The Role of the Backchannel in Collaborative Learning Environments

Abstract: Students at UC Berkeley's School of Information Management and Systems have participated in a persistent, online "backchannel" chatroom during class for over a year. This paper describes the affordances offered by this technology for enhanced peer-to-peer and teacher-student interactions in a collaborative learning environment.

Introduction

Over the past year, leaders in education, academia, and mainstream media have discussed the role of the backchannel in presentations, conferences, and the classroom. Internet Relay Chat (IRC) is an online chat environment that enables groups of people to collaborate and chat from any physical location in the world (Harris, 1995; Dewes, Wichmann, & Feldmann, 2003). The definition of the term backchannel varies with context and usage. To some it suggests an intangible, clandestine community. To others, it suggests an empowering toolkit for participation, collaboration, and interaction. The central function of the backchannel is its use as a secondary or background complement to an existing frontchannel, which may consist of a professor, teacher, speaker, or lecturer. It offers a unique new communication medium, a novel toolkit through which students can create, identify, and filter new modes of learning.

The recent surge in interest has generated a number of conference-based case studies that attempt to study the implications of backchannel chats. Participants in these conferences expressed a wide range of opinions about the usefulness of the backchannel in context of the frontchannel discussion. A number of educators have similarly considered the effects of unrestricted wireless access in the classroom, some of whom have attempted to incorporate these technologies into their lectures and lesson plans (Anderson, Anderson, VanDeGrift, Wolfman, & Yasuhura, 2003; Campbell & Pargas, 2003; Franklin & Hammond, 2001; Karabenick, 2003; Ratt, Shapiro, Truong, & Griswold, 2003; Hembrooke & Gay, 2003, VanDeGrift, Wolfman, Yasuhara, & Anderson, 2002). However, little research has been conducted on how chatrooms affect learning experiences and environments. Chatrooms could transform how students learn, course content, learning behaviors and practices, and interactions between students and teachers, fundamentally changing the ways in which teachers and students create and disseminate ideas, knowledge and understanding.

This paper presents a groundbreaking new study of a real backchannel community in an academic setting, located at the University of California at Berkeley's School of Information Management & Systems (SIMS). It will first describe the physical and virtual community. It will then analyze the characteristics of the chatroom and users' interactions and behavior. Finally, it will suggest hypotheses and implications for the role of the chat in educational communities. What sort of new virtual communities does it enable? What types of interactions occur in this backchannel and how do they contribute to the academic learning community? How does this communication medium change techniques for information and knowledge sharing? Is there a compelling story to be told or is it simply noise – wasted bandwidth that distracts participants from the face to face environment they are in? In light of the increasing role of technology and computer-mediated communication as ubiquitous tools in our everyday lives, there is a need for a better understanding of how these tools can be incorporated into the classroom environment to facilitate enhanced teaching and learning.

This study analyzes the SIMS IRC chat logs from October 2004 to present. The logs contain over 200,000 user entries, with an average of over 400 user postings per day. Software visualization tools are use to plot chat statistics over time in order to highlight trends in adoption and usage within the classroom. In Figure 1, user count is plotted versus the first six weeks of the Spring 2005 academic

semester, showing a general increase in user participation. This suggests that students become more engaged in the chatroom community over time. Figure 2 shows total user entries by user. The curve shows a power log trend in behavior, indicating that a few users participate most often. Educators will need to facilitate and construct a classroom environment that enables equal access and participation.

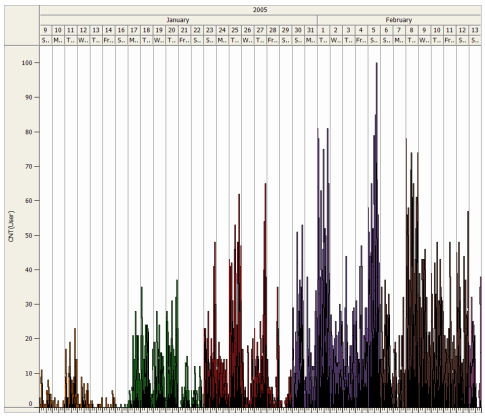

Figure 2. Number of Chat Entries Over First Six Weeks of Spring 2005 Academic Semester

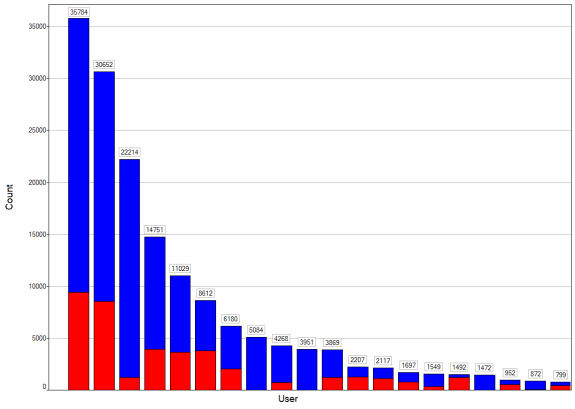

Figure 1. Total Chat Entries By User Between Oct 2004 and Oct 2005

Implications for Education

The use of technology in education and learning has been discussed at length by educators, instructional designers, and technologists (Haythornthwaite & Kazmer, 2004; Scardamalia & Bereiter, 1994; Hoadley & Kilner, 2005; Barab et al., 2004). The field of Computer Supported Collaborative Learning (CSCL) describes how scaffolding can support students' learning through a number of different methods, including situated learning (Lave & Wenger, 1991), peer-to-peer learning, and constructivist learning (Vygotsky, 1978; Bruner, 1996). These theories are based on the same underlying assumptions that individuals are active agents who are purposefully seeking and constructing knowledge within a meaningful context. The collaborative affordances offered by IRC chat suggest that learning can be enhanced through interactions between participants in the chatroom. A primary function of CSCL software is to promote reflection and inquiry, which the chatroom enables through unrestricted participation and a minimally rule-based environment that encourages intentional knowledge creation and sharing. The following sections highlight the salient factors in developing an effective tool for learning and theorize how an IRC chatroom might be incorporated successfully into an education environment. Hoadley (2004) states that "if we find out how people learn in natural situations, we can create educational environments more conducive to learning." The goal of this case study is to provide useful guidelines for future implementations of chatrooms in the classroom.

Situated Learning and Communities of Practice

Situated learning describes learning as a function of the activity, context and culture in which it occurs (Lave & Wenger, 1991). This contrasts with many classroom learning environments that are abstract and out of context, in which a teacher may structure a lesson plan based on an activity which is not personally relevant or meaningful to the students. Social interaction is a critical component of situated learning. Learners become involved in a "community of practice" that embodies certain beliefs and behaviors to be acquired. As the beginner or newcomer moves from the periphery of this community to its center, he becomes more active and engaged within the culture and assumes the role of expert, a process described as "legitimate peripheral participation" (Lave & Wenger, 1991). Brown, Collins, & Duguid (1989) describe the need for a new epistemology for learning that emphasizes collaborative social construction of knowledge over rote memorization of facts and concepts. There exists an immense potential and opportunity for incorporation of this backchannel into the classroom to enhance situated learning. The social cohesiveness among students increases in proportion to their levels of communication and interaction within the group. SIMS students affirm that the greatest value in their SIMS education

comes from their interactions with other students. In this light, incorporating the backchannel into the SIMS community augments and enhances a student's ability to actively and intently learn from his peers in a positive manner (Rogoff, Paradise, Arauz, Correa-Chavez, & Angelillo, 2003). The section below elaborates on ways in which this peer-to-peer learning can occur.

Peer-to-Peer Learning

Peer-to-peer learning in the backchannel describes a type of collaborative learning in which students share knowledge through self-motivated participation and engagement. Mercer and Fisher (1997) describe three kinds of peer-group discussions: disputational, commutative, and exploratory, and argue that exploratory discussion has the highest educational value. Successful exploratory peer-to-peer discussions are characterized by brainstorming, challenges, hypotheses testing, consensus, and decision-making. Failed exploratory peer-to-peer discussions may occur when ideas are accepted unchallenged or because continuous disputation leads to a breakdown of communication within the group. Exploratory peer-discussions rarely broke down in this manner in the SIMS community. As a graduate student community, the learning context of SIMS is different than that of K-12 or undergraduate classrooms. Failed peer discussions might occur far more frequently in younger learning environments where students are more susceptible to competition or immature group behaviors. In these environments, it would be important to have rules to minimize breakdowns in group communication. These might include guidelines that describe the information, assumptions, tasks, and evaluative criteria for constructive collaborative group work. This could be implemented through the presence of a teacher or teaching assistant within the chatroom or a post-mortem review of the chat logs on a regular basis in which the dynamics of the group could be studied and improved for future classes.

Constructivist Learning

Much of the potential success of peer-to-peer learning in a chatroom is rooted in the theory of constructivist learning. According to this theory, learning is an active process in which learners construct new ideas or concepts based upon their current and past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so (Bruner, 1966). Classes in which students participate in discussions encourage them to go beyond merely plugging numbers into formulas or memorizing terms (National Research Council, 1997). Educational researchers argue that students learn best when given the opportunity to learn skills and theories in the context in which they are used, then construct their interpretations of a subject and communicate those understandings to others (Brown et al., 1989). Students are creating their own knowledge by having the freedom to direct the backchannel discussion in ways that are relevant, contextual, and instructional for their own learning purposes. The ways in which students use chatrooms emulates their culture of learning, communicating, and interacting. Peer-to-peer interactions support flexible, learner-centered designs in which learning is active and organic rather than static.

Multi-Tasking and Cognitive Overload

Many opponents to the backchannel highlight its potential for distraction (Schwartz, 2003). Although students have always been subject to distractions during class, in a modern wireless-enabled physical space, the possibilities for distractions increase (Phalen, 2003). Some have suggested the term "continuous partial attention" to describe a student's cognitive ability to pay attention to the teacher's presentation when simultaneously engaged in the backchannel. Others, somewhat cynically, suggest that "continuous partial inattention" is a more appropriate description (McCarthy & boyd, 2005). Regardless of how well intentioned a student may be, a backchannel is going to elicit reactions and engagement from the students that will be asynchronous and off-topic to the teacher's lecture. The following example took place in a SIMS class on October 25, 2005:

Oct 25 18:42:31 <UserName> Wait, what did she say? Something about ADD. I wasn't paying attention. Oooh, a birdy...

Students may be distracted in the classroom and find themselves processing information at increasingly superficial levels while they attempt to juggle tasks and transfer attention across multiple domains simultaneously (Hembrooke & Gay, 2003; Hembrooke & Gay, 2002). Multi-tasking has emerged at the forefront of discussions related to both childrens' and adults' uses of technology (Ransford, 2005; Rideout & Foegr, 2005; Hafter, 2001). Educators need to determine if and how the tendency towards multi-tasking can be taken advantage of through the use of technology in the classroom rather than being given up on as an entirely negative outcome of wireless technologies. Some studies have indicated that learners can effectively multi-task in the classroom (Kennedy et al., 2005; Kaplan-Leiserson, 2003). At SIMS, multi-tasking sometimes provided more insightful backchannel discussions through the posting of links and reflective comments. Other times, it simply provided distractions that were off-topic to the professor's lecture. Can synchronous classroom activities be designed around conceptually related tasks to encourage deeper processing and greater learning of classroom content? Can the connectivity and real-time discussion facilitated by chat and the multi-tasking capabilities of students contribute to new learning opportunities in the classroom?

Emerging Guidelines and Hypotheses

As technology becomes an increasingly ubiquitous component of everyday life, educators will be left with little choice but to find a way to incorporate technology into the classroom. Computer and technology use and behavior is dynamic and evolving with the changing demands of the users and disciplines in which they occur. Ethnicity, gender, experience, and personality are all variables that factor into technology use. This paper is not an attempt to prescribe blanket statements or predictions about how technology can be used in the classroom. Rather, it is an effort to offer a set of hypotheses which educators, academics, industry leaders, and researchers can use to guide their own future research. A thorough understanding of the characteristics and implications of how this chatroom fits into the classroom structure will enable educators to design a better framework for learning.

Implementations of the backchannel will and should vary across different contexts and domains

This analysis of the backchannel is unique to the SIMS graduate community. However, implementations of the backchannel could exist across a number of domains, including K-12, undergraduate classes, graduate programs, law schools, business meetings, conferences, and online learning or eLearning environments. Schools, in particular, need to incorporate the notion of communities of practice in combination with contemporary learning theories to become more intentional and systematic for improving learning and education. For example, the ways in which a backchannel could be used in a 5th grade classroom will differ significantly from its use in a law class. Teachers may need to implement a more controlled and disciplined environment in younger grades whereas law professors could assume that a Socratic teaching method will effectively command their students' full attention.

Teaching styles should take advantage of the social and educational affordances the backchannel offers

Technology by itself cannot improve instruction (Hestenes, Wells, & Swackhamer, 1992). However, technology can enhance the effectiveness of a good instructional design (Hoadley & Enyedy, 1999). Many teachers will be more likely to adopt chatroom technology in their classrooms if they are first provided support and instruction on how to use the technology (Cuban, 1993). Teachers may need to teach in shorter cycles to hold students' attention. They should adjust their curriculum and teaching styles to provide different and improved environments for scaffolding than the standard lecture format. A tighter integration of the backchannel may require their lectures to be more permeable and the right level of focus and formality will need to be determined. Students should be enabled to continually build upon their own knowledge and use the backchannel to share and enhance their learning process (Bruner, 1966).

A better understanding of the socially constructed dynamics around the technology is essential to improving its use in the classroom (DeGennaro, 2005). One option is to use two publicly-projected chatrooms: one for comments, one for questions. In the latter chatroom, students could post questions for

the teacher. A second option is to use a chatroom robot to monitor a channel and provide basic information as well as perform a heuristic analysis of events for post-analysis. For example, entering the command "@define constructionism" would automatically return a definition from nerdbox. Nerdbox, the SIMS robot, can be programmed to take a variety of different types of commands. A third option is to display the backchannel on the screen in front of the classroom so that students would be less inclined to contribute off-topic postings and would instead focus on the academic discussion. Similarly, a teaching assistant could participate in the backchannel and help facilitate interactions by guiding the discussion and providing scaffolding for the learners.

Chatrooms should enable teacher self-assessment

Presenters want to be able to obtain feedback (Anderson et al., 2003; DiMicco, Lakshmipathy, & Fiore, 2002). For example, Classroom Presenter supports the ability for a student to send a question or comment to the professor as well as the location on the PowerPoint slide to which it relates (Anderson et al., 2003). Teachers should be able to analyze the chat logs of a particular lecture and self-assess their own effectiveness. Did students understand their lecture? Were students engaged in the material? Did they feel comfortable asking questions either in the classroom or in the backchannel? Were all students participating equally in the backchannel? Researchers at MIT's Media Lab have designed a number of tools to visualize chat conversations with the goal of evoking intuitive understandings of the nature of the discussion (Mutton, 2004; Donath, 2002). These visualization tools could be used to reveal the structure of the students' discussions, and understanding of the material.

A backchannel should encourage social interactions and community building

In the same way that the physical classroom environment, as well as corporate environments, business meetings, and conferences, all encourage moderate levels of informal chat and humor, the backchannel should also permit the same dynamics. Students' desire to participate in the backchannel is increased if they have a sense of community within the channel, which is most easily built through social interactions and shared experiences. Within the SIMS community, the sense of shared context is easily increased through the daily personal interactions that users experience in their face-to-face environment. By chatting informally in the classroom hallways, during lunch, or in outside social settings, users establish a sense of trust that is transferred to their interactions in the online environment. The more shared context participants have, the easier it is for them to negotiate their sense of interpersonal trust and reputation and therefore facilitate discussion and conversation online. A fostered community of learners will result in greater levels of metacognition, reflection, discourse, deep content knowledge, distributed expertise, instruction, and assessment (Brown & Campione, 1996).

A backchannel etiquette will need to be developed

Is a socially acceptable intellectual dialogue better than no engagement at all? How about if the dialogue includes an occasional off-topic or rude comment? Wireless technologies change how people interact with one another and etiquettes will need to evolve around these technologies. However, it will be difficult to construct a one size fits all set of rules. Rather, etiquette will be contextual and evolving, based on environment, users, and needs (White, 2005; Cox, 2005).

Future Work

The eroding distinction between the cultures surrounding education, work, play, and technology poses new methodological challenges within the learning environment. What are learners' rights with regards to wireless use in the classroom? Designing for new educational environments using these technologies requires the use of iterative and reflective design methods to explore what works, what is important, and how it enhances learning. This nascent subject offers a rich opportunity for growth and exploration.

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