to code to teaching presence in cases where both teaching and social presence were evident and to code to cognitive presence in cases where multiple presences were evident.

The coders negotiated discrepancies in ratings and reconciled frequencies on which to base the inferential statistical analysis and conclusions (Garrison et al. 2006). Reliability testing was conducted on the complete transcripts using an SPSS procedure for computing Krippendorff's (2004) alpha ( $\alpha$ ) developed by Hayes (2005). Interrater reliability on total meaning units at time one was .85. At time two, it was .61, primarily because of a large discrepancy in what was considered paralinguistic. Interrater reliability for the frequency of presence in online transcripts was .91 at time one (week 4) and .82 at time two (week 4); reliability for face-to-face transcripts was .78 at time one and .93 at time two. Discrepancies were subsequently negotiated and resolved.

Table 2 shows the frequency scores for teaching, social, and cognitive presence used in the analysis. The scores represent the final frequency of meaning units per presence in the online and face-to-face transcripts.

**Table 2.** Frequency Scores for the Community of Inquiry Dependent Variables

Time in course	Online			Sum	Face-to-Face			Sum
	TP <sup>a</sup>	SP <sup>b</sup>	CP <sup>c</sup>		TP <sup>a</sup>	SP <sup>b</sup>	CP <sup>c</sup>	
Week 4	16	127	121	264	77	259	293	629
Week 7	10	71	73	154	45	245	462	752
Sum	26	198	194	418	122	504	755	1,381

<sup>a</sup>Teaching presence. <sup>b</sup>Social presence. <sup>c</sup>Cognitive presence.

**RESULTS**

**Total Units of Meaning**

The online group met in a chat space and generated 418 units of meaning (statements and paralinguage). On average, teaching presence accounted for 6.5% of the total presence during discussions. Social presence accounted for 47%, and cognitive presence accounted for 46.5% of the total.

The face-to-face group met in a restaurant and generated 1,381 units of meaning. On average, teaching presence accounted for 9% of the total presence during discussions. Social presence accounted for 37%, and cognitive presence accounted for 54% of the total.

**Statistical Analysis**

To address the first research question, correlations among each presence were calculated. A significant, moderate correlation occurred between teaching presence and social presence ( $r = .492, p = .038$ ), and a strong correlation occurred between social presence and cognitive presence ( $r = .799, p = <.001$ ). Teaching presence and cognitive presence were not significantly correlated ( $r = .219, p = .382$ ).

To address the second research question, a multivariate analysis was conducted to assess any difference between the group that met online and the group that met face-to-face in the frequency of teaching, social, and cognitive presence indicators generated over time. Table 3 shows significant multivariate effects for the main effect of group mode and a high effect size ( $\eta^2 = .91$ ). The effects for time were not significant, and the interaction between group mode and time was not significant. This indicates that the linear composite of teaching presence, social presence, and cognitive presence differed for online and face-to-face groups. There was no difference over time. Nor was there an interaction between group mode and time, meaning that time and whether groups met online or face-to-face had no effect on the frequency of any presence.

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**Table 3.** Multivariate Test Results

Effect	Multivariate test	Value	<i>F</i>	Sig.	Partial eta squared
Group mode	Pillai's trace	.908	16.42	.005	.91
Time	Pillai's trace	.580	2.30	.195	.58
Time × Group mode	Pillai's trace	.370	.98	.473	.37

*Note:* Alpha = .05.

Follow-up ANOVAs with a Bonferroni correction to the .05 alpha level for multiple comparisons indicate that the effect of group mode was significant for both social presence,  $F(1, 7) = 22.64, p = .002$ , and cognitive presence,  $F(1, 7) = 34.68, p = .001$ . The group that met face-to-face generated higher frequencies of social and cognitive presence than the group that met online. An examination of the differences in social presence showed a greater proportion of affective statements face-to-face (37%) than online (26%) and a greater proportion of statements representing open communication face-to-face (62%) than online (46%). However, the online group generated a greater proportion of cohesive statements (28%) than did the face-to-face group (1%).

Because integration and resolution are higher levels of cognitive presence, the percentage of conversation devoted to those categories was examined for both modes. The MANOVA suggests that time was not a factor in frequency of cognitive presence. Therefore, the frequencies for interaction and resolution at times one and two were added together, and the mean percentage was calculated. The proportion of cognitive presence statements devoted to integration was 8% for the face-to-face group and 9% for the online group. The proportion of cognitive presence statements devoted to resolution was 0% for the face-to-face group and .5% for the online group. Both the face-to-face and online groups achieved minimal levels of integration, whereas the online group achieved a minute level of resolution during chats.

## DISCUSSION

The first research question explored the relationship of teaching presence, social presence, and cognitive presence to one another in a learner-led synchronous environment. Findings suggest that social presence is extremely important to support cognitive presence. Social presence and cognitive presence are highly positively correlated; therefore, when social presence is high, cognitive presence will be high. Cohesive statements were particularly important for the online group, perhaps because those learners lacked the visual cues that show learners working together and coalescing as a group. The results suggest that social presence is vital to cognitive presence. This may be partially attributed to how Rourke et al. (1999) define social presence. Generally,

social presence involves social relationships and perceptions of people as three-dimensional beings despite not communicating face-to-face. Rourke et al. expand on that definition by including such actions as continuing a discussion thread rather than starting a new topic and referring explicitly to others' messages. Those are indicators that arguably could be considered part of the exploration and integration categories of cognitive presence.

Teaching presence and social presence are moderately positively correlated in synchronous environments. This supports the notion that teaching presence and social presence overlap to some extent. However, the correlation between teaching presence and cognitive presence was not significant. This may be because teaching presence accounted for the lowest proportion of conversation in all discussions. The groups generated fewer units of meaning in the teaching presence category, which resulted in less opportunity to produce a statistically significant correlation. Others have reported strong correlations between teaching presence and social presence (Shea et al. 2010) and between teaching presence and cognitive presence (Arbaugh 2008) when the instructor is present during the learning task. The present study reflects teaching, social, and cognitive presence exhibited by learners in the absence of an instructor during the chat.

The second research question related to time found that learners in a face-to-face discussion group had significantly higher frequencies of social and cognitive presence indicators than those who met in online chats. Findings also show that the frequency of any presence did not change over time for either group.

## CONCLUSIONS

First, synchronous discussion mode (online or face-to-face) was not a determining factor in the groups' ability to attain high levels of cognitive presence. Even though the group meeting face-to-face had a higher frequency of cognitive presence in general than the online group, the particular categories of integration and resolution were nearly the same. Given the same amount of time in a face-to-face discussion and an online chat, members who meet in person can speak more rapidly than those who meet online can type, thus generating more units of meaning to be coded. This does not mean that more is better. Shea et al. (2010) caution against using quantity rather than quality when evaluating cognitive presence. Achieving integration and resolution in practical inquiry is the desired outcome to attain the highest level of cognitive presence and contribute to meaningful learning in the CoI model. Neither group achieved more than minimal levels of integration and resolution. However, integration and resolution were evident in the groups' postings to the asynchronous discussion board. This supports the notion from Shea et al. that other course documents provide evidence of integration and resolution.

Second, teaching presence was not affected by group mode or time, nor was it significantly correlated with cognitive presence. Low frequency of teaching presence may lead to low levels of the integration and resolution categories of cognitive presence in learner-led discussions. Teaching presence represents ownership in how the discussion is conducted, how the time together is used, how the group transitions from social presence to cognitive presence, and how the group advances to the higher levels of cognitive presence. It is noteworthy that two learners (one in each group) had scores of zero for teaching presence, and one learner (online) had a score of one. Despite Garrison and Cleveland-Innes's (2005) prompt that all members of a class are responsible for teaching presence and not only the instructor, Shea, Li, and Pickett (2006) report that students prefer directed facilitation from the instructor and may need to be coached in teaching presence. This is particularly apt in courses, such as the one under study in this research, that feature learner-led discussions.

Third, time had no effect on the ability of the groups in this study to increase or reallocate teaching, social, or cognitive presence. The three-week time frame may not have been long enough to see measurable changes in frequency. Swan (2002) found that greetings and social sharing declined whereas agreement and disagreement increased over a five-day period. Garrison and Cleveland-Innes (2005) found that higher-order thinking emerged during the course of a semester. What those findings may mean, however, is that the allocation of categories within cognitive presence may have changed—not that cognitive presence as a whole increased in relation to social presence and teaching presence. For example, by the end of the term in the Garrison and Cleveland-Innes study, learners allocated more time on integration and resolution (higher-order thinking) than on triggering events and exploration.

It should be noted that each group contained a member whose native language is not English; therefore, both groups had language barriers to overcome. More time may have been spent in explanations (teaching presence) and simple agreement (social presence) than in cognitive presence. In addition, it is possible that the learners did not receive enough feedback on their performance to improve their performance over time.

In a course design that uses learner-led chats, learners are responsible for the type of dialogue and interaction that takes place during their group discussions. Instructors should not assume that learners have the necessary skills to integrate information and resolve issues under discussion. In particular, learners may have to be coached in teaching presence as it relates to facilitating dialogue among all group members. Learners may also need coaching in teaching presence before and after each synchronous discussion to help the group move to the integration and resolution phases of cognitive presence and accomplish their responsibilities for learning. This applies to learners in both online and face-to-face environments. Chat participants transfer practices from ordinary conversation to their online interactions (Schönfeldt and Golato 2003). Thus, learners may need coaching that applies to any real-time conversation (Valaitis

et al. 2005). Coaching can foster more independent learners so they can conduct their own inquiries and model self-directed learning and problem solving.

Making discussions meaningful involves awareness on the part of the instructor as to how learners are combining teaching, social, and cognitive presence in their dialogue with one another. That awareness may result in coaching strategies for each presence so that learners will recognize the role of teaching, social, and cognitive presence in meaningful discussions that contribute to shared understanding and a worthwhile educational experience.

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