

INTERACTION IN SYNCHRONOUS CHAT TUTORIALS TO FACILITATE LEARNING IN INTRODUCTORY STATISTICS

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This paper investigates interaction in synchronous chat tutorials trialed in an introductory statistics course offered in distance education mode. The Community of Inquiry (CoI) framework of Garrison, Anderson and Archer, while primarily developed to inform online asynchronous discussion groups in non-mathematical contexts, is used to describe the interactions in these online tutorials. Transcript analysis was performed on three chat logs of weekly online sessions and the three presences of the CoI framework - social, cognitive and teaching presence - were identified. The changing dynamic amongst these presences across the semester was explored. Preliminary results indicate that the balance of the presences changes over time and, while it is suggested that this may be associated with the difficulty of the content, further investigation is needed.

BACKGROUND

The *distance* in distance education connotes the isolation of students from their teachers, from each other and from the institution itself. Moore's seminal "theory of transactional distance" (Moore, 1997) described distance education as "the universe of teacher-learner relationships that exist when learners and instructors are separated by space and/or by time" (p. 22).

Traditionally, distance education – as afforded by the available technologies of print and the postal system – predicated a delayed transmission mode of learning. Universities are now looking to technology to change this restrictive teaching approach and to provide distance students with intensive support systems to promote and sustain their learning. It is thought that technologies can "rescue the scattered students from their loneliness by providing interaction" (Guri-Rosenblit, 2009, p. 106) and that "the interaction inherent in discourse [in synchronous chat] can be motivating to learners" (Dennen, 2008, p. 207). It is, however, important to choose the right tool for the task whether this be information exchange, social support or task support (Hrastinski, 2006).

In the context of mathematics education, Smith and Ferguson (2005) suggested that pedagogical models that privilege asynchronous interaction and threaded discussions do not work because of the slow turnaround time in addressing student difficulties or misunderstandings. One solution is to use, as described in this paper, readily available synchronous chat clients that have been shown to reduce isolation and heighten learning outcomes (Loch & McDonald, 2007).

Through the transcript analysis of chat logs of three chat sessions, this paper explores the changing dynamics afforded by synchronous communication technology; and, further, attempts to map the balance created amongst the three presences. It describes a community, learning with, and through, the technology.

THEORETICAL FRAMEWORK

Gaining insights from analysing the discourse that takes place in computer-supported collaborative learning environments is integral to understanding the learning and knowledge construction afforded by these environments (De Wever, Schellens, Valcke, & Van Keer, 2006). The Community of Inquiry (CoI) model (Garrison, Anderson & Archer, 2000) provides a useful framework for investigating the "nature of the educational transaction" that takes place in online asynchronous discussion forums by considering the interaction amongst the three core elements: social, cognitive and teaching presence (see Figure 1) (Akyol et al., 2009, p. 124).

Social presence asks learners to establish personal and purposeful relationships to foster effective communication and group cohesion (Garrison, 2007). It also enables *cognitive presence*—characterised by "exploration, construction, resolution and confirmation of understanding" (Garrison, 2007, p. 65)—to develop through practical inquiry (Garrison et al., 2000). *Teaching presence* balances cognitive and social issues (Garrison et al., 2000) and facilitates discourse and

direct instruction (Garrison & Arbaugh, 2007). While this framework was developed to describe asynchronous online interaction, it is equally applicable to synchronous interaction in learning contexts where the focus is on “how we construct knowledge as opposed to an objectivist focus on learning outcomes” (Akyol et al., 2009, p. 124). The key questions for this study are how does the balance in presences change across a semester and how might this knowledge be used by the instructor. The interpretation of this framework in the teaching of statistics is also investigated.

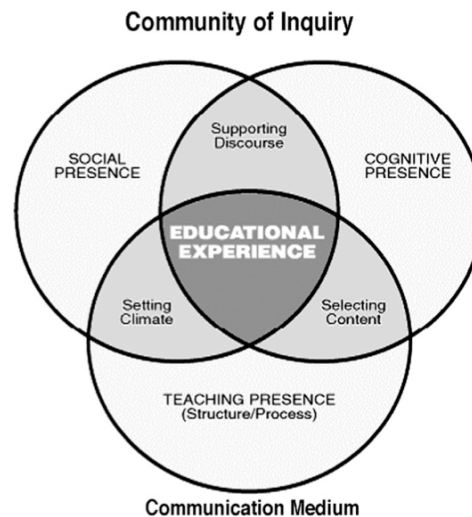


Figure 1. Community of Inquiry Framework (Garrison et al., 2000)

ANALYSIS AND DISCUSSION

As noted, the context for this study is a semester-long introductory statistics course taught through distance mode. The students who take it as a core requirement of their business, science or psychology programs typically perceive it as being very difficult. This has been anecdotally shown to be because (a) they often lack the mathematical background, capacity and skill to feel at ease; and (b) the subject itself is dependent on a logic best served by sequential explanation.

The students were offered the opportunity to participate in a weekly synchronous chat tutorial to supplement their studies. While ten out of the approximately 200 students enrolled in the subject initially expressed an interest in being involved, the highest number of participants present in any one chat session was six. Difficulty with commitment to a particular time for the chat session was one reason expressed by some students for non-involvement. Some participating students also commented that a larger chat group would have been more disorganised. The chat tutorials were not an assessable part of the course (Loch & McDonald, 2007).

To investigate the nature and changing dynamics of the interaction taking place in these synchronous chat tutorials, three of a total of twelve chat logs, one from early in the semester (Chat 3), one midway through the semester (Chat 5) and one late in the semester (Chat 11) were randomly chosen for analysis. Chat 3 related to descriptive statistics and an introduction to the normal model; Chat 5 was about regression and correlation; while Chat 11 discussed chi-square tests. Once coding protocols were established, two coders worked independently using individual messages as the unit of analysis, because they are easily defined without ambiguity. In addressing inter-rater reliability, a negotiated approach to coding transcripts was used whereby, after independently coding the transcripts, coders discussed their codes and worked towards a consensus (Garrison et al., 2006). In this preliminary investigation, messages were coded as the dominant presence identified, since most were relatively short and generally related to one presence only. Reflecting the model presented in Figure 1, larger segments of conversation in the chat logs displayed interaction of the three presences.

All three presences—social, cognitive and teaching presence were identified in all three chat logs, but to differing degrees (Figure 2). Chats 3 and 11 contained a much higher level of social presence than Chat 5. As social interaction is an essential component for forming a community of learners (Garrison & Arbaugh, 2007), it would be expected to be high at the beginning of the semester. Once open communication (questioning one another, complimenting one another,

acknowledging agreement with other's suggestions) became established, the group moved to a higher cognitive level of interaction. By Chat 5, students were comfortable with expressing an opinion during the problem solving process and not afraid to be wrong and then corrected by the instructor or one of their peers, so the social conversation declined. By Chat 11, discussion turned to preparations for the end of semester examination and the social interaction moved towards supporting and encouraging one another. Cognitive presence—centered around questions and discussions of difficult concepts—was consistent across all three chat sessions. The students had committed to taking part at a particular time one night a week and so were strongly content focused. Teaching presence was significantly higher in Chat 5 as there seemed to be a number of misconceptions about the content that needed to be resolved.

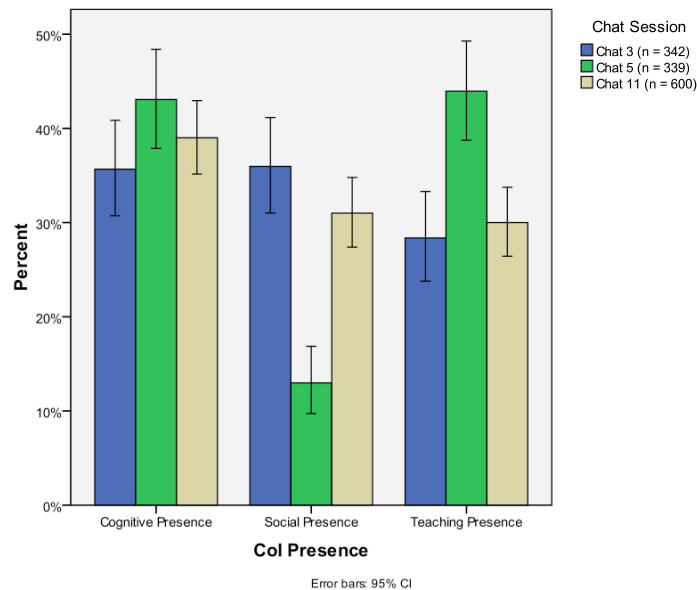


Figure 2. Comparison of conditional distributions of presence across coded chat sessions

The trend across cognitive presence matched that across teaching presence. Cognitive and teaching presences intersected because students found the content challenging and looked to the instructor for guidance. Teaching and social presences overlapped because a level of confidence in the instructor needed to be established. On one occasion, the messages were being posted so quickly that one student's contributions were overlooked as the instructor became immersed in content explanations and struggled to maintain control. The overlooked student became disengaged and left the session early. The instructor was able to retrieve the situation by approaching the student through personal email after the session. This highlights an important aspect of the immediacy of the synchronous chat environment. The instructor needs to be constantly aware of each student and this can become difficult without the visual cues of a face-to-face encounter and the lack of time to check the involvement of each student. The instructor needs to actively find the best mix of the three presences to keep the conversation moving forward productively.

There is a generally held belief that student satisfaction, perceived learning and a sense of community are strongly influenced by teaching presence (Garrison, 2007). In this instance, students were very positive about the experience of a weekly online meeting with their peers and an expert to guide them when asked about it in a questionnaire at the end of the semester. For example, when asked if their study experience would have been different if they had not participated in the synchronous tutorials, Student A responded: *Yes, I would have felt completely alone on this one. It is a hard subject and being external, not having any interaction to check progress is quite frustrating and lonely.* When asked, what was the (dis)advantage of having an instructor present, Student B said: *Obvious advantage is the ability of the lecturer to provide guidance and clarity.*

In regard to the presences of the CoI (see Figure 1), the following was found. Social presence was identified through comments such as one given by Student B: *OMG, this is starting*

to make sense, indicating the excitement of starting to make sense of the content. A mixture of social and cognitive presences was displayed by Student C: *I can't grasp the concept of a negative standard deviation. Wouldn't that be like the black hole of statistics?* This comment was made in response to a problem with another student's interpretation of a concept but Student C put some humour into the response so as not to upset the other student. This demonstrates the benefit of social presence in fostering greater cognitive presence thus impacting on student learning. How teaching presence can facilitate discussion is indicated by the instructor: *Can be, Student A. But what about when it is not so obvious?* acknowledging to the student that she had some idea of the concept but prompting for more detail.

CONCLUSION

While the changing balance amongst the presences across the semester has been identified, it may well be that this is dependent on the inherent or perceived difficulty of the content covered in the particular chat sessions. To obtain a clearer picture of this changing dynamic amongst the presences in this context, all chat logs from the semester should be evaluated.

The next stage is to investigate cognitive presence and its interaction with teaching presence in more depth, in particular, develop indicators for each of the phases of cognitive presence in this context. This may prove to be problematic because of the difficulty in interpretation due to the brevity and sometimes jumbled order of messages. In order to improve practice in teaching introductory statistics at a distance, a comprehensive analysis of the instructor's role in the synchronous chat situation could highlight the strengths and pitfalls of this medium for fostering collaborative learning and meaning making in a community of inquiry. Though a small scale study, evidence suggests interaction in synchronous online tutorials supports distance students in their learning of introductory statistics.

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