Social Nature of Online Learning in Sakai

Social Computing Research Group
School of Information Science & Learning Technologies
University of Missouri-Columbia
Columbia, USA
LaffeyJ@missouri.edu

Abstract: This study explored the social nature of online learning in a computer management system (CMS). Based on Wenger's (1998) social theory of learning and an awareness framework for online collaborative learning proposed by Carroll et al, (2003), a four-lesson sequence of course interaction was studied in an information experience laboratory to better understand usability and social ability in online learning. Two participants were observed as they engaged in an online simulated experimental course implemented in Sakai and recorded with Morae. Coding focused on what and how awareness information interacted with intentions and influenced actions. The findings from this study guide us to recognize the importance of awareness information for supporting the participation and contributions needed for social learning in online learning, the need for sensitivity to individual differences, and the need to fit awareness information to the users and task requirements.

Keywords: social ability, interaction, awareness

Introduction

Online learning, as represented by distance learning courses as well as hybrid courses that provide traditional classroom instruction augmented by online experiences, has gained wide use and become an important part of higher education. A report released by the U.S. Education Department's National Center for Education Statistics (NCES), showed that in the 2000-2001 academic year over half (56%) of the nation's two-and four-year degree-granting postsecondary institutions offered online courses with over 3.1 million enrollments (Tabs, 2003). At the University of Missouri-Columbia (MU), nearly a thousand courses – representing approximately 22,000 student enrollments– use online course management tools each academic year. In the Fall 2005 semester, 83% of all MU students had at least one course that included the use of a course management system. However, while there has been a substantial increase in the use of online learning and students express appreciation for the flexibility and convenience offered by online access to courses, studies show that students prefer to learn in traditional classrooms (Klesius, Homan, & Thompson, 1997; Kleiner, 2000).

A key reason for the preference and a limitation that must be overcome in order to sustain and grow the use of online learning in higher education is that education is a social activity and that while online learning systems have succeeded in creating information spaces they still fail to create adequate social places for learning. Kleiner (2000) found numerous reasons why students prefer traditional education. Their choices were not directly related to the learning process but represent their preferences for the social interactions inherent in face-to-face learning environments. In addition to the need to better support social interaction for bringing about learning satisfaction and acceptance of online learning, social interaction is a key part of the educational process. In their review of classroom interaction research Kumpulainen and Wray (2002) identify the importance of the quality of social interaction to learning outcomes and argue for attention to how the patterns, content and context of interactions support or challenge learning. They highlight how learning arises both from guided participation by a more capable other and, incidentally, through collective peer activity.

Wenger (1998) developed a social theory of learning based on an understanding of how cognition is situated in a social context that provides a framework for understanding the role and importance of the social nature of learning. The social theory of learning shows how learning takes place through participation and engagement in certain activities with others in the community. Wenger argues that learning is a reciprocal process of identity formation and

meaning negotiation with and through active participation in a social practice. Participation with others provides shared perspectives and resources for sustaining engagement in activity. Thus, the social nature of the experience is both a key motivation and a method for engagement.

The Social Nature of Using a Course Management System

The University of Missouri-Columbia became a member of the Sakai partnership in 2005, and has been exploring how best to deploy and use Sakai to support online and hybrid courses. Sakai is a web-based, open-source environment for course management (similar to Blackboard and WebCT), but it allows for greater online collaboration (http://www.sakaiproject.org). Like other course management systems (CMS), Sakai has limited support for awareness information, which is important for productive online collaboration. However, because Sakai is an open source application it can be modified by its community. Following from earlier work exploring the social nature of online learning and the need to understand and better support social ability in online systems, we have developed a Context-aware Activity Notification System (CANS) (http://cans.missouri.edu/) (Author, 2005a) that can be used to extend the social ability and user interaction capabilities of online systems. As part of a design research effort to integrate CANS and Sakai we undertook a study of usability and social ability to identify how users experience course interaction within Sakai and to what extent Sakai supports the social nature of those course interactions. Using awareness information to improve the social experience of online learning in Sakai is a long term design research effort, and this report describes important steps in this work.

Framework for the Investigation

The work reported here is a usability study with a focus on social ability and the social nature of user activity. (Author, 2005b) demonstrated that social ability as defined as social navigation, presence and connectedness was a significant predictor of learning satisfaction and behavioral intentions in online learning. By social ability we mean a person's capacity to associate with fellow online group members and to use the members, resources and tools of the social context to achieve something of value. Social navigation is a key part of social ability and is closely associated with awareness information. Awareness is defined by Dourish and Bellotti (1992) as "an understanding of the activities of others, which provides a context for your own activity" (p. 107). Awareness has been operationally defined and used in numerous ways (Rettie, 2003). Carroll et al. (2003) studied awareness breakdowns in collaborative activity and provided a guide for how to observe awareness in learning activity. They examined how middle and high school science students used the tools of the Virtual School online environment to collaborate on a variety of group projects and science experiments. Moving beyond concerns for awareness in strictly synchronous online environments, they identified three different types of awareness information for productive synchronous and asynchronous collaboration: social awareness ("who is around"), action awareness ("what is happening to objects"), and activity awareness ("how are things going on"). Additionally an international standard provides guidance on usability and defines it as the extent of product effectiveness, efficiency and satisfaction in a specified context of use (ISO 9241-11). For our study the "context of use" is the social nature of course interaction. Artifacts, scripts and procedures were developed to make that context of use as authentic as possible is the test setting.

Research Questions

The key research questions of the study are:

1. How do users experience course interaction and develop their usage of Sakai?
2. In what ways and to what extent is the experience of course interaction in Sakai social?
3. How is social ability supported during course interaction in Sakai?

The purpose of this study is to describe how students experience their course when it is mediated through a CMS, specifically Sakai, and to serve as a basis for designing and developing new mechanisms to support awareness and social ability in Sakai.

Method

Participants

For this study, subjects were recruited from a science methods course. One male and one female student volunteered and were given the code names of Mike and Cindy respectively. Both participants are currently majoring in Elementary Education. They use a computer and Internet on a regular basis. Cindy did not have any distance learning experience prior to the current semester, but has been using Blackboard and WebCT on a daily basis for approximately one month. Mike has similar experience to Cindy, but said that he knew Blackboard and WebCT very well and has been highly interested in using them.

Context for course interaction in Sakai

Since the pool of subjects was pre-service teachers' in science education, an online simulated experimental course "Teaching Science" was designed and implemented in Sakai to serve as the experimental context. The course site in Sakai consisted of nine main menu items: Home, Schedule, Syllabus, Assignments, Discussion, Announcements, Chat Room, Gradebook, and Resources. The home page provided the overview site information, newest announcements, discussion items, and chat messages. The schedule page contains a course calendar which was marked with important dates in the course. One researcher acted as a course instructor and two researchers acted as additional students. We implemented a four-session (per subject) sequence of activities in which Mike and Cindy's sessions was interwoven. In addition we did not give written scenarios to the participants, but we asked them to imagine that they were distance learners taking the Teaching Science course and to participate in this course just as they might in a real online course.

Procedure

Testing sessions were conducted in the University of Missouri Information Experience Lab. The equipment setup in the lab consists of two Dell Windows OS computers with Internet connections. The participant testing station was equipped with a Logitech webcam, a USB headset microphone, and a copy of the Morae User software. The Firefox web browser was used to access the Teaching Science course site in Sakai. To collect data on participants' use of Sakai we utilized the Morae software program from Techsmith. Morae is a comprehensive usability testing and analysis software program which enables the simultaneous capture of a user's keystrokes, mouse actions, audio comments and video of the user's facial expressions during computer interaction. In addition, the remote viewer of Morae installed on a computer in another room allows researchers to monitor the testing sessions remotely. For each session at least one researcher was present to assist participants to get started on the assigned tasks for that session. Participants were asked to say out loud what they were thinking while engaged in the simulated course activities and to talk about what they were attempting to do. Brief semi-structured interviews were conducted immediately after each session.

Each subject carried out a series of simulated course-related activities in Sakai within a two-week period. The course activities included: 1) an orientation activity to explore various tools in Sakai, 2) a "get to know you" activity to meet classmates and find a buddy for peer review of the lesson planning assignment, and 3) a lesson planning assignment which required proposing a lesson planning idea and to then provide feedback on their buddy's idea. These assignments were posted to the course site as appropriate for each of the 4 sessions. The sessions varied in length from 11 minutes to 53 minutes depending on the activity of the subjects. The two subjects worked primarily asynchronously with the exception of one synchronous session when the participants logged into the course site at the same time in separate rooms.

Data Analysis

Researchers used the Morae Manager software to record mouse movements and actions from the screen capture as well as to listen to participants' think-aloud statements, and view their facial expressions while making coding decisions using the coding template outlined in Table 1 below.

Following from Carroll et al's (2003) awareness framework and Hillman et al's (1994) interaction model, the coding

scheme for the awareness information category was developed. The coding scheme for awareness information consists of four different types of awareness information: *social awareness*, *action awareness*, *activity awareness*, and *tool awareness*. First, social awareness information refers to who is available to interact with at the moment. In our study, we identified two types of social awareness: instructor-presence awareness (IPA) and peer-presence awareness (PPA). Second, action awareness information represents what is going on with objects that participants care about. Knowing who is initiating or revising an object such as a discussion post or a resource item can be useful for online collaborators in order to be aware of others' contributions and to make decisions for their own responses to the action. In our study, action awareness information had three codes: instructor-task awareness (ITA), instructor-contribution awareness (ICA), and peer-contribution awareness (PCA). Third, activity awareness information represents a concern for participants' and fellow students' working processes. We assigned a code of my work process awareness (MWPA) for one's own work process. If a person is aware of or wants to monitor peer work processes, a code of peer work process awareness (PWPA) was used. Finally, tool awareness information represented an awareness of the availability of tools that enable certain actions.

Seven researchers developed the coding template (Table 1), discussed how to code the data, undertook trial coding sessions, and reviewed the coding scheme and decisions with colleagues. Then each researcher completed coding of one or two assigned sessions. As part of the initial process of insuring consistent coding across coders, all researchers reviewed a coding example that represented two researchers coding the first five minutes of the third session of Mike. Once the coding was completed and reviewed the researchers developed a set of observations that stand as key findings from the usability test. These findings are described in the results section.

Awareness Information	Intention	Action		Result	
		Where the subject is	What the subject does	What happened (o): Researcher observation "": Subject verbalization	Problem/ Solution/ Feeling
ITA [announce-ment menu]	Want to know the detailed instructions of the Mini-Project 1	Teaching Science Site > Assignments	Read the Assignment Title.	"Ok, Assignments. Here we go."	

Table 1. Coding Template and Example Code

Results

How do users experience course interaction and develop their usage of Sakai?

Influence of Prior Experience/individual differences in establishing usage of the Sakai

Since both participants have used a computer and Internet on a regular basis, they drew on their prior knowledge and experiences to help them quickly figure out things they could or could not do in Sakai. Both Mike and Cindy had expectations for how the system should work based on their prior experience of using web browsers and other course management systems. They were frustrated when their expectations and experiences conflicted. For instance, when Mike saw other users' names displayed in the "Sakai users present" window during his first session, he put the mouse over the name and clicked on his mouse several times in the belief that his actions would show more information about the person whose name appeared as *present* such as their contact information or a detailed user profile. Another example can be found in Cindy's interpretation of certain terminology used in the discussion board in Sakai. Sakai discussion board structures conversations into categories. In each category, discussion participants can either reply to a topic using the Reply to Topic button or reply to other messages using the Reply to Message button. When replying to a message in the discussion board, Cindy expected that using Reply to Topic would send a private message back to the person who wrote the message and using Reply to Message button would display her message publicly in the discussion board based on her experience using WebCT.

As they gained more experience with the course environment in Sakai, Cindy and Mike started adapting to the

environment. For example, through trial and error both participants figured out that screens persisted when they left the mode and then returned to it instead of refreshing the screen back to a default status. This characteristic of Sakai began to influence how they used features of the Sakai course site. Mike preferred to move back and forth to read the assignment instructions on screen while he was working on tasks rather than printing out the assignment instructions. Not surprisingly, individual differences were observed in how long it took participants to adapt to the course environment. In comparison with Mike, it took more time for Cindy to get familiar with Sakai. For example, she was still confused with the features on the Assignments tool and failed to submit her work even in her second session, while Mike figured it out quickly with no apparent confusion. Cindy also had difficulty navigating back to the entire assignments list after viewing a single assignment.

> *Cindy said, "The semester project…… if I can access it, but I can't….The current assignment is the only thing I see listed."*

Awareness Information

Participants paid considerable attention to tool awareness during the first and second sessions. When they saw a new tool, they tended to explore it in order to figure out how they might use it. Mike enthusiastically explored the functions of the system. During his experiments, he figured out how he could change the discussion board view from row layout, which is the default setting, to column layout. He also figured out how to change the Calendar view from Calendar by Week, which is a default setting, to List of Events and felt that this view was better than the default setting. Having made changes to two areas of the interface, it became his habit to change the default views on other views to make the environment fit his preferences. In contrast to the first or second sessions when the participants were highly influenced by a new tool awareness information, they started paying more attention to the instructor's task awareness information and the instructor's and peers' contribution awareness information in later sessions. In addition to the action awareness information, they often expressed that they wanted to have activity awareness information for both their own work process and fellow peers' work process information. For instance, Mike wanted the status information in the Assignment menu to more synchronously monitor his work process.

> *Mike said, "I still see my status as Not Started. So I am not sure whether it is monitoring my progress or I have to set that somewhere……Oh. I can save a draft which almost likes change my status……I've noticed that it's not my status showing up in progress. But it popped up when I entered some generic text into the assignment submission…"*

In what ways is the experience of course interaction in Sakai social?

Influence of Peer on a User's Behavior

Peer presence awareness and peer contribution awareness were found to influence behavior in the simulated online course. Cindy liked to check how other students did the tasks when she noticed peer contribution information such as a new post by her peers. Cindy would often read Mike's posts first and then create her own post, and commented; *"Because the first thing I did was to see what Mike had to say so that I know how to respond."*

Peer presence information also influenced behavior during problem solving activity. When Mike and Cindy encountered unexpected results, they had several strategies for figuring things out: trying the function several times until they understood better how it works, seeking more information within the system, or asking help from others. The participants seemed to prefer to ask help from other peers when they knew fellow students were online. For example, Cindy went to the Chat room directly when she saw Mike online and posted a question asking for help. When there was no peer present, she did not want to leave a question on either discussion board or chat room because she did not want to wait for responses. Instead, she adopted an exploratory method to figure out how she could add a new item in the resources page.

By using the chat room, Mike provided guidance to help Cindy on the task. More importantly, they worked together and constructed/negotiated the meanings of the task. To complete the task, they also developed a strategy to coordinate the work by dividing the workloads. Using the chat room as a main medium to communicate with each other, they came up with the final decision and product.

From their discussion in the chat room,

Mike (11:08 am) :sorry posted that twice. At this point, because both parts 1 & 2 are only worth 5 points each I say let just keep working together and for Peer review we will just review and build upon what we have already done. What do you think.

Cindy (11:09 am) :The lesson could include a lesson on creating flashlights using batteries or having the students brainstorm to create something that is interesting them that could be powered using batteries. This lesson will lead to inquiry about circuits, energy, etc. All things that will dictate what the next lesson is by what the students are interested in.

Mike (11:09 am) :good idea I'll build on that

Influence of Instructor on User's Engagement

Both participants found the course more enjoyable when they received a prompt response from the instructor. For instance, Mike and Cindy misunderstood the Lesson Planning assignment as a group task and thus they worked together and posted a lesson planning idea as a group. When the instructor saw their result, she posted an announcement message, "Sorry for Confusion" right away and informed them that the lesson planning assignment is an individual assignment. When Mike and Cindy read the instructor's prompt message, they felt that they were more motivated to engage in the course work. Cindy commented, *"I think the professor is very involved…that makes me feel better."*

How is the social nature or social ability of course interaction supported in Sakai?

Influence of the Level of Visibility of the Information on User's Behavior

Visibility of information is a determinant of how influential it may be. In the second session, Mike posted a question to the instructor in the chat room asking about when he could get the lesson planning instructions. After the session, the researcher asked why he left the message in the Chat Room instead of in the Discussion Board. He said that he saw the instructor's message, "If you have any questions regarding the course, please don't hesitate to ask" in the Chat Room, even though he had seen the same message from the instructor on the Discussion Board. In Sakai the Chat messages are very prominent in the interface, and leaving a message in chat room required fewer button clicks than posting a message to the discussion board while leaving a more visible outcome.

Awareness Information Supported in Sakai and how it influences users

Both Cindy and Mike liked that the *user present pane* in Sakai lists the names of users present with them in the site and that they could chat together synchronously and asynchronously in the Sakai chat room. It seems that presence awareness information gives them a feeling of connectedness with fellow students and the instructor and influences them to be more socially interactive. When Cindy saw Mike's name in the user present pane in her second session, she visited the chat room several times in order to see whether Mike was in the chat room and available to talk. Mike also visited the chat room when he saw Cindy's name in the user present pane and then left a message asking for her to be his buddy for the lesson planning assignment. The following is what Cindy said about the necessity of real-time chatting for distance learners.

Cindy said, "I mean if you had to have a class completely online, it will be necessary to be able to talk to people……I think it's a necessary feature. I think it works very well. It's quick and you can kind of do it in real time. So I think it's nice."

The participants wanted more social information than Sakai provides. For example, seeing users' names in the user present pane is not enough social awareness information. Mike expressed his desire to see peers' profiles, pictures, and contact information to get to know the person better as they prepared to work together. In addition, both Cindy and Mike wanted to see how other students worked and were concerned with how fellow students could come to know that they had completed some work.

Mike said, "I can't click on the name here [User Present box], I can't see a profile. I can't get to know this person…..Like I see I have mine but I don't see how other people work…Just something simple, someone can post the picture, put a little information about themselves, contact information for them so I could call them outside the class."

To Whom Do Users Want to be More Visible/concerns?

Cindy had concerns about showing her work to others. After she posted a new message or a new resource, she always checked it out to make sure whether it was displayed properly. She also had a concern about privacy and security of her work. For example, she wanted to show her work only to the relevant person and asked for a way to send a private message to the person. In addition, she created a folder titled with her name and put all of her works to this folder to insure the work was properly credited.

Cindy said, "I think I need to add a new folder. I am going to post my assignment under the resources (while naming the folder with her name)."
Cindy said, "I am wondering if he can privately reply to me in a discussion forum or something to give me the paragraph. But I don't know."

Conclusion

Users' prior experience and individual differences were apparent in their usage of Sakai system. The participants were able to figure things out quickly when the system works as they expected or experienced frustration when there was a contradiction between what they expected and how the system responded to their actions. However, the frustrations were fairly rapidly overcome as the students adapted to and began appropriating the system capabilities. Social interaction and the desire for making the course experience social was a determinant in their appropriation. For example, when Cindy was confused with the Assignments tool and she saw Mike's name in the user present pane, she sought out help by posting a question in the chat room . Mike then provided guidance to Cindy through synchronous chatting.

The participants expressed a desire for more awareness information and more direct interaction through the awareness representations. Mike responded positively to seeing names in the user present pane but was frustrated when his action of clicking for more social information was fruitless. The participants also wanted to observe their own working progress synchronously as well as others' working progress and these capabilities are not currently well supported by Sakai. One aspect of social interaction seen in this study was that it led the participants off course through their "negotiating" that the lesson plan was a joint activity. They were brought back to the intended course of action by the instructor's intervention (another social act). Interestingly the negotiating and collaborative, off-course activity appeared to be a positive learning exchange. The example illustrates that good tools for work process support and for social ability can enhance online learning. In addition to having tools, attention needs to be paid to how social and activity awareness information are best represented. Students are empowered by having the information made visible, but for some students and some circumstances privacy or security issues may call for less or restricted visibility of information. In sum, the findings from this study guide us to recognize the importance of awareness information for supporting the participation and contributions needed for social learning in online learning environments (Wenger, 1998), the need for sensitivity to individual differences, and the need to fit awareness information to the users and task requirements. The next step for our group research study is to identify design approaches that better support awareness in online learning, are sensitive to individual differences and learning task requirements, and can be implemented in Sakai. We will explore how notification tools will influence social interaction and learning in an online environment in the context of real courses.

Acknowledgements

The authors are members of Social Computing Research Group and include Christiana Kumalasari, Piyanan Nuankhieo, Demei Shen, Xinxin Huang, Bosung Kim, I-Chun Tsai, Paul Turner, Chris Amelung, Pei-Ju Liu, , David Reid, , and Dr. James Laffey.

References

Author (2005). *A context-aware notification framework for developers of computer supported collaborative environments*. (Unpublished doctoral dissertation)

Author (in press). *Assessing social ability in online learning environments. Journal of Interactive Learning.*

Carroll, J., Neale, D., Isenhour, P., Rosson, M., & Strickland, D. (2003). Notification and awareness: Synchronizing task-oriented collaborative activity. *International Journal of Human-Computer Interaction, 58,* 605-632.

Dourish, P. & Bellotti, V. (1992). Awareness and Coordination in Shared Workspaces. *Proceedings of Conference on Computer-Supported Cooperative Work.*

Hillman, D. C., Willis, D. J., & Gunawardena, C. N. (1994). Learner-interface in distance education: An extension of contemporary models and strategies for practitioners. *The American Journal of Distance Education, 8,* 31-42.

ISO 9241. (1994). ISO 9141-11 DIS Ergonomic requirements for office work with visual display terminals (VDTs):- Part 11: Guidance on usability. Draft international standard.

Kleiner, C. (2000). Best graduate schools:Degrees of separation. *U.S. N&WR, 128*, 56-59.

Klesius, J., Homan, S., & Thompson, T. (1997). Distance education compared to traditional instruction: The students' view. *International Journal of Instructional Media, 24,* 207-220.

Kumpulainen, K., & Wray, D. (2002). *Classroom interaction and social learning. From theory to practice*. London: Routledge-Falmer.

Rettie, R., (2003), Connectedness, Awareness and Social Presence, 6th International Presence Workshop, Aalborg

Tabs, E. D. (2003). Distance education at degree-granting postsecondary institutions: 2000-2001 (NCES 2003-017). Washington, D.C.: U.S. Department of Education. Retrieved March 03, 2004, from http://nces.ed.gov/pubs2003/2003017.pdf

Wenger, E. (1998). Communities of practice: Learning, meaning and identity. Cambridge, UK: Cambridge University Press.