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BUILDING LEARNING COMMUNITIES IN ONLINE COURSES: THE IMPORTANCE OF INTERACTION

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Abstract

This paper discusses course design factors affecting the success of asynchronous online learning with a specific focus on the social development of learning communities through online discussion. It reports on an empirical investigation of correlations between 22 course design factors and student perceptions of satisfaction, learning, and interaction with instructors and classmates using data collected from 73 courses offered through the State University of New York Learning Network (SLN) in the spring, 1999 semester. Data analyses revealed that three factors were significantly related to student perceptions – clarity and consistency in course design, contact with and feedback from course instructors, and active and valued discussion. An explanation for these findings may center on the importance of creating opportunities for interaction in online learning environments. In this vein, preliminary findings from research on the development of community in online course discussions is presented. Drawn from content analyses of asynchronous discussions in an online graduate course in education, this research examines the ways in which course participants use verbal immediacy indicators to support the development of online community. Findings support an equilibrium model of social presence in online discussion which suggests that as affective communications channels are reduced, discussion participants use more verbal immediacy behaviors to support interaction among classmates. Taken together, the findings support the importance of interaction for online teaching and learning.

Background

Many believe that the defining characteristic of the computing medium, if one can think of the computer as a single medium at all, is its interactivity (Bolter, 1991; Landow, 1992; Murray, 1997; Turkle, 1997). The computing medium makes it possible for users to manipulate objects on the screen, and for programs to respond to their manipulations. Moreover, computers linked through the Internet allow users to communicate with each other around the world. Indeed, researchers concerned with computer-based education have identified three kinds of interactivity that support learning in online courses: interaction with content, the ability of learners to access, manipulate, synthesize, and communicate content information; interaction with instructors, the ability of learners to communicate with and receive feedback from their instructors; and interaction with classmates, the ability of learners to communicate with each other around content to create an active learning community (Moore, 1989). Of course, none of the three modes of interaction function independently in practice. Interaction among students, for example, is supported by instructor facilitation and support, which, in turn, centers on content. These forms of interaction, however, provide useful lenses for thinking about interaction online.

Although interaction with content has been well researched in other media domains, interaction with instructors and interaction with classmates have been most investigated to date in the asynchronous online medium. These literatures are reviewed below.

Interaction with content. All of us are aware of the enormous amount of content available through the World Wide Web; many of us are overwhelmed by it. Shank (1998), however, warns that information is not learning. Indeed, researchers agree that many computer-based educational offerings provide poor learning opportunities (Bork, 1986; Janicki & Liegle, 2001). What we do know about design for online learning has been extrapolated from research on computer-based learning in general, and multimedia design in particular. Janick & Liegle (2001) have synthesized the work of a range of instructional design experts in these areas (Anderson & Reiser, 1985; Gagne, Briggs, & Wager , 1988; Hannafin & Peck, 1988; Tennyson, 1989; Jonassen, Davidson, Collins, Campbell & Haag, 1995; Ward & Lee, 1995; Merrill, 1997) to develop a list of ten concepts they believe support effective design of web-based instruction. These are:

- Instructors acting as facilitators
- Use of a variety of presentation styles
- Multiple exercises
- Hands-on problems
- Learner control of pacing
- Frequent testing
- Clear feedback
- Consistent layout
- Clear navigation
- Available help screens

While it is well accepted that these design principles support computer-based learning, it remains to be seen whether they apply to online courses. Future research in these areas is definitely needed.

Interaction with instructors. The relationship between student-teacher interactions and learning outcomes has been well documented in traditional classrooms (Madden & Carli, 1981; Powers & Rossman, 1985). Of particular importance in face-to-face classrooms is teacher immediacy and immediacy behaviors. "Immediacy" refers to the "psychological distance between communicators" (Weiner & Mehrabian, 1968). Educational researchers have found that teachers' verbal (ie., giving praise, soliciting viewpoints, humor, self-disclosure) and non-verbal (ie., physical proximity, touch, eye-contact, facial expressions, gestures) immediacy behaviors can lessen the psychological distance between themselves and their students, leading (directly or indirectly, depending on the study) to greater learning (Kelley & Gorham, 1988; Gorham, 1988; Christophel, 1990; Rodriguez, Plax & Kearney, 1996).

It stands to reason that interactions with instructors would be equally important online. This has led certain researchers to suggest that asynchronous media, because they support fewer affective communication channels, are less capable of representing the "social presence" of participants in online courses (Short, Williams & Christie; 1976). Researchers experienced with online teaching and learning, however, contest this view, arguing that rather than being impersonal, computer-mediated communication often seems to be "hyper-personal" (Walther, 1994). Participants in computer-media communications, they argue, create social presence by projecting their identities and building online communities through verbal immediacy behaviors alone (Gunawardena & Zittle, 1997; LaRose & Whitten, 2000; Rourke, Anderson, Garrison & Archer, 2001; Richardson & Swan, 2001).

Picciano (1998), for example, found that instructors' activity was related to students' perceived learning in online education courses. Jiang and Ting (2000) found correlations between perceived interactions with instructors and the average numbers of responses per student that instructors made and the average numbers of responses students themselves made in course discussions. Richardson and Ting (1999) compared the perceptions of two groups of students involved in asynchronous learning. They found that students learning through written correspondence with instructors were more concerned with instructor feedback, whereas students learning online felt that all interactions with instructors mattered.

Other researchers have investigated the changing roles of teachers working in virtual classrooms. Coppola, Hiltz, and Rotter (2001) assert that in any environment, teachers have three roles – cognitive, affective, and managerial. They found that online the cognitive role shifts to one of deeper complexity, the affective role requires faculty to find new tools to express emotion, and the managerial role requires greater attention to detail, more structure, and additional student monitoring. Anderson, Rourke, Garrison, and Archer (2001) report similar categories of what they call "teaching presence" (direct instruction, facilitating discourse, and design and organization) and similar shifts in responsibilities.

Current research on teaching online, then, seems to indicate a heightened need for instructor activity and interaction in online environments, as well as highlighting the overlap with content interactions (the need for attention to structure and design), and interaction among students (the need to establish the learning community). Clearly, online pedagogy deserves further investigation.

Interaction among students. Interactions among students through course discussions seem to be one of the most influential features of online courses (Swan, Shea, Fredericksen, Pickett, Pelz. & Maher, 2000). Many researchers note that students perceive online discussion as more equitable and more democratic than traditional classroom discussions (Harasim, 1990; Levin, Kim & Riel, 1990). Asynchronous discussion affords participants the opportunity to reflect on their classmates' contributions

while creating their own, and on their own writing before posting them. This tends to create a certain mindfulness among students and a culture of reflection in an online course (Hiltz, 1994; Poole, 2000).

However, as Eastmond (1995) reminds us, computer-mediated communication is not inherently interactive, but depends on the frequency, timeliness, and nature of the messages posted. Ruberg, Moore and Taylor (1996) found that computer-mediated communication encouraged experimentation, sharing of ideas, increased and more distributed participation, and collaborative thinking, but also found that for online discussion to be successful, it required a social environment that encouraged peer interaction facilitated by instructor structuring and support. Hawisher and Pemberton (1997) relate the success of the online courses they reviewed to the value instructors placed on discussion, and Picciano (1998) found that students' perceived learning from online courses was related to the amount of discussion actually taking place in them. Likewise, Jiang and Ting (2000) report correlations between perceived learning in online courses and the specificity of instructors' discussion instructions and the percent of course grades based on discussion responses.

Interactions among students seem clearly to matter in online discussion. Indeed, Rourke, et. al. (2001) identify the development of social presence, the perceived interaction with others, as one of the cornerstones for the development of online learning communities. How social presence develops in online discourse is also fertile ground for further research.

In any case, research thus far indicates that online courses that are both well structured and easy to use and that take advantage of increased access to instructors and more equitable and democratic discussion are the most successful (Swan, et. al., 2000). In the sections which follow, these ideas are examined through two research studies. The first study used quantitative methodology to examine relationships between course design factors and student perceptions in 73 online courses. Findings from this research are related to the three types of interactivity that have been shown to support online learning. The second study looked deeper into interactions among students. It analyzed online discussion in a graduate level course in education. Findings from preliminary analyses of these discussions reveal the importance of discussants' use of verbal immediacy indicators for building online community among course participants, and the particular importance of interactive indicators for linking individual postings into knowledge building activities.

Study One:
Course Design Factors, Student Perceptions, and Interactivity in Online Courses

The SUNY Learning Network (SLN) is the infrastructure created to support asynchronous online courses for the 64 institutions and nearly 400,000 students of the State University of New York (SUNY) system. It's primary goal is to bring SUNY's programs within the reach of learners everywhere. Rather

than each campus developing its own online interface and support network, SLN has developed and implemented operational and support services that can be shared across the entire system. SLN created a course template using Lotus Notes that is distributed through a series of Lotus Domino servers. The template makes course development almost as easy as using a word processor, and provides a consistent interface for students. Within that consistent interface, however, instructors have a great deal of flexibility and powerful tools for developing their courses. SLN provides instructors with training in the use of the template and in instructional design, as well as access to ongoing support in both areas.

SLN started as a regional project involving campuses in the Mid-Hudson Valley. Its first courses were offered in the 1995-1996 school year. With generous support from the Alfred P. Sloan Foundation, SUNY System Administration, and participating campuses, it grew from offering eight courses to 119 students in its initial year to offering more than 1,500 courses to over 15,000 students in the 2000-2001 school year.

Methodology

In the spring of 1999, approximately 3,800 students were enrolled in 264 courses offered through SLN. At the end of the semester, students in all courses were asked to complete an online survey. The survey consisted of mostly multiple choice, forced answer questions eliciting demographic information and information concerning students' satisfaction, perceived learning, and activity in the courses they were taking. For purposes of this paper, only the latter responses are relevant. These are summarized in Table 1.

SATISFACTION WITH COURSE	very satisfied	49%
	satisfied	39%
	not very satisfied	8%
	not satisfied	4%
PERCEIVED LEARNING	more than expected	47%
	as much as expected	41%
	less than expected	11%
	nothing	1%
PERCEIVED INTERACTION WITH INSTRUCTOR	a great deal	31%
	sufficient	53%
	insufficient	14%
	none	2%
PERCEIVED INTERACTION WITH CLASSMATES	a great deal	20%
	sufficient	56%
	insufficient	16%
	none	8%
PERSONAL ACTIVITY IN COURSE *	much higher	20%
	higher	25%
	about the same	35%
	less	20%

Table 1: Spring, 1999 Student Satisfaction Survey
Student Perceptions Data (N = 1,406)

Fourteen hundred and six (1,406) students returned the survey. We believe that not only is this rate of return quite good (38%), but that it is probably reasonably balanced. Although students not completing courses could not have returned the survey, the better students would not have completed it either because it was given very late in the semester when they had already finished the course (and so most likely didn't see the link to the survey). Thus, outliers at both ends of the academic spectrum were eliminated. One-way analyses of variance was performed on this data to look for significant differences in student satisfaction and perceived learning relative to students' demographics and perceptions of online learning. In this paper, only significant differences relative to student perceptions are considered.

Because we were especially interested in actual course designs and the relationship between course design features and student perceptions, we also looked at twenty-two design features and course variables in a subset of the courses offered in the spring 1999 semester. We decided to examine only courses in which five or more students were enrolled and for which there was a 40% or greater rate of return on the student satisfaction survey. While such a methodology favors slightly larger courses, we felt it necessary because the alternative would have been to base analyses on the perceptions of one or two students. This procedure left us with 73 courses, or 28% of the total courses offered. Eleven hundred and eight (1,108) respondents were enrolled in the courses whose design features we examined.

Two of the researchers separately examined each of the 73 courses and rated their content on twenty-two variables using Likert-type scaling. Ratings related to course structure included course level, class size, whether or not a textbook was required, the number of modules in the course and the consistency among them, the number of external links to outside sources, the instructor's voice (first, second, or third person), and the design of individual pages. Ratings related to assessment included how often assignments were due and the percentage of course grades that were based on discussion, papers, other written assignments, projects, quizzes and tests, cooperative or group work, and other assessments. Ratings related to interactivity included the frequency of interactions with course instructors, whether there were gaps in this interaction, the frequency of interaction among students, the required frequency of participation in discussion, the authenticity of discussion questions, and the average length of discussion responses. These data are given in Tables 1 through 3 in the Appendix. Ratings for each course were checked for agreement, and disagreements were resolved by consensus with reference to the courses themselves. Averages for student satisfaction, perceived learning, interaction with instructor, and interaction with peers were computed and added to individual course design records. Correlations were run to look for relationships between course design variables and student perceptions.

Results

In this section, findings from one way analyses of variance examining relationships among student perceptions and correlations testing relationships between student perceptions and course design factors are

given as they relate to interaction with content, interaction with instructors, and interaction among classmates.

All four student perception variables – student satisfaction, perceived learning, perceived interaction with the instructor, and perceived interaction with peers – were highly interrelated, but not identical. Student satisfaction with the courses they were taking and their perceived learning from them were the most highly correlated variables we examined ($r = .784$, $p < .01$). They clearly did not measure the same perceptions, however, as shown by the fact that some of the correlations with course design variables were significant for one variable but not for the others.

Correlational analyses also showed a significant relationship between the interactions students believed they had with their instructors and their satisfaction with their courses ($r = .761$, $p < .01$) and their perceived learning from them ($r = .707$, $p < .01$). Similarly, a significant relationship was found between perceived interaction with other students and students' satisfaction with their courses ($r = .440$, $p < .01$), and their perceived learning from them ($r = .437$, $p < .01$). These findings reinforce similar results from analyses of variance run on the full data from Spring, 1999, and suggest that the smaller data set taken from 73 courses is representative of the whole. Perceived interaction with course instructors and perceived interaction with peers were also highly correlated ($r = .517$, $p < .01$). Taken together these results give further evidence for the overlap the three categories of interaction suggested by Rourke, et. al. (2001).

Interaction with content. It stands to reason that students who are more active in courses, online or off, will be more satisfied with them and will learn more from them. In the online survey (Table 1), students were asked to compare their personal activity in the course they took with their activity in a traditional classroom. Forty-five percent rated their activity as "higher" or "much higher" than in face-to-face classrooms, and thirty-five percent rated it as "about the same."

Significant differences in student satisfaction ($F_{(3,1402)} = 44.21$, $p < .01$) and perceived learning ($F_{(3,1402)} = 90.20$, $p < .01$) were found among students reporting differing levels of activity in the online courses they were taking. Students who rated their level of activity as high also reported significantly higher levels of course satisfaction and significantly higher levels of perceived learning. Frequent and engaging interaction with course content thus was shown to be an important course design feature. These results support Moore's (1989) concern with interactivity. Future research should investigate this area further and seek to distinguish better between types of interactions.

For the present, our correlational analyses highlight one important feature of content presentation, consistency. Significant correlations were found between structural consistency among course modules

and student satisfaction ($r = .333$, $p < .05$), perceived learning ($r = .474$, $p < .01$), and perceived interactions with their instructors ($r = .451$, $p < .01$).

In addition, perceived learning was found to be related to the number of modules in the course ($r = .338$, $p < .01$). The fewer the number of modules a course had, the more likely students were to report higher levels of learning from it. The strength and persistence of these correlations demonstrate the superiority of straightforward course designs with relatively few, similarly structured modules. They also support previous findings that link clear course structures to student satisfaction, learning, and retention (Romiszowski & Cheng, 1992; Eastmond, 1995; Irani, 1998; Janick & Liegle, 2001). The findings also highlight the fact that, lacking face-to-face communication, it is easy for students to get confused or lost in complex course structures, making interaction with content more difficult. Course designers should keep this in mind and strive for both simplicity and redundancy.

It is perhaps also interesting to note, with regards to interaction with content, factors which did not show significant correlations with any of the student perception variables. No correlations were found between any student perceptions and the use of graphical interfaces or between these and the number of links to external websites. These are factors that anecdotal reports suggest matter to online learning. It is possible that our rating scales for these factors were imprecise and so obscured results. On the other hand, it may be that students as well as designers are sensitive to the downloading constraints of online formats. The notion clearly invites revisitation in the future.

Another interesting non-significance involves assessment. The only correlations between student perceptions and assessment factors involved percent of grades based on discussion and percent of grades based on cooperative work. No correlations were found between any student perception and percentages of course grades based on papers, other written assignments, projects, quizzes and tests, or anything else. It is hard to know what to make of this finding. Perhaps these latter assessments function in much the same way online as off, and so went relatively unnoticed by students. On the other hand, it is possible that, at least within the SLN network, instructors and course designers have yet learned to exploit direct interaction with content in a positive way. Interactive exercises, for example, might make more of a difference in student perceptions. Still another possibility is that interaction with content is to a large measure accomplished through interactions with instructors and other students in online environments, and so was subsumed by other measures in this study.

In any case, interaction with content remains under-researched and something of a mystery in online teaching and learning. It definitely deserves further investigation.

Interaction with instructor. Student-teacher interaction has been shown to significantly affect learning in both regular classrooms (Madden & Carli, 1981; Powers & Rossman, 1985; Kelly & Gorham, 1988; Christophel, 1990; Rodriguez, Plax & Kearney, 1996) and online (Jiang & Ting, 2000; Picciano, 1998; Richardson & Ting, 1999; Swan, et. al., 2000). In the online survey (Table 1), students were asked whether they had "a great deal," "sufficient," "insufficient," or no interaction with their instructors. Eighty-four percent reported that they interacted with their instructor a great deal or sufficiently. Interestingly, two percent reported no interaction with their instructor at all.

Analyses of variance indicated that student-teacher interaction was indeed strongly related to student satisfaction and perceived learning in Spring, 1999 SLN courses. They revealed significant differences in student satisfaction ($F_{(3,1402)} = 188.97$, $p < .01$) and perceived learning ($F_{(3,1402)} = 168.25$, $p < .01$) among students interacting with their instructors at differing perceived levels. Students who reported low levels of interaction with their instructors also reported the lowest levels of satisfaction with their courses and the lowest levels of learning. Conversely, students who reported high levels of interaction with their instructors also reported higher levels of satisfaction with their courses and higher levels of learning from them.

Correlational findings support the analyses of variance. They show that the relationship between students' perceived interaction with their instructor and the actual frequency of instructor feedback (Table 4) was weakly significant ($r = .269$, $p < .10$). This finding, while weaker than findings concerned with peer interactions, once again highlights the importance of instructor feedback and participation in class discussions.

It is also important to remember that student perceptions of interaction with their instructors were highly correlated with both satisfaction ($r = .761$, $p < .01$) and perceived learning ($r = .707$, $p < .01$). Perhaps the quality of interaction with instructors is more important than the quantity of interactions. Qualitative analyses of these interactions might provide more answers in this regard and is an area deserving of future research. In any case, taken together, the results clearly indicate that instructors' activity is an important factor in the success of online learning.

In this vein, it is also interesting to note course design factors related to interaction with instructors for which no significant results were found. Neither class size nor student achievement levels, factors which are known to influence student perceptions in traditional classes, correlated significantly with any of the student perception variables. This lack of results, at the very least, indicates differing relationships between teachers and students in the online environment. The notion surely deserves further investigation.

Another course design factor we thought might be associated with student perceptions was instructor voice. Our hypothesis was that more familiar forms of address in course lectures would help bridge the gap created by the lack of face-to-face communications. The results don't bear this out, but again our instruments may have been imprecise. On the other hand, it may be that other kinds of interactivity with instructors, instructor participation in class discussions and instructor feedback on assignments in particular, far outweigh the tone of lectures. Positive correlations for both of these factors point in such direction.

In any case, the results clearly indicate that courses that include ample opportunity for interaction with instructors are preferable to those with limited or no interaction, and that interaction with instructors is an important factor in online learning (Picciano, 1998; Jiang & Ting, 2000). Future research should explore the relationship between students and teachers in online environments more deeply.

Interaction among students. Interaction with classmates is an integral part of learning in regular classrooms. The importance of peer interaction online is suggested by research findings concerning the importance of online discussion (Hawisher & Pemberton, 1997; Jiang & Ting, 2000; Picciano, 1998; Swan, et. al., 2000; Richardson & Swan, 2001; Rourke, et. al., 2001). In the online survey (Table 1), students were asked whether they had "a great deal," "sufficient," "insufficient," or no interaction with their classmates in the online courses they were taking. Seventy-six percent reported a great deal or sufficient interaction; twenty-four percent reported insufficient or no interaction.

We hypothesized that perceived interaction with classmates would be associated with student satisfaction and perceived learning. Analyses of variance bore this out. Significant differences in students' satisfaction with the courses they were taking ($F_{(3,1402)} = 68.91$, $p < .01$) and perceived learning from them ($F_{(3,1402)} = 50.27$, $p < .01$) were found for differing levels of perceived peer interaction. Students who rated their level of interaction with classmates as high also reported significantly higher levels of course satisfaction and significantly higher levels of learning.

Correlational analyses also give strong support to the importance of student interactions in course discussions. For example, a strong correlation was found between students' perceptions of their interactions with peers and the actual frequency of interactions between students ($r = .398$, $p < .01$). This finding demonstrates the accuracy of student perceptions of peer interactions. We also found correlations between students' perceived interaction with peers and the percentage of the course grade that was based on discussion ($r = .455$, $p < .01$), the required frequency of participation in discussion ($r = .369$, $p < .05$), and the average length of discussion responses ($r = .353$, $p < .01$). High levels of perceived interaction among students were thus related to actual interactivity, high values placed on discussion, greater required participation, and longer discussion responses.

In addition, the correlation between the percentage of the course grade that was based on discussion and students' satisfaction with courses was significant ($r = .381$, $p < .05$), and the correlation between the percentage of the course grade that was based on discussion and perceived learning was weakly significant ($r = .286$, $p < .10$). Values put on discussion were also found related to perceptions of instructor ($r = .307$, $p < .05$) and peer interaction ($r = .455$, $p < .10$). Taken together, these findings point to the importance of discussion, and to the value put on discussion, in the success of online courses. They also suggest that shared discourse among students and instructors is positively associated with student satisfaction with courses. They support previous findings linking the valuing of discussion to student satisfaction and learning (Hiltz, 1994; Moore & Taylor, 1996; Gunawardena & Zittle, 1997; Hawisher & Pemberton, 1997; Picciano, 1998; Jiang & Ting, 2000; Poole, 2000; Richardson & Swan, 2001.

Our results also include, however, a finding of a negative correlation between the percentage of the grade that was based on cooperative or group work and perceived learning ($r = -.320$, $p < .05$). While this finding seems antithetical to the notion that interaction among students supports online learning, it replicates those of other researchers who have explored collaborative learning online (Hawisher & Pemberton, 1997; Sturgill, et. al., 1998). Student comments indicate that it was difficult to get group members to work together on projects in the few courses in which collaborative learning was tried. This may stem from embedded problems with asynchronicity (Hmelo, et. al., 1998). On the other hand, it may stem from instructor naivete concerning collaborative work. None of the nine courses which utilized collaboration that we reviewed employed such factors as interdependency and individual responsibility to maximize the collaborative experience (Johnson & Johnson, 1992). Future research clearly should explore this issue further and look for ways to successfully employ collaborative strategies online.

In any case, our results generally support the importance of interaction among students in online courses. Taken together, they suggest that discussion fosters interactivity among students, and that several factors contribute to successful online discussions. Some of these are the value instructors place on discussion, the frequency of participation in discussions they require, and the average length of students' discussion responses. These findings support the theorizing of Moore (1989) and Rourke, et. al. (2001), and point to the importance of creating opportunities for interaction among classmates in online courses. As even such seemingly simple interactive forums as whole class discussion require careful consideration and a great deal of facilitation online, it is also suggests that future research might well investigate the efficacy of differing methods for building and maintaining peer interaction.

Discussion

The research findings on computer-mediated communication and asynchronous online learning, both those reported in the literature and the findings reported in this paper, are quite consistent. They

suggest that three factors are consistently associated with the success of online courses. These are a clear and consistent course structure, an instructor who interacts frequently and constructively with students, and a valued and dynamic discussion. Although the correlational nature of the bulk of our research does not permit the assertion of a causal relationship between these factors and the success of online course, it is our belief that this combination of factors is not an accident, but rather that they jointly support interaction with course content, interaction with course instructors, and interaction among course participants. Support for students' interactions with content, instructors, and classmates and for the development of online communities of learning clearly deserves the attention of online developers and instructors alike, and further investigation by the educational research community.

Study Two:
Immediacy, Social Presence, and Interactivity in Asynchronous Discussion

The findings from our first study pointed to the critical importance of active, authentic, and valued discussion to students' perceptions of satisfaction and learning in online courses. We thus decided to investigate asynchronous discussion further. In particular, we wanted to explore the development of a sense of community among course participants. This led us to research on immediacy and social presence.

As previously noted, "immediacy" refers to perceived "psychological distance between communicators" (Weiner & Mehrabian, 1968). In traditional, face-to-face classrooms, researchers found that teachers' immediacy behaviors could lessen the psychological distance between themselves and their students, leading, directly or indirectly depending on the study, to greater learning (Kearney, Plax & Wendt-Wasco, 1985; Richmond, Gorham & McCroskey, 1987, Kelley & Gorham, 1988; Gorham, 1988, Christophel, 1990; Richmond, 1990; Frymeir, 1994, Rodriguez, Plax & Kearney, 1996). Researchers further distinguished between teachers' verbal immediacy behaviors (ie., giving praise, soliciting viewpoints, use of humor, self-disclosure, etc.) and their non-verbal immediacy behaviors (ie., physical proximity, touch, eye-contact, facial expressions, gestures, etc.), finding that both contributed important supports for learning outcomes.

The immediacy research in traditional classrooms has implications for learning through online communications. Some communication researchers argue that differing media have differing capabilities to transmit the non-verbal and vocal cues that produce feelings of immediacy in face-to-face communication. Because bandwidth is narrow in text-based asynchronous communication, they contend, affective communication and hence immediacy is lost. Short, Williams and Christie (1976), for example, referred to the "quality of a medium to project the salience of others in interpersonal communication" as "social presence", and believed that asynchronous computer-mediated communication has less social presence than higher bandwidth media or face-to-face communications. Rice (1992) referred to the capacity of media to represent affective communications as "media richness," but argues similarly. Thus,

these researchers agreed that asynchronous environments were less capable of representing immediacy behaviors and so less conducive to learning.

Researchers experienced with online teaching and learning, however, contest this view. Participants in computer-mediated communications, they argue, create social presence by projecting their identities into communications. What is important, these researchers contend, is not media capabilities, but rather personal perceptions (Walther, 1994, Gunawardena & Zittle, 1997; Richardson & Swan, 2001).

Rourke, Anderson, Garrison & Archer (2001), for example, developed a model of online learning that highlights the importance of the development of social presence in that process. In this "community of inquiry" model, learning occurs through the interaction of three core components: cognitive presence, teaching presence, and social presence. Rourke, et. al. (2001) further distinguished among three kinds of social presence responses in online discourse: affective responses, interactive responses, and cohesive responses. We adopted these distinctions for our own content analyses that looked for indicators of the three types of responses in the texts of online discussion.

Methodology

Data was collected from the discussions that took place in a graduate level course in Educational Computing given entirely online in the Spring, 2001 semester. The course consisted of four modules that ran sequentially across the semester. In each module, there were three large discussions initiated by instructor questions and roughly corresponding to the three weeks students were directed to spend working in each module. Students were required to submit one response to instructor prompts and two responses to their classmates in each discussion. They could, of course, submit as many responses as they liked, and many participated a good deal more than required.

Data collected consisted of all discussion strands from the first discussion in each module that were initiated in the first five days each module was open. These were choosen because they had the potential to be the most evolved sections of the discussion because students could respond to them for the longest periods of time. Two hundred and thirty-five postings in 39 discussion threads, or approximately 10% of all postings in the course discussions, were examined. Students participating in the course ranged in age from 23 to 48 and were about 2/3 female. The majority were practicing K-12 teachers, but course participants also included post-secondary educators, librarians, and educational technology specialists.

Hardcopy transcriptions of the online discussions were reviewed by multiple researchers who identified and refined verbal immediacy indicators through a constant comparison process. Emergent indicators were found to match quite well with indicators found in face-to-face analyses and research on online learning (See supporting sources in Tables 2-4). In particular, they seemed to fit well with

categories identified by Rourke, et al. (2001), thus, these categories, although not exactly the same indicators, were employed to analyze findings.

Hardcopy transcriptions were then coded, again by multiple researchers, for each of the fifteen affective, interactive, and cohesive indicators given below, as well as for the number of words per posting, the number of postings per discussion thread, and the depth of each discussion thread. Coding consisted of noting all occurrences of immediacy indicators within the transcripts reviewed. Occurrences noted ranged in size from punctuation marks (paralanguage) to multiple sentences (self-disclosure). In some instances, immediacy indicators overlapped. These were coded for all indicators such sequences contained. Participant names were replaced with IDs to preserve subject anonymity and their genders noted. Discrepancies between coders were resolved by consensus and reference to the discussion transcripts. Data analyses consisted of compiling and reviewing raw numbers of indicators across modules and reviewing the findings for patterns of indicator use.

Affective indicators (Table 2) are personal expressions of emotion, feelings, beliefs, and values (Rourke, et. al., 2001). Affective indicators, we believe, might be conceived of as ways of making up for the lack of gestures, facial expressions, and/or intonation in face-to-face communication. The affective indicators we coded for included the use of paralanguage, expressions of emotion, statements of values, humor, and self-disclosure.

indicator	defined	examples	supporting sources
paralanguage (PL)	features of text outside formal syntax used to convey emotion (ie. emoticons, exaggerated punctuation or spelling)	*Someday . . . . . .; How awful for you :-(; Mathcad is definitely NOT stand alone software; Abolutely!!!!!!*	Bussman, 1998; Poole, 2000; Rourke, et. al., 2001
emotion (EM)	use of descriptive words that indicate feelings (ie. love, sad, hate, silly)	*When I make a spelling mistake, I look and feel stupid; I get chills when I think of . . .*	emergent
value (VL)	expressimg personal values, beliefs & attitudes	*I think that it is a necessary evil; I feel our children have the same rights*	emergent
humor (H)	use of humor -- teasing cajoling, irony, sarcasm, understatement,	*God forbid leaving your house to go to the library*	Eggins & Slade, 1997; Poole, 2000
self-disclosure (SD)	sharing personal information, expressing vulnerability	*I sound like an old lady; I am a closet writer; We had a similar problem*	Cutler, 1995; Poole, 2000; Rourke, et. al., 2001

Table 2
Affective Indicators

Cohesive indicators (Table 3) are verbal immediacy behaviors that build and sustain a sense of group commitment or group presence (Rourke, et. al., 2001). Cohesive indicators seem to support the development of community. Cohesive indicators coded for included greetings and salutations, the use of vocatives, group reference, social sharing, and course reference.

indicator	defined	examples	supporting sources
greetings & salutations (GS)	greetings, closures	*Hi Mary; That's it for now, Tom*	Poole, 2000; Rourke, et. al., 2001
vocatives (V)	addressing classmates by name	*You know, Tamara, . . .; I totally agree with you Katherine*	Christenson & Menzel, 1998; Gorham, 1998
group reference (GR)	referring to the group as "we," "us," "our"	*We need to be educated; Our use of the Internet may not be free*	Rourke, et. al., 2001
social sharing (SS)	sharing information unrelated to the course	*Happy Birthday!! to both of you!!!*	Rourke, et. al., 2001
course reflection (RF)	reflection on the course itself	*A good example was the CD-ROM we read about*	emergent

Table 3
Cohesive Indicators

Interactive indicators (Table 4) provide evidence that the other is attending (Rourke, et. al, 2001). Interactive indicators seem to support interpersonal interactions among communicators, and provide the links that join individual postings into ongoing discourse. Indicators we coded for included acknowledgement, agreement, approval, invitation, and personal advice.

indicator	defined	examples	supporting sources
acknowledgement (AK)	referring directly to the contents of others' messages; quoting from others' messages	*Those old machines sure were something; I agree that it is the quickest way*	Rourke, et. al., 2001
agreement/ disagreement (AG)	expressing agreement or disagreement with others' messages	*I'm with you on that; I agree; Ithink what you are saying is so right*	Poole, 2000; Rourke, et. al., 2001
approval (AP)	expressing approval, offering praise, encouragement	*You make a good point; Right on; Good luck as you continue to learn*	emergent
invitation (I)	asking questions or otherwise inviting response	*Any suggestions?; Would you describe that for me, I am unfamiliar with the term*	Rourke, et. al., 2001
personal advice (PA)	offering specific advice to classmates	*Also the CEC website might have some references*	emergent

Table 4
Interactive Indicators

Results

We coded 235 postings in 39 discussion threads taken from each of the four modules in the course. The average number of words per posting was 82.4 (range = 5 to 562); the average number of responses per thread was 6.05 (range = 0 to 30); and the depth of responses (how many levels down responses to responses (to responses . . .) go) was 3.63 (range = 1 to 10).

We found a great many verbal immediacy indicators in the online discussions we reviewed, a total of 1,336 (663 affective, 235 cohesive, and 468 interactive) in 235 postings, or an average of almost 6 indicators per posting. Only one posting had no immediacy indicators in it and that message was not responded to. We believe these findings provide evidence that participants in the online discussions we studied made up for the lack of affective communication channels by employing more immediacy behaviors in those channels that are available to them (Danchak, Walther & Swan, 2001). A closer look at the data supports this notion.

Affective Immediacy Indicators. Affective verbal immediacy behaviors are ways of projecting personal presence into online discourse through linguistic constructions. Across all modules, we found an average of 2.8 affective indicators per response. This finding supports the notion that students adopt verbal immediacy behaviors to make up for the lack of nonverbal and vocal cues communicated online.

The most frequently used affective indicator (254 instances) was paralanguage, the use of text outside formal syntax to convey emotion or emphasis (ie. emoticons, punctuation, capitalization, exaggerated spellings, etc.), with an average of over one indicator per response. It seems reasonable to assume that discussion participants were using paralanguage to take the place of gestures, facial expressions, and aural cues in their conversations.

The second most frequently employed affective indicator, with almost one indicator per response, was self-disclosure. Self-disclosure is the sharing of personal information, usually of a vulnerable nature. Self-disclosure is an immediacy behavior frequently noted in the immediacy research as employed by teachers to lesson the gap between themselves and their students (Kearney, Plax & Wendt-Wasco, 1985; Gorham, 1988; Christophel, 1990; Richmond, 1990; Frymeir, 1994; Rodriguez, Plax & Kearney, 1996). It seems to have been employed similarly by students in the discussion threads we coded. Indeed, self-disclosure seemed to evoke the greatest number and depth of response from other participants. However, humor, another behavior noted in the classroom immediacy research, was very little employed, perhaps because many forms of humor are easily misinterpreted in text-based communication. This finding points to differences between face-to-face and computer-mediated communications.

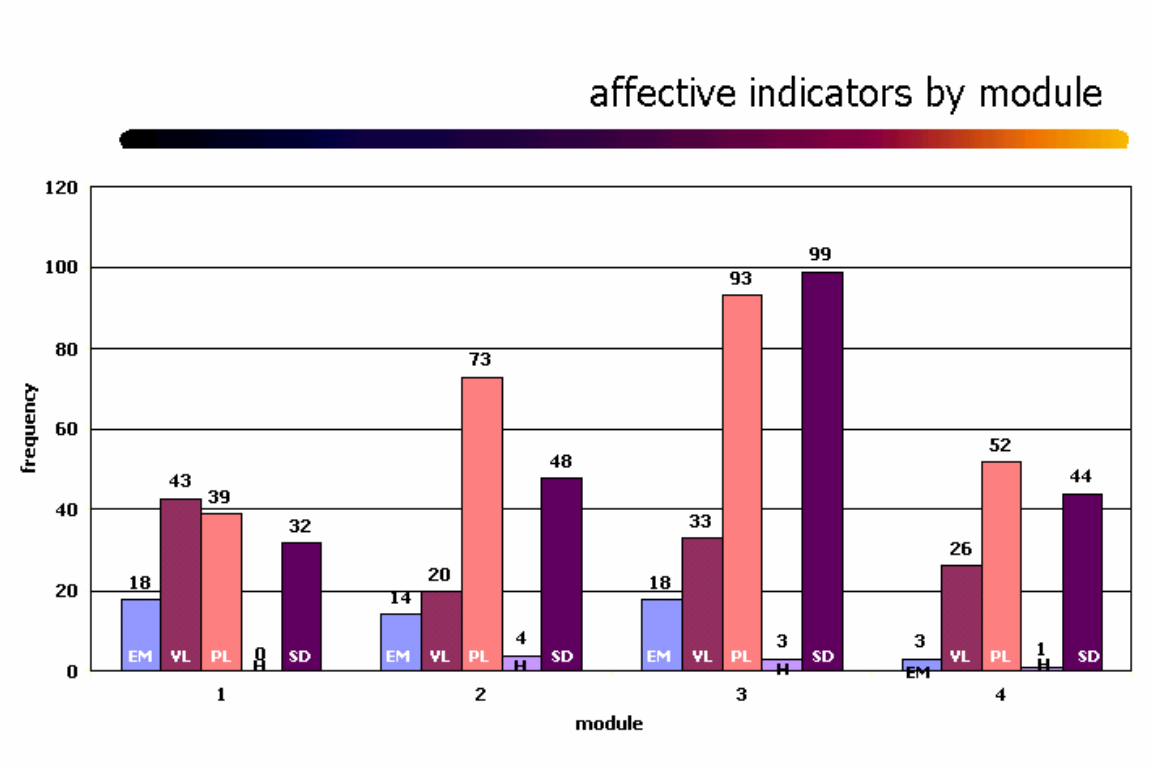

Figure 1

Figure 1 gives the raw numbers of affective immediacy indicators found in the discussion threads coded in each of the modules of the course (EM = emotions, VL = values, PL = paralanguage, H = humor, SD = self-disclosure). It thus shows the use of these indicators across time. It is interesting to note in this regard the pattern of usage across the modules. It can be seen that the use of affective indicators in general, and paralanguage and self-disclosure in particular, seemed to grow to a peak usage in the third module and drop precipitously after that. This usage seems to mirror the pattern of discussion in this course and perhaps in online courses in general. Activity in discussions generally seems to peak in the third quarter of a course and decline in the fourth.

Cohesive Immediacy Indicators. Cohesive verbal immediacy behaviors are linguistic activities that acknowledge the group and/or individuals in it. They seem to build and sustain a sense of group commitment to support the development of a discourse community. Cohesive indicators were the least used of verbal immediacy behaviors in the discussions we coded. Across all modules, we found an average of 1 cohesive indicator per response. It is interesting to note in this regard that the use of cohesive indicators declined across the modules. It seems possible that the use of such reference became less necessary as a clear classroom community was formed. That is, as participants developed a greater sense of community, they felt less need to point to it (Eggins & Slade, 1997).

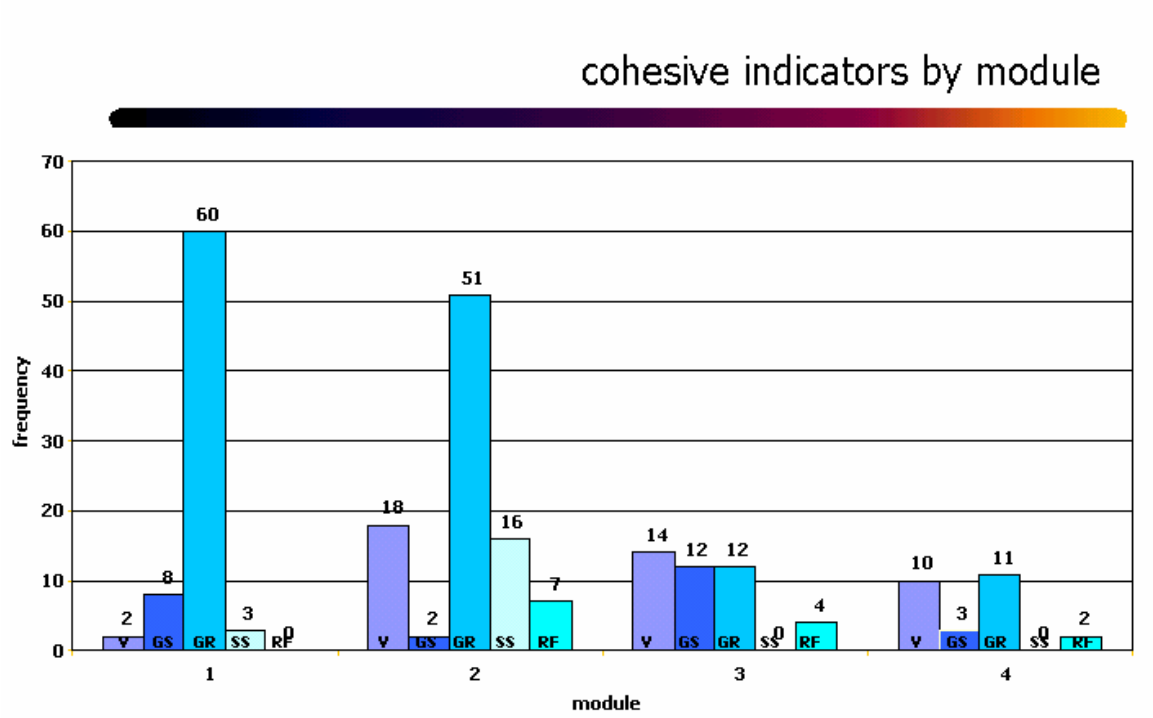

Figure 2

Figure 2 explores this pattern. It gives the raw numbers of cohesive immediacy indicators found in threads coded in each of the modules of the course (V = vocatives, GS = greetings and salutations, GR = group reference, SS = social sharing, RF = course reflection). Indeed, it depicts a decline in all cohesive indicators by the third and fourth modules, except perhaps in the use of greetings and salutations and vocatives, and a significant decline in the most frequently used cohesive indicator, group reference. Greetings and salutations and vocatives are immediacy indicators that refer to conversational partners by name. It may be, then, that some of the use of group reference was replaced by personal reference as participants learned and became comfortable using each other's names. This shift in behaviors does not account for the real decline in most cohesive behaviors across modules, however, or even, for that matter, for all the decline in the use of group reference. The most plausible explanation remains that discussion participants felt less need to employ cohesive indicators as they felt a greater organic cohesion amongst themselves.

Interactive Immediacy Indicators. Interactive verbal immediacy behaviors use language to show that discussion participants are attending to each others' contributions to the discourse. Across all modules, we found an average of 2 interactive indicators per response. The most frequently used interactive indicator was acknowledgement, which refers to quoting from or referring directly to the contents of others' messages. Discussion participants employed, on average, almost one use of acknowledgement for each response. In addition, agreement/disagreement and approval, taken together, were used almost as frequently. These findings seem to indicate that acknowledgement, agreement, and

approval are the glue that holds asynchronous discussion together, an interpretation given further credence by the fact that the use of all interactive indicators continued to increase across modules.

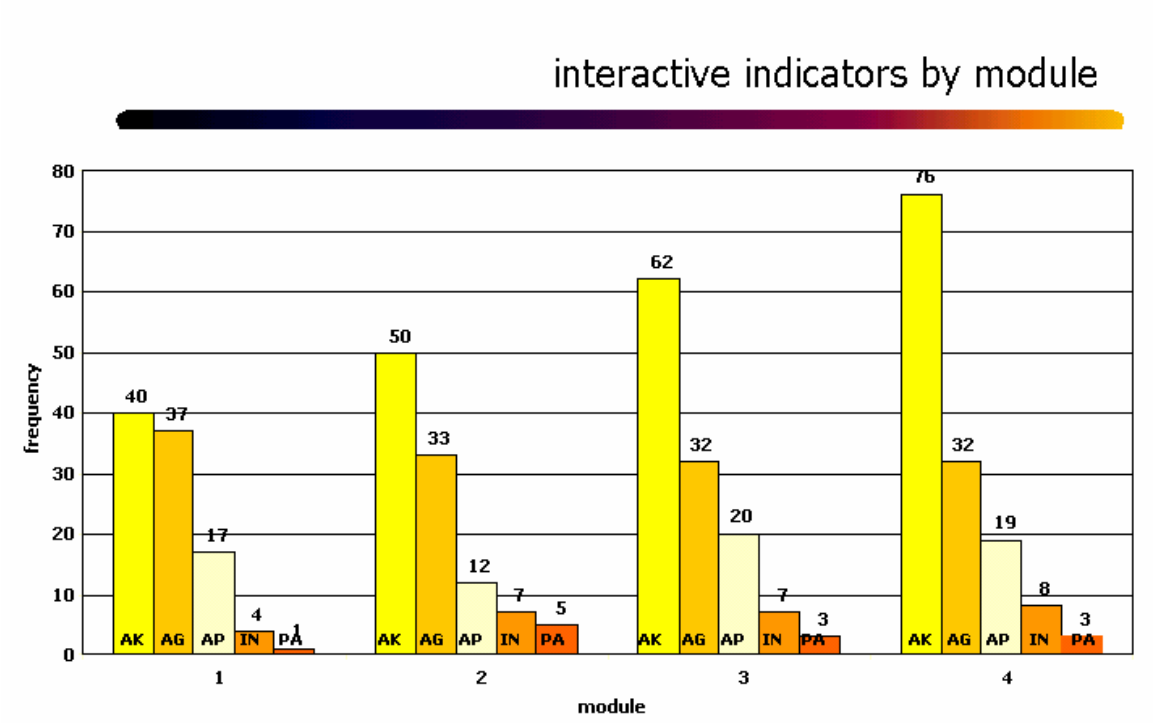

Figure 3

Figure 3 gives the raw numbers of interactive immediacy indicators found in the discussion threads coded in each of the modules of the course (AK = acknowledgement, AG = agreement, AP = approval, IN = invitation, PA = personal advice). It shows a consistent increase in the use of interactive immediacy behaviors across time. The pattern seems to indicate, at least within the course studied, a growing awareness among course participants of the importance of the use of these indicators. Thus, while cohesive behaviors became less important as the online community came together, the importance of interactive behaviors seemed to grow over time as participants became aware of their usefulness in linking the discussion into a coherent whole. We believe this points to the importance of the use of interactive verbal indicators to support interaction among classmates.

Discussion

What all these findings lead us to conclude is that students participating in the online course discussions we investigated strove to develop a greater sense of social presence by employing text -based, verbal immediacy behaviors to reduce the psychological distance amongst themselves. They lend support to an equilibrium model of social presence (Danchak, Walther & Swan, 2001) that suggests that social presence derives from both the affective communication channels available in a medium and the

immediacy behaviors of the participating communicators. In this model (See Figure 4), as affective communication channels narrow, immediacy behaviors increase in order for a desirable, equilibrium level of social presence to be achieved.

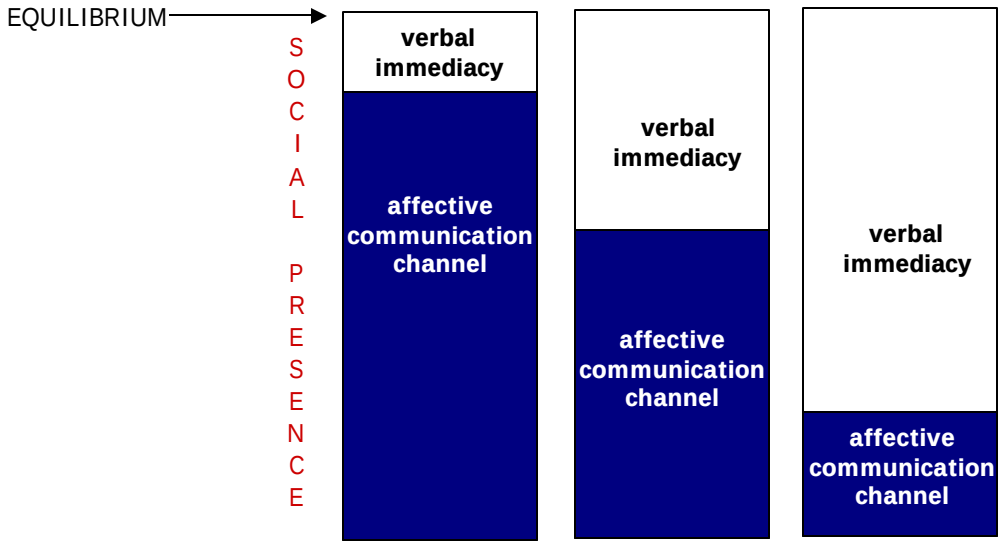

Figure 3
Equilibrium Model of the Development of Social Presence in Mediated Environments

Participants in the course discussions we studied seemed to employ more verbal immediacy behaviors then are normally found in traditional, face-to-face classroom discussions. In addition, the equilibrium model makes sense of the patterns of the use of affective, cohesive, and interactive immediacy indicators that were found in the discussion threads studied. We found that as the course progressed, cohesive indicators declined in importance while the importance of interactive indicators increased, a pattern that, we believe, relates to their importance at various stages of community building. Indeed, taken together, the raw numbers of cohesive and interactive indicators were not significantly different across modules. The use of affective indicators generally mirrored the general flow of the course discussions across time, suggesting that the maintenance of affective presence was integral to the maintenance of social presence.

Claims have been made linking teachers' immediacy behaviors in face-to-face classrooms with student learning. Although some scholars have argued that the lack of affective communication channels in computer-mediated communication leads to a loss of immediacy and a corresponding loss in learning, more recent research suggests otherwise. This study supports the latter research but tries to incorporate findings from media theorists by suggesting that participants in online discussions make up for the lack of affective communication channels by engaging in a greater number of verbal immediacy behaviors. It posits an equilibrium model of social presence to describe this view. It also provides evidence for the importance of interaction among classmates, in that students strive to develop and maintain it.

Of course, this research only looks at a single course thus it is impossible to generalize from it. While the research supports an equilibrium model, it does not confirm it. Future research should examine discussion in other course contexts to see if the model holds. In particular, it would be interesting to examine courses covering different subject areas and involving differing groups of students. In addition, research exploring the actual, real-time behaviors of students participating in online discussion might reveal more of what is happening in this emergent and fascinating medium.

Conclusions

The findings from our first study suggest that three factors are associated with the student perceptions of satisfaction and learning in online courses -- interaction with course content, interaction with course instructors, and interaction among course participants. The findings from our second study suggest some verbal immediacy behaviors that may support interaction among course participants. Support for students' interactions with content, instructors, and, in particular, with each other, clearly deserves the attention of online developers and instructors alike, and further investigation by the educational research community.

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Appendix

COURSE LEVEL	freshman / sophomore	74%
	junior /senior	18%
	graduate	8%
CLASS SIZE	< 10	31%
	11 to 20	51%
	21 to 30	14%
	> 30	4%
TEXTBOOK?	yes	92%
	no	8%
NUMBER OF MODULES	1 to 5	22%
	6 to 10	59%
	11 to 15	14%
	16 to 20	5%
CONSISTENCY	all modules have similar structure	10%
	most mods have similar structure	48%
	some mods have similar structure	34%
	no consistency among modules	8%
EXTERNAL LINKS	none	41%
	< 10	26%
	11 to 25	18%
	26 to 50	10%
	> 50	5%
INSTRUCTOR'S VOICE	first person	6%
	second person	36%
	third person	30%
	mixed	28%
INTERFACE/ GRAPHICS	dense text only	10%
	text only	20%
	text & graphic org.	44%
	Text, graphics & images	26%

Table 1: Spring, 1999 Course Design Features: Structure Frequency Data* (N = 73)

ASSIGNMENTS DUE	> every 15 days	8%
	every 9 to 15 days	18%
	every 4 to 8 days	73%
	every 1 to 3 days	1%
PERCENT OF GRADE BASED ON DISCUSSSION	none	18%
	< 10%	7%
	10% to 25%	49%
	26% to 50%	25%
	51 to 75%	1%
	> 75%	0%
PERCENT OF GRADE BASED ON PAPERS	none	63%
	< 10%	1%
	10% to 25%	14%
	26% to 50%	11%
	51 to 75%	3%
	> 75%	8%
PERCENT OF GRADE BASED ON OTHER WRITTEN ASSIGNMENTS	none	42%
	< 10%	6%
	10% to 25%	18%
	26% to 50%	23%
	51 to 75%	10%
	> 75%	1%
PERCENT OF GRADE BASED ON PROJECTS	none	71%
	< 10%	0%
	10% to 25%	11%
	26% to 50%	12%
	51 to 75%	4%
	> 75%	2%
PERCENT OF GRADE BASED ON QUIZES AND TESTS	none	43%
	< 10%	0%
	10% to 25%	16%
	26% to 50%	27%
	51 to 75%	7%
	> 75%	7%
PERCENT OF GRADE BASED ON COOPERATIVE OR GROUP WORK	none	87%
	< 10%	4%
	10% to 25%	7%
	26% to 50%	1%
	51 to 75%	1%
	> 75%	0%
PERCENT OF GRADE BASED ON OTHER ASSESSMENTS	none	86%
	< 10%	0%
	10% to 25%	6%
	26% to 50%	3%
	51 to 75%	1%
	> 75%	4%

Table 2: Spring, 1999 Course Design Features: Assessment Frequency Data* (N = 73)

INTERACTION WITH INSTRUCTOR	every 1 to 3 days	44%
	every 4 to 8 days	45%
	every 9 to 15 days	8%
	< every 15 days	3%
GAPS?	yes	64%
	no	36%
INTERACTION AMONG CLASSMATES	every 1 to 3 days	7%
	every 4 to 8 days	41%
	every 9 to 15 days	22%
	< every 15 days	19%
	never	11%
REQUIRED PARTICIPATION IN DISCUSSION	every 1 to 3 days	4%
	every 4 to 8 days	53%
	every 9 to 15 days	12%
	< every 15 days	18%
	not required	13%
AUTHENTICITY OF DISCUSSION	extremely authentic	18%
	very authentic	48%
	somewhat authentic	22%
	not authentic	12%
AVERAGE LENGTH OF DISCUSSION RESPONSES	no discussion	8%
	< 5 lines	14%
	5 to 10 lines	59%
	10 to 20 lines	18%
	> 20 lines	1%

Table 3: Spring, 1999 Course Design Features: Interactivity Frequency Data* (N = 73)