

Understanding and Supporting Social Ability in Online Learning

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Abstract: The purpose of this study was to explore the social nature of online learning and examine how technology acceptance of a tool for notifying students about the activity of all students influences their perception of social ability and how social ability influences their sense of community and learning satisfaction. Qualitative data analysis using content analysis of interviews with students and quantitative analysis via path analysis of data from student surveys were undertaken. The findings show that technology acceptance of the notification tool positively relates to perceptions of subcomponents of social ability: instructors' and peers' social presence as well social navigation. Social ability also helps predict sense of community and learning satisfaction. Findings also show how students use and adopt tools and the ways in which their tools, including the notification tool, support their ability to be social and benefit from their social context.

Introduction

Allen and Seaman (2007) report that online enrollment has been increasing rapidly for the past several years in higher education. Compared to Fall 2004 with 2.3 millions students (18.2% growth rate) and Fall 2005 with 3.2 millions students (36.5% growth rate) who were enrolled in at least one online course, 3.5 millions students (9.7% growth rate) were found enrolled in at least one online course in Fall 2006. In 2006, 74.1% of public institutions of higher education identified online education as critical to their long-term strategy in sustaining learning (Allen & Seaman, 2007). Many positive reports of online learning success show its impact and potential, such as relative equivalence in test-result outcomes with face-to-face learning courses (Tallent-Runnels, et al., 2006) and provision of access for many students who would otherwise have to forego higher education. However, concerns remain about the quality of online courses (Yang & Cornelius, 2005; Hara and Kling, 2000) and advances are needed to improve the processes and assure quality in online teaching and learning.

One area of concern is faculty acceptance. In a survey of institutes of higher education (IHE) undertaken for the Sloan Foundation (Allan & Seaman, 2004) only 31% of Chief Academic Officers agree that "Faculty at [my institution] accept the value and legitimacy of online education," and in IHE with bachelors and graduate programs this percent has actually decreased from previous years. A second area of concern is student acceptance and the quality of learning activity. Although students appreciate the flexibility and convenience offered by online learning, students do experience difficulties (Wegerif, 1998) a sense of isolation (Abrahamson, 1998) and in general are more satisfied with face-to-face courses (Johnson, Aragon, Shaik & Palma-Rivas, 2000; Allen, Bourhis, Burrell & Marbry, 2002). In order to improve the acceptability and role of online learning in IHE system developers, researchers and online educators need to better understand the social nature of online learning and find ways to foster interaction between instructors and students and among students that are more social and engaging and that support cooperative and collaborative activity.

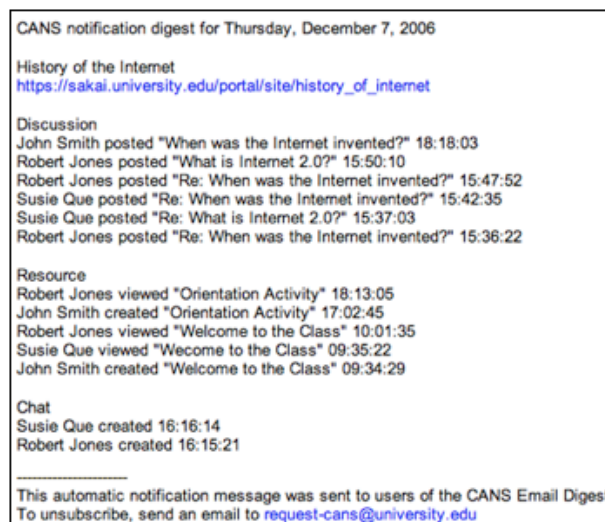
Social Ability and Activity Awareness in Online Learning

Today's approach to online learning is encapsulated in course management systems (CMS) of which Blackboard and Sakai represent popular applications. These CMS provide access to information about a course (syllabus, assignments, grades) and about the subject matter (instructional resources). They also provide some facilities for direct interaction through discussion boards and chat rooms. These approaches help manage the course but are very limited in how they help teach the course or support learning. In many ways the CMS is a black veil between the instructor and students and among the students. Faculty and students do not see each other working. The incidental learning that happens through working together, the social learning that happens through observing others, and the motivation to keep learning that happens because of a sense of shared social experience in a traditional classroom are greatly constrained online. Learning in CMS does not provide social attributes and cues that normally help motivate and tacitly shape face-to-face learning. Expert online instructors try to make up for these deficiencies with engaging tasks and emphasizing the social and collaborative nature of learning, but in general CMS are deficient in many of the cues that are important to engagement and for having activity help shape learning.

In the mid 90's a project team at MU developed an intranet system for schools called Shadow netWorkspace™ (SNS) intended to help poor and rural schools use network services such as file sharing,

discussion boards, and email, and do so within a secure environment. As SNS became operative we started to use it in our own teaching and project work. We complained amongst ourselves that it took too long to go into a course and look around to see if students had posted in the discussion board or uploaded documents, etc., so we decided to build a monitor that would show what had been recently done. Fortunately we created the Activity Monitor with links to the objects they referenced. In our own behavior and in those we observed in usage studies we saw users not only using the Activity Monitor to see what had taken place in the course, but also using it as a menu for linking to the objects. In short the monitor transformed the interface from one based on system structures to one based on social activity.

These early investigations led us to focus on the social nature of the online learning experience, examine current scholarship on social learning (Wenger, 1998) and social computing (Dourish, 2001), and develop a construct and instrumentation for assessing social ability in online learning. The social ability instrument has shown construct validity and predictive power for learning satisfaction and behavioral intentions (Laffey, Lin & Lin, 2006; Lin & Laffey, 2006). Additional studies have replicated these findings, determined predictive power for Sense of Community, and identified underlying factors (Yang et al. 2006; Tsai et al. 2008; Lin, Lin & Laffey, 2008). Our general definition of social ability is the person's capacity to associate with fellows and to use the members, resources and tools of the social context to achieve something of value, but the following sub-factors articulate the elements of this ability in online learning: social presence with the instructor (SPi), social presence with peers (SPp), Social Navigation (SN), Written Communication skills (WC), and Comfort with Sharing Personal Information (SI). Subsequent to the early work with the Activity Monitor, Chris Amelung, one of the doctoral students on our SNS team, developed an architecture and system for activity notification in CMS for his dissertation work, and the result was the first implementation of CANS (Amelung, 2005). In 2005 our academic unit also made the decision to retire SNS as our CMS and implement Sakai. Sakai is an open source collaboration and learning environment used by over 80 institutes of higher education as a CMS. CANS (Laffey, Amelung & Goggins, in press) works by monitoring activity in Sakai (the CMS for our courses) and providing notification about activity on a subscription basis to members of the courses. In our Fall semester 2007 instance of CANS with Sakai we provided a "daily digest" (see figure 1) of the previous days activity in the form of an email delivered to each student in the early morning of the following day. In the beginning of the semester this email included activity about what posts students and instructors made to the discussion forums, if messages had been made in the chat tool and what resources (files from students and instructors) had been uploaded to the course resources section. Later in the semester we enhanced these daily digests by also providing information about when posts were read and resource files were opened. In this way the daily digests served to keep students aware of the activity of the instructor and other students. We hypothesized that activity awareness would lead to an increased recognition of the role of others in the class, influence the social nature of the online course experience and improve student social ability.



CANS notification digest for Thursday, December 7, 2006

History of the Internet
https://sakai.university.edu/portal/site/history_of_internet

Discussion
 John Smith posted "When was the Internet invented?" 18:18:03
 Robert Jones posted "What is Internet 2.0?" 15:50:10
 Robert Jones posted "Re: When was the Internet invented?" 15:47:52
 Susie Que posted "Re: When was the Internet invented?" 15:42:35
 Susie Que posted "Re: What is Internet 2.0?" 15:37:03
 Robert Jones posted "Re: When was the Internet invented?" 15:36:22

Resource
 Robert Jones viewed "Orientation Activity" 18:13:05
 John Smith created "Orientation Activity" 17:02:45
 Robert Jones viewed "Welcome to the Class" 10:01:35
 Susie Que viewed "Welcome to the Class" 09:35:22
 John Smith created "Welcome to the Class" 09:34:29

Chat
 Susie Que created 16:16:14
 Robert Jones created 16:15:21

 This automatic notification message was sent to users of the CANS Email Digest
 To unsubscribe, send an email to request-cans@university.edu

Figure 1. A sample of a daily digest delivered via email.

Research Procedures

The study of social ability and the use of awareness information through email digests included (1) interviews with student participants for a qualitative examination of the social nature of online learning and the potential role of the daily digests, and (2) the use of surveys for a quantitative examination of how well levels of technology acceptance of the digests explain social ability and how well levels of social ability explain learning

satisfaction and sense of community. Interview participants were recruited by sending an invitation to all 125 students in the courses. A total of 20 students agreed to participate in serial interviews (a series of 3 interviews throughout the semester) and 18 students committed to participate in the final interviews. A total of 14 students participated in all three serial interviews (14X3=42), 5 students finished the first two of the three serial interviews (5X2=10), and 1 student completed only the first of the three serial interviews (1X1=1). Thus, 53 serial interviews and 18 final interviews were conducted.

Near the end of Fall semester 2007, a recruiting email with a link to an electronic consent form and survey instrument was sent to the full 125 students. There was a 67.2% response rate resulting in 84 participants who completed the survey via the Internet. The key variables for the quantitative analysis are Technology Acceptance, Social Ability, Sense of Community and Learning Satisfaction.

Technology Acceptance. The Technology Acceptance Model (TAM) (Davis, 1989) posits perceived usefulness (PU) and ease of use (PEU) as two key factors in the acceptance of new technology. Perceived usefulness is defined as “the degree to which an individual believes that using a particular system would enhance his or her job performance” (p. 320) and perceived ease of use is defined as “the degree to which an individual believes that using a particular system would be free from physical and mental effort” (p. 320). The TAM measures of PEU (6 items) and PU (6 items) were adapted to assess students’ acceptance of the daily digest used in the Sakai learning environment (for being aware of others’ activities in the online system and recognition that others were aware of your actions).

Social Ability (SA). A total of 30 items from the Online Learning Experience Study Questionnaire (Yang et al., 2006) were utilized to measure the five factors of students’ perception of social ability in online learning environments: social presence with instructor (SPi), social presence with peers (SPp), social navigation (SN), written communication skill (WC), and comfort with sharing personal information (SI).

Sense of Community (SOC). Sense of community is defined as “a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together” (McMillan & Chavis, 1986, p. 9). A total of 20 items from the Classroom Community Scale (Rovai, 2002b) were employed to measure students’ sense of community.

Learning Satisfaction (LS). Nine questions assessing students’ learning satisfaction and satisfaction with course materials and teaching in the online learning environments were taken directly from the Zone Experience Study Questionnaire (Lin, 2005). The original scale was developed based upon Hiltz’s (1998) and Alavi’s (1994) learning and evaluation scales.

Path analysis was employed to analyze the survey data for PEU, PU, SA, SOC and LS. Content analysis was utilized to identify and explore themes for how students’ experienced the social nature of their courses and for how the use of the daily digest and other social information shaped their behavior and perceptions. In the content analysis, a coding scheme developed by the research team based on the technology acceptance (Davis, 1989), social ability (Laffey, Lin & Lin, 2006) and activity awareness (Carroll, et al., 2003) was utilized to analyze both serial and final interview transcripts. A process was conducted to resolve different coding results and establish inter-rater reliability among five researchers. In the first stage of the coding, the researchers discussed their understanding of how to code the data based on the coding scheme. Later, researchers were assigned to review each others’ coding results and resolved different coding results until 100% agreement was reached.

Findings

Results from Survey Data

A path model was developed to examine the relationship of technology acceptance of the daily digest to social ability. In the path analysis, the Wald test for dropping parameters was employed, and paths were dropped if they were not statistically significant ($z < 1.96$, $p < .05$) and the chi-square (χ^2) change was smaller than 3.84 ($\chi^2(0) = 3.84$; Kline, 2005). During the process of Wald tests, five paths, including PEU to SPi, PEU to SN, PU to SI, PEU to WC, and PEU to SPp were dropped because of not achieving significance. After discarding the non-significant paths, a final path model with best model fit was found. Following the criteria for a good model fit (non-significant χ^2 value, CFI and TLI $> .95$, SRMR $< .10$, and RMSEA $< .06$) suggested by Hu and Bentler (1999), all of the criteria were met, suggesting that overall the data fit the model well.

In the path model (see figure 2), the correlation coefficients of the most direct paths range from .20 to .77, and are statistically significant at $p < .05$ or $.001$. The only non-significant direct path is the relationship of PEU to SPp. This path was not dropped from the model because the chi-square (χ^2) change is greater than the standard of 3.84 ($\chi^2(0) = 3.84$; Kline, 2005) for comparative paths. The R^2 s means indicate that approximately 13% of the variance of SPi, 12% of variance of SPp, 9% of variance of SN, and 6% of variance of WC are explained by students’ perception of usefulness of the daily email digest. Additionally PEU accounts for 46% of variance of PU. These findings show that learners who find the social information provided in the daily digest

useful have a stronger sense of presence with the instructor and peers and a better ability to use social information to make choices about what to do (social navigation). Additionally the learners who find the social information useful also have less concern for their own written communication skills.

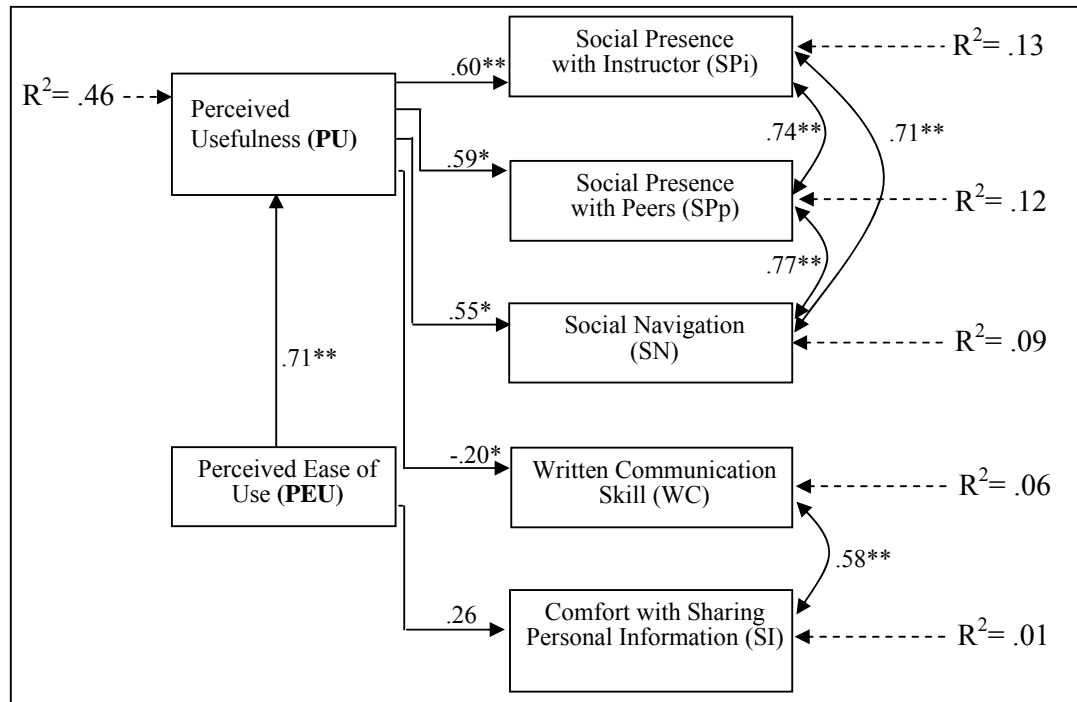


Figure 2. First Path Analysis Model (Set 1) with R^2 Values (* $z > 1.96, p < .05$; ** $z > 3.29, p < .001$ statistically significant; \longrightarrow represent significant direct path, \longleftrightarrow represents significant correlation paths, $---\longrightarrow$ represents variance explained)

Given the result, that the usefulness of the daily digest provides significant predictive power for some sub-factors of social ability a second analysis was undertaken to examine the relationship of SA with Sense of Community and Learning Satisfaction in this cohort of students. In the path analysis, the Wald test for dropping parameters was employed, and paths were dropped if they were not statistically significant ($z < 1.96, p < .05$) and the chi-square (χ^2) change was smaller than 3.84 ($\chi^2(0) = 3.84$; Kline, 2005). During the process of Wald tests, four paths, including SI to S, SN to SOC, WC to S, and SPp to S were dropped because of not achieving significance. After discarding the non-significant paths, a final path model with best model fit was found. Following the criteria for a good model fit (non-significant χ^2 value, CFI and TLI $> .95$, SRMR $< .10$, and RMSEA $< .06$) suggested by Hu and Bentler (1999), all of the criteria were met, suggesting that overall the data fit the model well.

In the final path model (see Figure 3), the correlation coefficients of the most direct paths range from .15 to .79, and are statistically significant at $p < .05$ or .001. The R^2 s means indicate that approximately 46% of the variance of satisfaction is explained by students' perception of SPi, SOC, and SN. Also, members' perception of SPi, SPp, WC, and SI contribute to explaining approximately 64% of the variance of members' sense of community. However, the variance in SOC explained by WC and the variance in S explained by SI were non-significant. These results indicate that the role of SPp in S is at least partially moderated through the relationship of SPp with SOC and that SPi (within this model) has a strong influence on S. Overall the model provides significant explanatory power for both SOC and S in online courses.

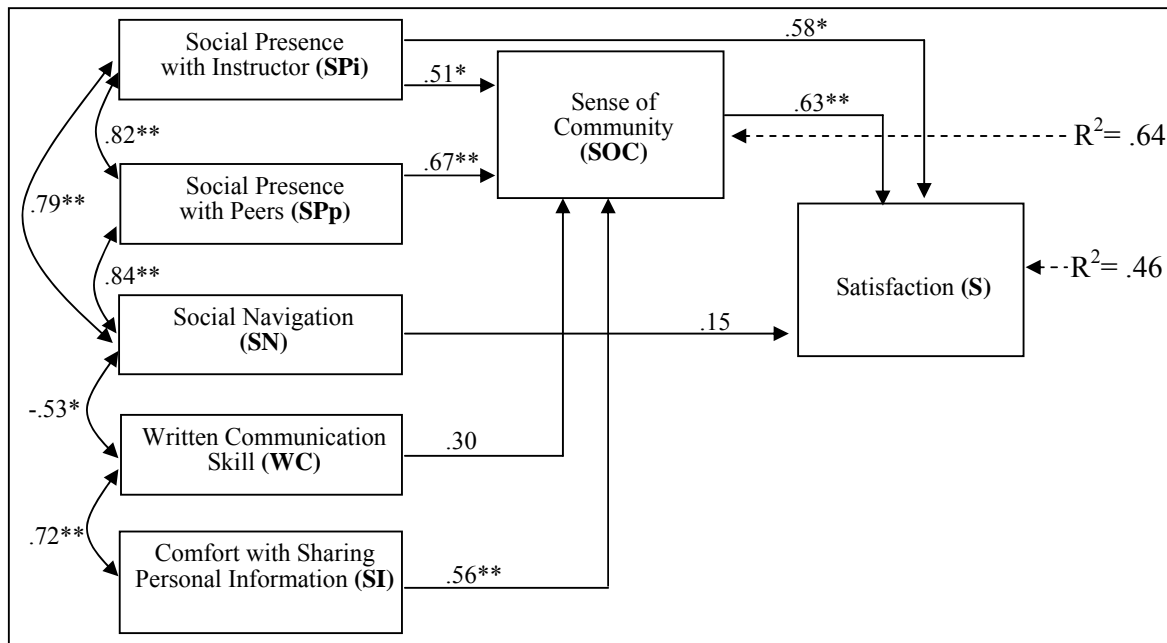


Figure 3. Second Path Analysis Model (Set 2) with R^2 Values (* $z > 1.96, p < .05$; ** $z > 3.29, p < .001$ statistically significant; \longrightarrow represent significant direct path, \longleftrightarrow represents significant correlation paths, $---\blacktriangleright$ represents variance explained)

Results from Interview Data

The purpose of the content analysis for the serial and final interviews was to examine (1) members' perceptions of being in an online course and (2) how they adopt or appropriate the social awareness information delivered by daily digests as well as the other Sakai communication tools used to socially interact with others in the online learning environment. Three themes were identified for better understanding students' social ability in online learning.

The first theme is that students take social awareness information from a variety of tools (discussion board, social presence tool, chat room, and daily email digest) in their online course and use that information for making decisions about what to do (social navigation). Much of the work of the online courses is represented in discussion board postings and students described searching the boards to answer questions they might have by finding other students who had similar questions and if an answer was posted regarding that question. Also, students expressed a high interest in viewing others' work and comparing it with their own in order to determine how well they were doing on an assignment or throughout the course. If that student felt their work was subpar, the comparison would often motivate them to try to improve their work. Some students also analyzed other students' work to improve their understanding of course content. Interviewees described looking at others' responses to assignments as helping them get a better feel for the course topics or skills to be undertaken. In some ways the students use of discussion board, albeit asynchronously, parallels the incidental learning we anticipate happening in a classroom where awareness of what others are doing and saying shapes activity and impacts learning. Even when an instructor may be using the discussion board simply for the students to report their work to the instructor other students are paying attention and using the information to guide their own behavior and learning.

"I guess that's part of the online experience, because you can gain information from people without really asking them questions. Because you see their questions, and by looking at their questions, that answers other questions that you would have had...It's like this constantly growing body of work out there that you have reference to. If you're reading a discussion board, you're learning as you're reading other people's questions."

"Well when I'm doing a project and I get lost then I just research through the discussion boards and see if the subject has already been brought up, and so far it has. Everyone seems to be kinda having the same difficulties."

"...The history that's kept on the discussion board kind of gives you an idea who's there. I guess, I mean there are certain people who I know by looking at the board they post a lot. It's

good to know who those people are, because if I have a question, that history that's posted on the board gives me a pretty good indication of the type of person who would be willing to help if I did have a question."

"...I looked at their [projects] after they had been turned in...I did look at other peoples', what they turned in afterwards. And yes, I sometimes felt like, 'Oh, my goodness, I have to step it up a little bit.'"

"Well, it helps to know what other people are doing so you can gauge your work. I mean, so you would know, OK, I'm not really stepping up enough. Other people are doing a little higher level work than I am."

Sakai also includes a social presence tool which informs members while logged in of other course members who are also logged in. The tool does not provide any mechanism for interaction but provides information about presence. Because of this tool students were aware of the number of people and which members were online, and used this information to make judgments about the likelihood that their questions may get answered in a timely manner. The high participation students were the ones who mentioned utilizing the social presence tool for making inferences about how long it might take to get questions answered. The following comments show the importance of seeing the instructor and other class members' participation, both through the Sakai social presence tool as well as through postings on the discussion board.

"It's helpful when I get online to be able to see if I see the instructor or aide is online. I know if the aide is online, there's a good chance if I do post a question I'll see [an answer] right away."

"...when I log in I can see who's in there. And usually I'll see the instructor or I'll see the teaching assistant. Somebody will be on while I'm in, because you can see them. So I know they're there and they know that I'm working."

"If [other students] are online at the time, then that's my first resource, my first resource is to ask the others. But if they're not online, then I don't post because if they're not online I'm going to go to a third party resource like Google."

Although our direct interest was in if and how students used the social information from Email Digests for awareness, navigation and decision making, the above comments show that students are industrious in finding social information in many ways. The students report using the Email Digest to track instructor and other class members' actions. Some interviewees also emphasize that they value the instructor's social presence higher than the presence of other class members as well as distinguishing among their peers.

"Before...before the e-mail digest I may have gotten a grade for...for a module, but that gave me no feedback that they even read my stuff, you know. Well I knew they [the instructor and TA] graded it but I didn't know if they even read it, you know,...in high school you would get a paper back and you have a grade on it, and you have a hundred but you don't even know if the instructor read it or not. The thing [about email digest] I like too, which was nice, was the time tags. I could tell when the student was browsing through the assignments because they were only there for thirty seconds. Now if the student really reads the assignment and instructor reads the assignment, they might be there two or three minutes to really read your assignment. Time tag is what I looked at a lot to see how long someone was reading my assignment. Now if the instructor read my assignment in ten seconds then I would get the feeling that, well maybe he didn't really read to get an understanding of my assignment....well, two things...I can identify people that just browse through all the assignments based on very quick contact, and...remember I told you [interviewer] that there were a couple of students, I really liked their work and I knew that they were really working. And when I went to the digest I saw that they would look at my stuff and I would go look at their stuff too. So that was kind of a feedback that I was having my work viewed by my peers."

"Um, usually in this class, usually if it's something from the professor or the TA, that would get me to the site quicker than anything else to check and see, you know, because the professor has a couple of times changed a due date or modified an assignment, and so it does

behoove me to get there quickly and find out what, you know, what exactly he has posted, you know, what kind of changes to..."

"Anything that [the instructor] posts or any time there's something in the digest that she [the instructor] does, I always go look at it...I want to make sure I don't miss anything. I'm not really concerned about whether or not she's looking at my posts or anything like that, because I assume she is...I'm really more interested in what information she's providing to us."

Students also perceived the social presence of group members involved in collaborative learning tasks as more important than other students. They used tools differently when working in group or in individual work. During group work the Email Digest was used to carefully monitor group members' activity, especially "Read" and "Open" actions were used to keep track of group members' participation and contributions. The "Read" and "Open" actions enabled them to see if their group members were participating by reading threads, opening resources and instructions, and doing some of the essentials in the timely way needed to be a functioning and knowledgeable member of that group.

"Well I can use it to track the progress to see who had actually done the readings, who had actually opened the assignment. So I knew from early on that one person was and one person wasn't. So she and I began to talk because we knew...we could see that he wasn't doing things and so she and I decided...we sent e-mails, we would post stuff and he is not responding so we are going to go ahead. We drafted the projects that needed to be done and we said hey can you take a look at this, can you participate, or whatever. The thing is with the e-mail digest we could tell if that was going to happen."

"We had someone in our...there were three people in our group...and one guy just didn't participate at all...I would look at the e-mail digest to see if John [group member who did not participate] had even logged on or looked at anything honestly. I don't think he was. I could tell, he would say I am going to do this or that, and I would look at my digest and see if he had even opened it yet."

"...for the most part what I've used the e-mail digest for is when I'm doing group work and when I'm trying to, you know, get a sense of, you know, where my partners are...cause I think you can use the e-mail digest with some fair degree of accuracy as to...I mean, if you know what to look for you can kind of tell where they are in the project...You can see if they are looking at other people's assignments to get an idea of how to do it. You can see when they have posted their assignments and things like that, so for group work I think it's great."

The most frequently mentioned value of the email digest was simply to remind the student of the class. For people who were away from Sakai for a few days, the email showing up in their mailbox, whether a student read it or not, served a purpose to remind them that they had the class and there was activity going on. Another commonly mentioned value of the email digest was to serve as a general indicator of the activity level in the course. When the list of activity was short, students would often see that as an indicator that there was not much activity and therefore there probably was not anything important going on. However, if the list of activity was long, students would see that as an indicator that something more important might be happening. Many students also use the activity level presented in the daily email digest to decide whether to log into Sakai. If they perceive a high level of activity which suggests they should take a look at what is going on, they log into Sakai right away. Also, the information in the email digests helped students locate interesting topics or information efficiently. The following students addressed how they utilized activity awareness information to accomplish learning tasks and how they perceived the usefulness of having the Email Digest.

"When you're not assigned in specific groups with people, you don't always go look at their work like you should, and with CANS [Email Digest] I would always see who's posting what and I would be like ooh that looks really good, I want to go look at that. And so it was kind of a prompt to make me go back to the site and look at other people's work that I wasn't really assigned to look at but I still wanted to go look at it."

"It [Email Digest] reminds me that, 'Hey, I am in this class.' I don't actually go to class at a set time, so it's mostly just a daily reminder to me that I am enrolled in this class...It keeps me from going three weeks without logging on, just forgetting that I am in the class."

“...If I have noticed that people have posted something in response to my project or something, I would go in and look at what they posted.....it helps you keep up-to-date with what’s going on in the course. It’s kind of a little brief reminder or recap of what’s going on in the week.....We don’t have face to face meetings so it’s a good reminder of the class itself.”

“Well one night when I logged into my email I had all the CANS notifications, and one of them was someone had replied to something that I had written and I wanted to go to see what that person had said. And so I went straight to that post and instead of sitting there and clicking through every single post, I went straight to that post and responded directly to that person. It’s much quicker.”

“I guess one thing it would do when you see what people are opening, maybe there’d be something there that was something new to you or something you hadn’t noticed and you go oh okay, well these people are opening these different topics and maybe that jogs your memory, oh okay we had a reading on that topic or there was a discussion about that, and maybe I’ll go check that out. That reminds me that that was there, so I can see how that would be useful... I think it [Email Digest] encourages some communication. Quite honestly, in the end what it showed is every discussion board that anyone would open, and what I noticed were a lot of people opened and read the messages, but they didn’t necessarily leave a comment, and it surprised me because specifically on mine, if you have no comments and responses, not just my own but other people, you sort of have the feeling that no one is reading it or looking at it, and it surprises me how many people are opening it and reading it. So I thought that was actually good because there was more of a sense that oh it is getting more attention from, you know, people are reading different people’s posts than what it would appear to be.”

“Sometimes it’s an annoyance because I’ve been in the site, so getting that [Email Digest] is just annoying. But other times, like whenever I’m gone for a couple of days, you know, having the digest is really helpful to get me connected back into the class. Like this is what’s happening....So it kind of...it kind of gives me a quick glimpse of what’s been going on in the class before I actually jump back into the site and it helps direct me where I can look and i can see, ‘Ok, this announcement was posted.’ and I can prioritize from reading that.”

“In terms of meeting deadlines and things like that...I think the digest gives a big picture and helps me pace myself...It helps me manage my time in that I know what new stuff has been put up.”

Discussion

The results of path analysis show the strength of relationships among factors of technology acceptance and social ability as well as relationships among social ability and sense of community. In this setting we found that students who accepted the Email Digest as useful reported higher levels of social ability. However, the correlational nature of the quantitative data do not allow us to rule out the possibility that the direction of the relationship is that students who perceive higher levels of social ability are more likely to accept the Email Digest. In fact, our qualitative data suggest that there is likely to be an inter-play between the sense of usefulness and the sense of ability. We speculate that the two may create a provident cycle, but that speculation will require further study to confirm and better understand. It is also clear in the data that having social ability is associated with a sense of community and learning satisfaction. Triangulating the qualitative and quantitative data make the case that providing social information in a systematic and rich way as in the Email Digest has benefits for online learning. The social information is valued and used by students to keep track of their instructors, to support collaborative learning, to do social comparisons that may push students to more work, to participate more regularly and more efficiently in the course, and to appreciate some subtle aspects of the social nature of online learning, such as reciprocity with peers and an appreciation that others are reading your work. These uses and values contribute to the students’ sense of social ability and relate to sense of community and learning satisfaction.

The results of the content analysis show how students use and adopt tools and the ways in which their tools, including the Email Digest, support their ability to be social and benefit from their social context. Similarly, the content analysis articulates ways in which students experience a sense of community during their online learning. Students’ social navigation is impacted by the information available in the tools supported by the Sakai system. Students appear to be quite ingenious and enterprising in finding social information in the content information, such as discussion boards, of the course. Additionally, throughout the courses students are

developing assessments of others and establishing their own reputations. Getting to know others and establishing relationships with class members were found to be influenced by awareness of others actions as well as from the content they shared within the course. From reading others' messages and having access to others' activity notification information, students developed a sense of connection to other students and an appreciation for others' presence. For example, students build their reputations online through active posting and helping others. Other students notice that those that post frequently and provide many answers can also be a trusted resource for questions they may have in the class. When a student sees these high reputation students reading one's posts it may enhance their own sense of their reputation in the course and draw the student from the course periphery to feeling like a core member.

Of note is that students perceive and value social presence with the instructor and with peers differently (Tsai, Yang, & Laffey, 2008). For many students, knowing the instructor is an active participant in the class is very important to them. Being aware of the instructor's actions and activities (teaching, reading, commenting, announcing, grading) was a common concern of most students interviewed and the email digest proved to be comforting as it provided a reliable and efficient way for tracking the instructor. In the interviews, students mentioned the importance of a general awareness of instructor activity and participation. For example, while some students mentioned keeping track of higher-reputation students posts or replies to their own posts via the daily Email Digest, almost all students reported looking for details about instructor activity. Additionally, use of the Email Digest and access to social information was shown to shape student behavior. When students noticed instructor activity, high levels of other student activity, concentration around certain resources (such as many students reading a particular resource), something deemed important (such as a high reputation student replying to one's posts), or just a reminder that they were enrolled in the course, they were often spurred into logging into Sakai or taking some particular actions. The quantitative findings show strength in the relationships of using the Email Digests, having a sense of social ability and developing a sense of community. The qualitative findings show the variety of ways in which these relationships may form and suggest that notifications of social information may be improved by customizing the notifications to the nature of the course tasks (more or less group work) and individual differences (highly active versus less active students). Similarly some students may value some forms of information while others find it only to be noise. Additionally we need to be cautious about unintended negative effects such as using social comparisons to decide to do less work than one might without the information and concerns that students may have about the privacy of their actions. We find our results confirmatory for our efforts to provide more and systematic social information to online learners, but the results show a need for more customizability of how the Email Digest. The results also suggest that while the Email Digest, as an external tool (it is delivered via email and is not part of the experience of being in the course site) has value, there is also potential for better supporting awareness within the course site. Further design and development work and new research is needed to explore how best to provide activity awareness within the course site.

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