Social Uses of Communication Backchannels in a Shared Physical Environment

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Abstract

This paper analyzes the social uses of computer-mediated backchannel conversation in a shared physical environment, specifically the SIMS Backchannel—a virtual communication environment actively used by graduate students at the U.C. Berkeley School of Information.

In this study, we follow seventy backchannel participants over eighteen months of persistent usage in an academic environment, during which time over a quarter-million lines of conversation took place. We employ a mixed methods approach including statistical analysis, an opinion survey, qualitative interviews with a number of participants, and field observation. We demonstrate and describe how the users of this communication backchannel have independently developed a variety of different usages for a novel communication environment, both in-class and outside. We descriptively categorize these usages and attempt to analyze the ways in which they are both highly dependent upon—and augment—the contextual relationship of co-presence.

Contents

1 Introduction

The concept of backchannel communication is rooted in the mechanics of simultaneous participation in two channels of communication. The frontchannel, the primary mode of communication in a physical space, is apparent to all, while the backchannel, a simultaneous secondary means of communication, is largely invisible to nonparticipants.

Backchannel communication recently received some attention as a potential means to solve the "bandwidth problem" of large one-to-many communication activities, in particular classroom settings where equal discussion and participation by all members of the audience are in principle desirable, yet frequently not possible. The possibility of enabling open debate and discussion while simultaneously preserving the ability of one individual to present material to many others without interruption clearly introduces a new dynamic to these settings.

Over the past two years, graduate students at the U.C. Berkeley School of Information Management and Systems (SIMS)[1] have widely adopted an informal textual-chat communication backchannel for usage in the classroom. We believe this represents the first large-scale adoption of a persistent communication backchannel for an extended period of time, and thus represents a unique opportunity to examine the types of usage that emerge in such an environment. In this study, we follow seventy backchannel participants over eighteen months of sustained usage in an academic environment, during which time over a quarter-million lines of conversation were produced. We employ a mixed methods analysis entrenched in Grounded Theory, including log file analysis, an opinion survey, qualitative interviews with a subset of participants, and field observation. Our aim is to demonstrate that the users of the SIMS Backchannel independently developed a variety of different usages within this communication environment, both inside and outside of the classroom. We descriptively categorize these usages and attempt to show the ways in which they are both highly dependent upon—and augment—the contextual relationship of co-presence.

The most unique element of the SIMS Backchannel is that it represents a chat room community where most of the usage occurs while the users are physically co-present in a shared environment. We argue that the experience of being in the same physical location radically affects the types of usage, and makes it categorically different from most computer-mediated communication (CMC) environments. In addition, many of the experimental environments in Computer Supported Cooperative Work (CSCW) and Computer Support Collaborative Learning (CSCL) research focus on either a limited number of participants, a short period of time, or both. In addition, as Hudson notes, the "dirty little secret" of most experimental CSCL studies is that limited participation is the norm.[12] Our study follows persistent and enthusiastic usage over an eighteen month period of time, allowing for usage to stabilize and for consistent social practices to be observed.

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[1]SIMS was recently renamed the School of Information (SOI). However, we maintain usage of the terms "SIMS" and "SIMS Backchannel" throughout this paper as this naming convention has still popularly persisted among backchannel users.

Our approach is rooted in Social Construction of Technology (SCOT) theory, which examines the ways in which users of a technology influence the development of that technology within a larger social context.[1] SCOT stresses the "interpretive flexibility" of an emergent technology: the ways in which users actively define how the technology is used. The organic and emergent usage of the SIMS Backchannel suggests it is a much closer approximation of real-world independent adoption than an experimental environment. By examining what "early adopter" backchannel participants choose to use it for over time, we gain insight into what other users may wish to do with this sort of technology.

Unlike experimental environments, the SIMS Backchannel represents an emergent technology usage observed "in the wild." Thus, we do not attempt to prescribe particular behaviors to participants or gauge their success at accomplishing a particular task, but rather attempt to study the behaviors that naturally emerged in this environment. We find that not only did the SIMS Backchannel function as a novel method of communication within an academic context, but that a number of social practices emerged over time that led to the development of a strong sense of community among backchannel participants. We examine the factors which we believe may have contributed to the development of this community element.

Finally, we theorize on the applicability of our findings toward those who seek to design experimental systems that encompass real-time social communication in shared physical environments, in particular those within an academic context.

2   Related Work

Research in the areas of online communication and virtual communities informs some areas of our work. We draw upon literature in CMC studies to evaluate the effect of the communication environment on participant interaction (Section 2.1). Additionally, we review selected studies exploring the potential usage of communication technologies to augment or extend work practices (Section 2.2), as the backchannel shares many common attributes with workplace environments. The effects of communication technology on the classroom (Section 2.3) are also widely studied, and we include relevant literature from this area to examine the potential impact of communication backchannels in an academic context. Finally, we examine the SIMS Backchannel within the context of virtual community research (Section 2.5) in order to assess whether or not it can be considered to be a legitimate example as such.

Although the formal study of communication backchannels (Section 2.4) is relatively new to the academic community, a number of minor studies have been conducted, and we review those most relevant to this paper. In general, however, in our review of the existing literature we discovered a lack of published research that examines the breadth of issues we encountered in this study. We attribute this to the dearth of studies examining backchannels in non-experimental environments, as well as to the limited amount of data gathered or observed in existing studies.

2.1   Computer Mediated Communication and Chat

Experiments in CMC have a longstanding tradition in sociotechnical literature. Early studies focused largely on experimental environments such as MUDs (Multi-User Domains) and MOOs (MUD Object Oriented) that had limited adoption among the general populace. More recently, studies focused more broadly on the notion of "online chat," especially as applications such as instant messaging (IM) gained mainstream adoption and stable usage among large populations.

The mode of communication in textual chat systems is similar to the environment of the SIMS Backchannel. Greenfield and Subrahmanyam [8] studied teen chat rooms, examining the linguistic patterns for information exchange in IM chat environments. They found that there were a number of strategies for mitigating multiple simultaneous threads of communication in a single threaded text interface. Others, such as Voida [29], examined the linguistic patterns specific to online chat applications, and found tensions arose from certain tasks such as turn-taking and attention and context management.

Finally, researchers examined the effects CMC has on the type and content of communication in these mediums. Kiesler and Sproull [16] discovered that the lack of social context cues in the medium appeared to contribute to "extreme, more impulsive, and less socially differentiated" behavior. However, in a general review of this research, Hine [10] argues that critics of the social context cues approach countered with a context-based approach. This alternate

approach examines CMC within the "natural" context of its use, noting that the experimental artificiality and rigidity of most CMC studies may have predisposed their findings. This holds particular relevancy for our work, as not only are we are examining a native population in a non-experimental environment, this population also uses CMC in an unusual way—while co-present in the same physical space.

2.2   Chat in the Workplace

A number of researchers examined the effects of chat and instant messaging (IM) in the workplace, an environment that possess some similarities to students working together in a graduate department. Isaacs [13] found that 62% of the IM conversations in their experimental workplace environment were about work, and while heavy users tended to use IM to work together, light users primarily used it to coordinate tasks. The distribution in their study between the types of conversation and types of content discussed differs widely from the categories of communication we found in the SIMS Backchannel, which was highly focused by the shared physical co-presence of its users (Section 6).

Studies of IM in the workplace also show the importance of a social dimension in information exchange, a finding corroborated in our own study. Nardi [24] also studied usage of IM within the workplace, particularly the negotiation of availability and the conversational process, and found that IM was effective for what they termed "outeraction," the process outside of information exchange in which participants connect with each other in social ways that can enable future information exchange.

2.3   Educational Technology

While our study is not confined to pedagogical aspects of the SIMS Backchannel, the primary environment in which this study took place is within an academic context. Existing studies of educational technology use in the classroom focused on the effect of communication technology in various ways. These studies have some bearing on our findings related to the interaction between the backchannel and how it influences the classroom environment as well as how participants engage with the academic material.

Hudson [11] studied the usage of Internet Relay Chat (IRC) in an educational environment, and observed that the disinhibiting effect that online communication, even with people who already know each other. Students were less fearful of making mistakes in front of their peers when chatting on IRC, as using it allowed them time to compose messages and correct mistakes before sending. Hudson theorized that disinhibition in this context could have a positive effect on learning environments. We examine the role of disinhibition and its effects on backchannel participation (Section 7.2).

Neal [25] found that when IRC was used in a distance learning environment, the prevalence of humor and "casual conversation" facilitated forming stronger relationships between the participating students, another finding echoed strongly

in our own study.[2] Other educational studies focused specifically on the potential role of online chat as a tool used within the classroom. Kinzie [18] identified categories in classroom chat, focusing on "on-task" versus "off-task" behavior, as well as identifying three content areas: reflections on teaching practice, a discussion of the possible applications of the technology, and opinions about the software used for online chat.

2.4 Communication Backchannels

The concept of a communication backchannel has become popular as of late, and a number of researchers designed informal experiments around the usage of communication backchannels. In particular, a number of academic and industry conferences begun encouraging attendees to participate in IRC-based backchannels during conference panels.[3]

McCarthy and boyd [22] examined approximately 120 participants over a three day period at CSCW2004, categorizing the types of usage by examining discussion logs. They found that usage was primarily divided between logistical and resource sharing activities. Still, the majority of these studies focus on extremely short-term environments with a transient population of participants where usage patterns and user relationships likely do not have sufficient time to stabilize.

Cogdill, et al.[3] examined backchannel communications in MUD environments, and developed a taxonomy of backchannel categories. They divided backchannels into five categories: process-oriented, content-oriented, participation-enabling, tangential, and independent discourse. Cogdill's study focused on backchannels in pre-existing electronic discourse, rather than those supplementing a physical space, a key factor in the SIMS Backchannel.

2.5 Virtual Communities

We also study the SIMS Backchannel in reference to the community aspects that emerged among users. Jones [15] reviewed the work of several sociologists to create a definition of community and derive a theoretical method for applying the concept of community to online CMC, providing basic guidelines for determining what constitutes a virtual community. Smith [27] and Wellman [30] are both classic examples of online community research investigating the phenomenon of virtual community during the Internet boom of the late 1990s and its creation among members who are not physically co-present.

Drawing upon the work of Jones [15], Liu [21] gives specific guidelines defining virtual communities within the context of IRC. Liu notes the level of interactivity between members and well as the membership criteria required to define a virtual IRC-based community, indicating that between three to six months

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[2]For further discussion of the social relationships in the SIMS Backchannel, see Section 9.
[3]Some recent conferences with highly publicized backchannels include ETech'06, CHI 2006, and SXSWi06.

would be the minimum required time period to generate sufficient data to make a study of an IRC community meaningful.

All of the referenced work in online community, however, focuses upon participants who are not only not physically co-present, but often never meet in person. The group in this study is unique in that they formed an online community within the context of the larger "real-life" community of which they were a part.

3　Our Approach

3.1　Survey

A paper-based, thirty-two question survey intended for both users and non-users of the backchannel was distributed to students over a two-week period to complete on their own time. An email reminder was also sent to student mailing lists informing students about the purpose of the survey and reminding those holding surveys to turn them in to the research team by a specific deadline. The potential pool of survey candidates consisted of approximately eighty-four students. Of fifty-three surveys distributed to students, thirty-nine were returned, for a response rate of 74%. Fourteen surveys were not returned.

The survey contained a mix of question types: seven questions were single-answer multiple choice, five questions were multiple-answer multiple choice, and twenty questions were presented on a Likert scale. The scale ranged from 1 (strongly disagree) to 5 (strongly agree), with an additional selection for "Not applicable." Respondents were asked to evaluate their level of agreement with each of the twenty statements.

The respondent pool consisted of twenty-seven backchannel users and twelve non-users. Of the entire pool, 51% were female and 49% male, with respondents falling into the following age categories: 20-24: 26%, 25-29: 41%, 30-34: 11%, 35-39: 19%, 40+: 4%. Respondents belonged to the following cohorts: entered SIMS in 2003: 3%, 2004: 51%, and 2005: 46%.

3.2　Interviews

Nine backchannel users and four non-users were interviewed for this project. The majority of interviewees were recruited from the survey pool, selected on the basis of general usage patterns, availability, and willingness to be interviewed. User interviews averaged approximately one hour in length and were conducted by both authors; non-user interviews averaged approximately twenty minutes.

Interviews did not follow a script; rather, interviewees were asked a series of general questions that allowed for more specific questioning when interviewees had more to say about a topic. However, with each interviewee we covered a consistent list of topics.

3.3　Participant Observation

We employed participant observation in our study of the backchannel by both participating and observing backchannel usage first-hand. Prior to embarking on this study, both researchers were SIMS Backchannel users and continued to participate after beginning this project. While our personal experience in using the backchannel informed our initial framework for this study, it was through the process of examination using our other methods—interviews, survey research, and log analysis—that we were able to build a broad framework of usage patterns

that exceeded the scope of our own personal usage of and experiences in the backchannel.

According to Davies, issues of reflexivity in social research refer to "the ways in which the products of research are affected by the personnel and process of doing research," and are particularly relevant when "the involvement of the researcher in the society and culture of those being studied is particularly close."[4] In this instance, our closeness to the subject matter provided us with a depth of knowledge about the community and its practices, as well as a level of trust with our subjects that would have been difficult for an outside observer to obtain. In fact, though we subjected the community to a low degree of scrutiny through surveys and interviews, our familiarity to users as fellow community members minimized the disruptive effect this had, if any, on their usage, compared to if comparable levels of participant observation were performed by non-members of the community. Furthermore, our role as researchers did not have any significant impact on our day-to-day role as backchannel users—we continued to use the backchannel as we had prior to engaging in research, albeit with a more informed perspective as to the types of usages other users practiced, providing no disruption to the backchannel community.

3.4   Log Analysis

Textual chat transcripts of the SIMS Backchannel were logged by the researchers from October 2004 until March 2006, a time frame of eighteen months. In this period, participants exchanged over 270,000 lines of chat conversation. These chat logs were algorithmically processed and anonymized, with unique user IDs assigned and time stamps added to all messages. This information was then imported into a relational database for further exploration. We analyzed these logs in order to determine baseline metrics for assessing the usage patterns of the SIMS Backchannel, primarily performing frequency analysis to gauge overall usage patterns and determine the number of legitimate users over time.[4]

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[4]The methods we used to determine legitimate users are discussed in detail in Appendix A.

4   The SIMS Backchannel

4.1   Overview

The SIMS Backchannel represents a novel method of real-time communication popular with graduate students in the School of Information. Participants engage in a group text-based chat with fellow students, most commonly while sitting together in the same classroom. The SIMS Backchannel is used, with varying degrees of participation as well as with varying degrees of instructor knowledge, in nearly every course taught at the U.C. Berkeley School of Information since the backchannel's inception in the Fall of 2004.[5]

The SIMS Backchannel is not an experimental environment, but rather a naturally developing virtual community. Over eighteen months of usage a wide variety of uses emerged which will be discussed and analyzed in this paper.

4.1.1   History

The SIMS Backchannel evolved into consistent usage during the Fall semester of the 2004–2005 academic year. While instant messaging (IM) was already used by students for exchanging messages in classes, a core group of students in the 2004 cohort began chatting during classes in IRC (hereafter referred to as the 'SIMS Backchannel') with the simple goal of "being able to talk to more than one person at a time."[6] Over the course of the semester, adoption of the SIMS Backchannel grew organically via word-of-mouth, and the number of users rapidly increased.[7] Adoption was primarily limited to the 2004 cohort, although a few individual students from previous cohorts made usage of the SIMS Backchannel on occasion. Since use of the backchannel was informal and not sponsored by the school, knowledge of its existence among teaching staff also grew extemporaneously. Usage continued throughout the entire academic year, and in Fall of 2005 a new incoming cohort of students also began using the SIMS Backchannel. Usage of the backchannel continues today.

4.1.2   Technology

The SIMS Backchannel is a textual chat room environment based on the popular Internet Relay Chat (IRC) protocol.[8] IRC is divided into "channels," essentially individual chat rooms, which are typically topical in nature. Channels can be either public or private, and have varying degrees of access control available. By default, IRC does not require users to register an account—users are free to pick any nickname ("nick") to represent them as long as it is not being used by someone else at the current time.

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[5]The student population consists of approximately seventy-six masters students and approximately twenty Ph.D. students. Students generally have a high degree of technical proficiency; over half of the master's students have undergraduate degrees in computer science or other scientific fields.

[6]Included in this group of early adopters is one of the authors of this paper.

[7]Rate of adoption is discussed in Section 4.2.

[8]The IRC protocol standard is defined in RFC-1459, "Internet Relay Chat Protocol."

The SIMS Backchannel is located in a public channel and hosted on a public IRC server that is not funded by or affiliated with the University. In order to participate, users must download one of many freely available client-software programs,[9] and configure it with the address of the server and the name of the channel. Conversation on IRC is unthreaded, meaning comments by users appear as independent lines of text as soon as a user hits "enter" on their keyboard. Conversations are not persistent; users are only able to view a conversation as it occurs in real-time from the moment they login and join the chat room. While users can log a transcript of the conversation, they are only able to do so while they remain logged in to the room. Users can remain logged in to a room indefinitely with a persistent Internet connection.

A significant factor contributing to the adoption of the SIMS Backchannel is the ubiquity of laptop computers used by students in the classroom. All interviewees mentioned that laptops as well as wireless Internet connections were uncommon in their previous classroom environments. While the University presently offers wireless Internet access widely around campus, interviewees noted that the use of laptops in other graduate departments is less common than at SIMS, where nearly every student brings a laptop to class. At the same time, users report that usage of the backchannel is also markedly lower in classes outside of SIMS, even if there are other SIMS students present. Several users explicitly mentioned that the presence of a critical mass of users combined with the shared experience of group participation in the backchannel while in class were primary factors affecting their personal participation. Another contributing factor to backchannel adoption is the relatively high level of technical expertise of the students in the graduate program. This expertise, in combination with the technical requirements and focus of the graduate program, predisposes this population towards facility in the novel technical environment of the backchannel.

4.1.3   Terminology

In order to avoid confusion, we explicitly define our usage of a number of terms in relation to discussion of the SIMS Backchannel in the scope of this paper.

cohort Since backchannel users include students from several graduating classes, we refer to each cohort by their year of entry in the graduate program. At the time of writing, this includes cohorts entering in 2003, 2004 and 2005.

frontchannel The primary means of communication in a physical space. In the scope of this paper, this usually is typified by auditory lecture and discussion lead by a designated instructor in a classroom environment.

backchannel A secondary means of communication in a physical space, often not visible or apparent in the physical space itself. Within the scope of this

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[9]One of the strengths of the IRC protocol lies in the wide amount of general-purpose and specialized software available—literally hundreds of client programs are readily available online.

paper, we will always discuss backchannels as technologically-mediated communication, typically via textual group chat conducted on laptops.

As noted by Cogdill [3] the vocabulary (and spelling) surrounding communication backchannels has not yet stabilized, and thus we feel it is necessary to explicitly define our terms in this fashion. Our choice of terminology merely represents an effort to remain consistent for the sake of clarity, rather than an implicit qualitative statement about which terminology we feel is best.

4.2   Overall Usage Patterns

Overall usage fluctuations correspond accordingly to breaks in the academic calendar. There are large dips in overall usage in periods corresponding to school holidays when students were likely to be on vacation (Figure 1). Adoption in the first year of usage was largely confined to the 2004 cohort; the "doubling" of usage seen beginning in the 2005 academic year largely corresponds to the adoption of a additional cohort of students while the previous cohort continued their usage (Figure 2).

Required core classes where an entire cohort is in attendance garner the most usage, likely due the number of potential participants in the room at one time. When examining backchannel usage by cohort, survey respondents demonstrate a significant difference in use between cohorts. At the time the survey was conducted, usage by the 2005 cohort, who were in their first year of the graduate program, was significantly higher than the 2004 cohort, who were in their second year[10]. This finding was corroborated by interviewees. The variance in usage is likely attributable to the difference in time cohorts spent together in required classes. Students from the 2004 cohort noted that the lack of core classes during their second year contributed to their decreased use of the backchannel.

4.3   Log File Analysis

Due to the overall size of SIMS backchannel log files, as well as privacy implications, analysis of backchannel transcripts was not attempted. However, during the automated anonymization process on the logs, a few programmatically generated metrics were obtained.

We processed punctuation at the end of sentences, detecting 30,895 lines ending in a question mark, which represented 11.7% of the total lines of chat. However, this should not be considered an accurate predicator of the proportion of chat content that was questioning in nature, since the casual grammatical conventions of text-based CMC [8] allow for the omission of such marks in typical usage.[11]

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[10]$t = 2.5, p < .02$

[11]In in addition to the 30,895 lines ending in question marks, 6,254 were detected ending in exclamation marks, and 49,465 ending in periods. Thus, the total of all lines that end in punctuation represent approximately only one-third of the total chat in the SIMS Backchannel during the reviewed period.
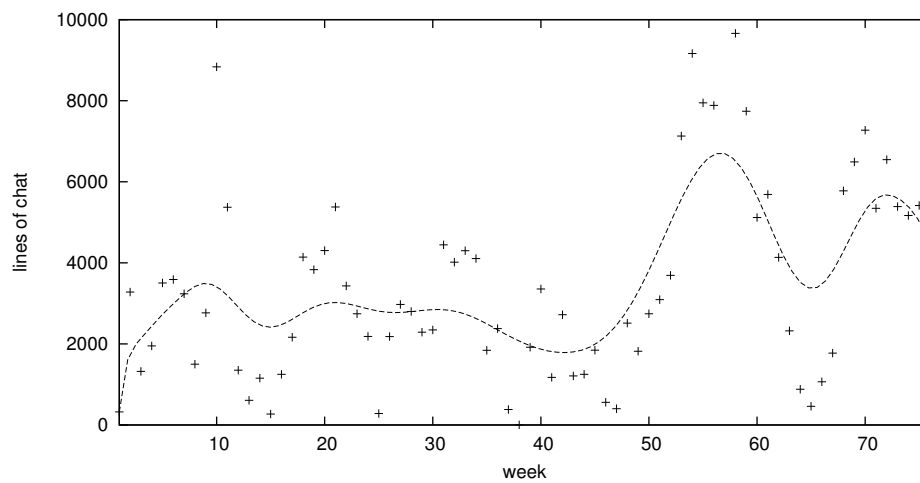
Figure 1: Usage over time, smoothed with a bezier curve.
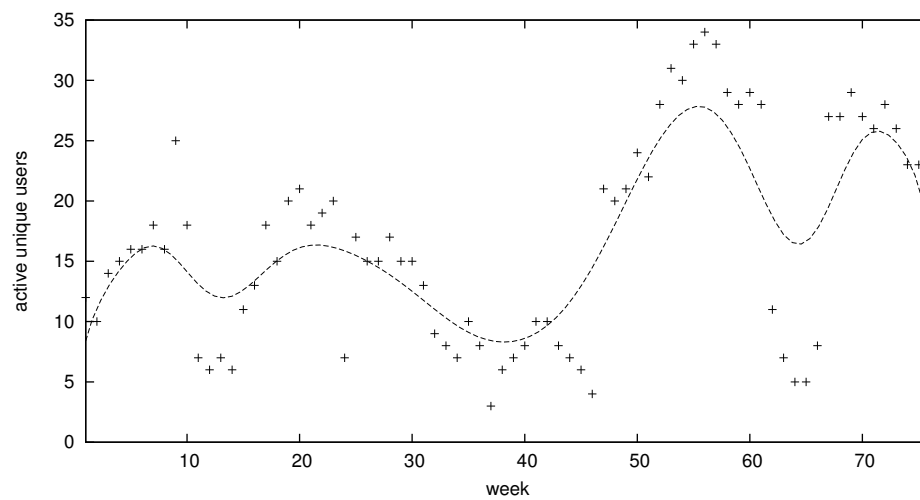
Figure 2: Active users over time, smoothed with a bezier curve.

The length of lines varied greatly, but were on average fairly short, with a mean of 31.7 characters and a first to third quartile of 10–44 characters.

4.4 User Breakdown

Determining the amount of active users was a complex task, requiring additional processing metrics.[12] Our metrics produced a count of seventy distinct active users for the SIMS Backchannel. The tenure of the users (length between first activity and most recent activity) is largely tied to adoption times that correspond to the beginning of semesters (Figure 3).

Participation (Figure 4) appears to vary greatly. The distribution of participation appears to roughly follow an exponential distribution (Figure 5), with the heaviest users totalling from 10,000 – 50,000 lines of conversation each, a large portion in the 500 – 5000 range, and a small number who have minimal participation.

The heaviest users were also active on days when class is not in session, and some average above 150 lines of communication a day. In contrast, most users primarily confined their usage to in-class sessions, so weekends and vacations lower the mean average for lines of communication per day to 13.1. Length of tenure was not the only predictor of a user's participation (Figure 6).

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[12]Due to the complexity of this process, it is documented fully in Appendix A.
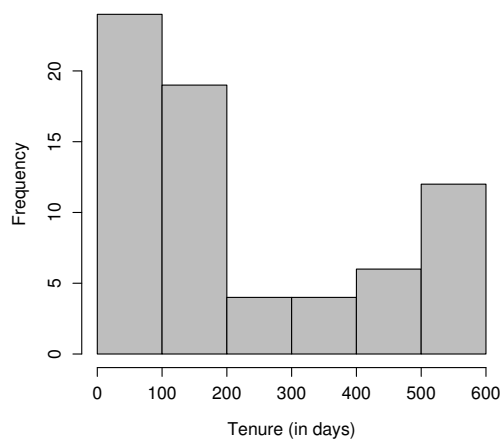
Figure 3: Distribution of tenure.
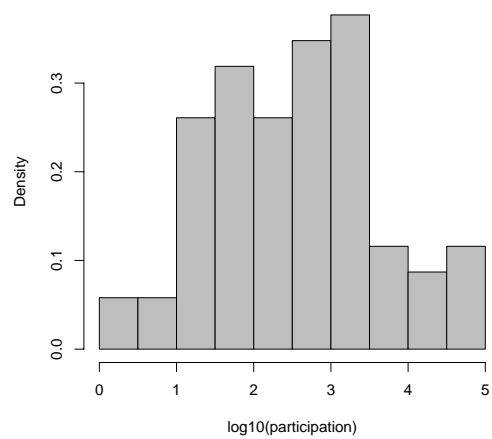
Figure 4: Distribution of participation
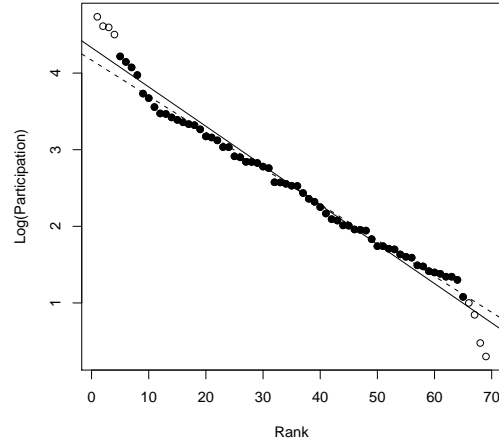
Figure 5: Distribution of participation is roughly exponential. We can fit in log-ordinate space (solid line) to $y = A \cdot exp(k \cdot x)$, where $A = 21502 \pm 1.1 (P < 2e^{-16})$ and $k = 0.118 \pm 0.002 (P < 2e^{-16})$ where $R^2 = 0.975$. If we reject 4 points at each extreme and fit to the inner points only (filled circles), we get a better fit (dotted line, $R^2 = 0.990$) and the parameters are now, $A = 14743.0 \pm 1.0 (P < 2e^{-16})$ and $k = -0.1083 \pm 0.0014 (P < 2e^{-16})$.
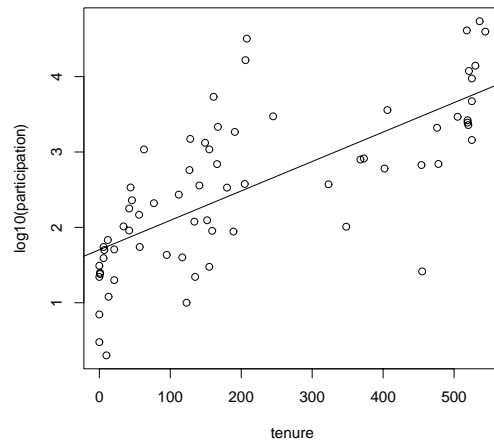
Figure 6: While tenure is overall an accurate predictor of participation (correlation coefficient of 0.72, $p < 0.001$), there remains a large degree of variance (fit with $R^2 = 0.51$).

5 Types of Usage

In this section we attempt to describe and categorize the types of usage we observed in the SIMS Backchannel. Usage patterns were discovered though interviews with backchannel users, survey results, as well as participant observation field work. Data gathered though these methods were then compared, and consistent patterns identified for discussion.

5.1 In Class Usage

The SIMS Backchannel is used in the classroom in a variety of ways: for clarification questions, debates and discussions about lecture material, resource and information sharing, criticism, entertainment and alleviation of boredom, presence sharing with off-site students, and other uses that are primarily social in nature. This section provides a detailed overview and discussion of each of these usage types.

In addition to observing and analyzing in-class usage patterns, we asked our survey respondents several questions about their own perceptions of their use of the backchannel during class. When asked how backchannel participation effected their classroom learning experience, survey respondents generally felt that the academic discussions in the backchannel were useful,[13] but were less certain whether their participation helped them with understanding class material better.[14] At the same time, both survey respondents and interviewees said that the backchannel could be distracting to use during class.[15] Regardless, users felt that the backchannel had contributed to their educational experience.[16] As one interviewee characterized his experience, "I think all of the contribution is very positive—it's just that it's not [all] necessarily academic. But it's always for the greater good."

5.1.1 Clarification

In-class discussion in the SIMS Backchannel is directly influenced by action occurring in the frontchannel. Due to this real-time influence, many of the in-class usages are related to discussions of the lecture content.[17] Asking clarifying questions about lecture content is one of the most common behaviors, with 78% of survey respondents reporting this usage. Users often request clarification about something just stated in the lecture that they did not understand or misheard.

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[13]In response to the statement "In general, discussions in the chat room about class content that occurred while in class were useful, user mean = 4.2.

[14]In response to the statement "In general, participating in the chat room has helped me with understanding class material," user mean = 3.5.

[15]In response to the statement "In general, the chat room helps me focus on the current classroom lecture/discussion," user mean = 2.1.

[16]In response to the statement "In general, the chat room has contributed to my educational experience at SIMS," user mean = 3.9.

[17]The relationship between frontchannel content and backchannel discourse is discussed in detail in Section 6.

The backchannel is also used to ask questions that the question asker deemed not relevant enough to interrupt class to ask.[18] In these instances, interviewees noted they didn't want to "disrupt class" or "bother the professor" with a minor question. This type of classroom usage is similar to that recommended by a study conducted on classroom chat by Kinzie, et al., where the researchers noted that "There is one case in which we might recommend use of a simultaneous discussion during a classroom lecture: the asking of clarifying questions about a part of the instruction students don't understand or did not hear."[18]

However, our interviewees noted that the common types of questions in the SIMS Backchannel were both factual and hypothetical:

> "The sorts of questions that usually get asked in [the backchannel] directly related to the lecture are either inconsequential questions, like wait, 'what did he say,' [and] more instances of clarification of what's happening. The other class of things would be the discursive things that are probably relevant to the class but barely, discussions that take off from the material but go way out on a tangent that probably wouldn't be terribly appropriate to ask in class."

We consider questions asked in the backchannel about frontchannel content that do not merely clarify front-channel content not to be categorized as clarification, but rather fall into the larger body of "Debate and Discussion" questions, described in the following section.

5.1.2   Debate and Discussion

SIMS Backchannel users frequently use the backchannel for academic discussions and debates, described by one interviewee as a real-time discussion group. Often this use takes the form of topical discussion, where, as one interviewee suggested, students "fill in the blanks" not only in the areas that other students may not fully understand, but also in circumstances where the professor only has time to briefly cover a topic. This also included debates among the participants about the subject material, which one user characterized as a "quick, casual way to get multiple perspectives" about an issue.

On the occasions when students are more knowledgeable about a specific topic area than what was presented in lecture, interviewees report their peers are a valuable source of additional information in the backchannel. Additionally, several interviewees reported benefiting from backchannel discussions where a student explicitly disagreed with the instructor and contributed an alternative point of view:

> "I found it really valuable because it often augmented what the professor was saying or disputed it, which I found helpful because that would set me off on a trail of looking [content] up in Wikipedia and let me investigate it a little bit more. It augmented the experience

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[18]In response to the statement "I have asked a question in the chat room about class content that I wouldn't have asked of the professor/lecturer," user mean = 3.9.

[and] it got me thinking about different aspects that I hadn't been
thinking of."

At the same time, discussions can move off-topic from what is being discussed
in the classroom. However, not all off-topic discussions are irrelevant, especially
when those discussions stem from the class material. As one interviewee points
out:

"At times you get a level of engagement in those discussions that
seems to suggest that it would be a good thing to talk about in class,
but a lot of the time it's that they're reasonable and good discussion
topics, but not appropriate ones for the class, or they would divert
the class so dramatically from where the professor is trying to go
that it just wouldn't make sense."

Another interviewee invoked the notion of a common good, asserting that asking
off-topic questions in class for one's "personal benefit" was not always appro-
priate, and that the backchannel was a more acceptable venue for that type of
digression as it allowed the lecture to stay on topic and not be diverted by a
single student.

5.1.3   Resource Sharing

A common in-class usage of the SIMS Backchannel is information exchange be-
tween participants. Resources are shared in real-time while a topic is under
discussion, generally to answer a question asked within the backchannel, or to
provide an example for the current discussion topic. The types of informa-
tion shared, according to one interviewee, includes "clarifications, expansions,
Wikipedia entries, [links] to classes people have taken at other institutions, web
links—lots of web things, expanding definitions, things like that." This user
said she usually looked something up for her own clarification, and then decided
to share it with the rest of the users on the backchannel if it seemed particularly
relevant. Another interviewee mentioned an occasion where the professor was
lecturing on a topic that another student had taken a class on at a different in-
stitution. The professor only reviewed the topic briefly, and the student posted
a link to his previous class, commenting "too bad we're not talking about some
of these issues."

Resource sharing appears to be more highly concentrated in periods when
backchannel participants are co-present at the same location. Log analysis
showed that during the school week, resource sharing of hyperlinks was 13.8%
higher than during weekend periods.[19] It is plausible that this could be due
to the higher incidence of shared topical discussion, based on students being
physically co-present in lectures together.

One of the interviewees described how he used backchannel resource sharing
as a pedagogical strategy while functioning as a teaching assistant. This inter-
viewee included hyperlinks to relevant information in the backchannel as it was

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[19]Significance of $p \approx 0.001$

discussed in class, in order to add more information to a topic that the professor did not have time to cover in class, or when the topic under discussion was difficult to grasp. He felt that the additional context or background information was helpful to students.[20]

5.1.4 Criticism

Participants in the SIMS Backchannel used it as a venue to offer criticism about lecture material or the instructor's teaching methodology. While some users characterized this use as "complaining," others defended the role of real-time criticism as valid.

```
1  <michaelk> you know what [instructor] needs to do? he needs
       to introduce this stuff BEFORE he gives the scary graph
2  <linda> heh
3  <michaelk> give us context first.  motivate the research.
       then give the research.
4  <Aaron> haha
5  <linda> i liked the graph
6  <linda> it wasn't text
7  <michaelk> true
8  <linda> but yeah, not enough context
9  <chrissmith12> i think he should do the whole lecture with
       pictures of baby animals on the slides instead.
10 <michaelk> (don't get me wrong, i like [instructor] and he
       knows what he's talking about)
```

Figure 7: Backchannel transcripts show an example of real-time criticism of teaching methodology. Note that humor is intermixed freely with serious conversation.

Most interviewees and survey respondents characterized the primary function of criticism in the backchannel as "venting." However, students did note some occasions in which the backchannel served as a planning area where they collaborated on carefully determining the most effective way to raise a shared criticism with a professor, exchanging opinions on how they thought they professor would react to different approaches.

Some interviewees noted that the "feel of anonymity" in the backchannel sometimes led to criticisms that would not be made otherwise, despite the fact that the users all knew one another. One interviewee described a particular class session where the criticism of the instructor's teaching methodology became increasingly harsh, which she felt was "so negative it poisoned the atmosphere," and led her to consequentially reduce her usage of the backchannel. However, another respondent called the backchannel a "somewhat appropriate environment for inappropriate behavior," noting that the venting in the backchannel

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[20]The role of teaching assistants in the SIMS Backchannel is further discussed in Section 8.1.

functioned as a safety valve to keep students from becoming too frustrated.

5.1.5   Boredom and Entertainment

Boredom can drive users to seek stimulation by using the SIMS Backchannel for entertainment purposes during class. Of course, boredom is a problem that predates computers in the classroom, and several interviewees noted that in previous classroom environments without computers or Internet access, they would on occasion "zone out" or even fall asleep. One interviewee who noted she does not bring a computer to class joked that her fellow students gauge her boredom level by the amount of doodling she does in her notebook.

Several interviewees mentioned the desire for entertainment: "In some situations if the lecture isn't something I'm particularly interested in, or if it's a slow lecture, or I'm just not in the mood to pay attention to it, it's something else I can do." Interestingly, several interviewees reported that discussions in the backchannel about why the class material was boring or uninteresting often became a relevant discussion about the material, thus re-engaging them. "If something's boring I try to have a little bit of fun in the hopes that you spent your time not wasting your life in the last hour and a half, that you may actually learn something because you're in a better mood or having fun."

While some interviewees mentioned that concern with showing disrespect for the instructor was a factor that dissuaded them from using the backchannel for personal entertainment, others had no such concerns. Several brought up the notion that they were in class by choice, and ultimately the time they spent in class was theirs to spend as they wished. They felt using the backchannel for entertainment was not disrespectful as long as it did not become disruptive to others.

5.1.6   Offsite Presence Sharing

The SIMS Backchannel is also occasionally used for what we term "off-site presence sharing," an activity where users who are not physically co-present with the currently logged on group share in the experience of the co-present group. This usage is not unique to backchannel chat: Ito and Okabe studied teen usage of mobile email in Japan, and found that "the boundaries of a particular physical gathering. . . are becoming extended through the usage of mobile technologies, before, during, and after the actual encounter." [14] They termed this phenomenon the "augmented flesh meet."

An example of one of the more practical uses in this area occurred when a student who was at home ill logged into the backchannel while their class was in session so that they could "participate" by observing backchannel conversation remotely. In such situations, interviewees mentioned increasing their note-taking in the backchannel as well as providing more real-time commentary in order to benefit the non-present student. Teaching assistants who were unable to attend class have also logged in remotely in order to answer questions for students in the class and to participate in the real-time backchannel discussion.

On occasion, this type of usage has produced amusing results. One story related to us by multiple interviewees involved a discussion between students in a class who were remarking upon the comeliness of a guest lecturer. Another student who was not enrolled in the class was logged in to the SIMS Backchannel while working in the student lounge in the same building, and asked for more details about the supposed attractiveness of the guest lecturer. This resulted in additional description from some of the students in the class, and even inspired one ambitious user to surreptitiously take a cameraphone picture of the individual, which was then uploaded and shared via the backchannel. Upon viewing the image, the non-present student was enticed to come visit the class to judge the merits of the group's observations in person.

5.1.7   Socializing and Humor

Both interviewees and survey respondents use the SIMS Backchannel for non-academic purposes in class.[21] However, this socializing is heavily intertwined with discussions of class content; the same percentage of respondents also note that they use the backchannel during class to engage in academic discussions.[22] As one respondent noted, we "socialize based on the lecture—it's a blurry line between on and off topic."

Users also use the backchannel as a venue to gossip about people they know or an event they observed in class. In these instances, the discussion often provides the impetus for the participants to bring up additional subjects of discussion or commentary (for an example, see Figure 8).

```
1  <wbst> the undergrad in [class] brought his girlfriend
2  <Aaron> im sitting right behind them
3  <pboz> has anybody ever been in class with their sig other?
4  <pboz> like if you sit next to your sig other... you
       supposed to just pay attention to class... or pay
       attention to them
5  <linda> she's cute
6  <Aaron> they're writing notes to each other on the comp
7  <Roland> undergrads shouldn't date, it's unnatural
```

Figure 8: Backchannel transcript shows an example of in-class gossip.

Humor plays a prominent role in the social use of the SIMS Backchannel. While offhanded comments based on real-time occurrences in the frontchannel often occur, running jokes that carry from day to day, or class to class, are also common. Many interviewees noted that humor in the backchannel provided another commonality by which users forged bonds with one another.

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[21]In response to the multiple choice question "If you use the chat room during class, do you:," 93% of users selected "Socialize with other students (participate in discussions that are unrelated to the current class lecture/discussion)."

[22]In response to the multiple choice question "If you use the chat room during class, do you:," 93% of users selected "Discuss class content."

There have been occasions where humor in the SIMS Backchannel has spilled out into the classroom, both purposefully and accidentally. Some interviewees described deliberately egging on their peers to introduce a joke into the front-channel, although they also noted that such jokes rarely, if ever, actually made it to the frontchannel. Some interviewees also recollected in instance in a particular class where some backchannel users would decide to "gang up" on a single user and fire jokes at this person in an attempt to make him or her laugh out loud.

While survey respondents generally agreed that the backchannel was an appropriate place to make jokes, a few mentioned that due to some instances during a class where the joking in the backchannel had become distracting, they had stopped participating in the backchannel during that class. One interviewee claimed that after a few instances in a particular class where the joking became out of hand, it made him feel "uncomfortable." This interviewee felt that many of his classmates agreed, and consciously attempted to exercise more control over their behavior from that point onward. Another interviewee specifically identified the point where humor becomes inappropriate as being when it verges on influencing the overall classroom environment.

The SIMS Backchannel is also occasionally used for social activity coordination, primarily in the context of students deciding upon where to go to lunch between classes, or coordinating after-school plans. One interviewee described the process of pre-selecting a lunch location during class as an efficient way to solve the problem of a short lunch break period.

5.1.8   Managing Multiple Usages

With the many types of concurrent in-class usages of the SIMS Backchannel, users are faced with processing a large amount of textual information, often while multi-tasking.

Some users described "filtering" out irrelevant discussions, paying attention only to the material they were interested in. Unlike IM, which is a synchronous conversation between two individuals, participating in a backchannel discussion does not require continuous monitoring by all participants at all times. Several interviewees mentioned that they could "put it in the background and leave it there," and another suggested that he had discerned over time the specific users that typically made comments he was uninterested in, and learned to ignore them.

Additionally, several users expressed annoyance when individuals used the backchannel to conduct discussions that were completely irrelevant or exclusionary to the group during high-traffic periods. On occasion, we observed a user asking others to take a conversation perceived to be not of the general interest to a more private venue. However, these instances were rare, and for the most part, conversations only involving a subset of people were carried out in the public channel. Other interviewees reported that even if a conversation was not necessarily relevant for all users present in the backchannel at the time, having it in a public venue allowed for the opportunity for new participants to freely

join the conversation if they had an interest.

5.2   Outside of Class Usage

The SIMS Backchannel is also used by some participants outside the classroom. While in this context it is no longer strictly a "backchannel,"' we found the outside of class usage adopted by some participants was significant enough to warrant substantial discussion.

While 96% of the users in our survey report using the SIMS Backchannel primarily during class, a significant number report outside usage: 37% report using it outside of class during the daytime, 33% report using it outside of class during the evenings, and 19% use it during weekends. Respondents report using the backchannel outside of class for online collaborations (48%), discussions of class content (22%), asking questions about class content (22%), and other uses (7%), including "lurk[ing]."

5.2.1   Outside of Class Collaboration

At times, the SIMS Backchannel is used for ad-hoc and uncoordinated group meetings. Several interviewees reported instances where they logged into the backchannel (typically from home in the evening) with the goal of finding other students to discuss a specific assignment, usually prior to the due date for a homework exercise.

More commonly, students engaged in coordinated group meetings, logging on the SIMS Backchannel at a pre-arranged time. Within this area, use varied; on occasion, a number of students decided to hold online study sessions in preparation for a homework assignment or an exam. These meetings were typically publicized via email.

Several interviewees reported using the backchannel for group project meetings, where members of a specific team agreed to meet in the backchannel. One interviewee said that her team started by meeting in the backchannel, and if other students were using the it, or if the team required privacy, they moved to a separate channel to conduct the meeting. Since this interviewee lived more than an hour away from campus, this option offered her a means for conducting group project work from home at a mutually convenient time.

5.2.2   Outside of Class Socializing

The SIMS Backchannel is also used for socializing outside of class, typically by a smaller, but regular, set of users; 41% of backchannel users reported using it for this purpose. Some interviewees mentioned that particularly when they were new to SIMS they would often login from home in order to get to know other students better, but that use appeared to drop off after their social circles stabilized.

5.3   Non-Users

We included non-users in both our survey and interview pools in order to understand what non-user perceptions were of the backchannel. The primary issues non-users mentioned as contributing to their lack of interest in using the backchannel were its perceived distraction from lectures in class, their perception that participating offered little value, and personal issues with electronic communication generally.

In interviews, it also became apparent that non-users were concerned that using the SIMS Backchannel during class could be perceived as a potential sign of disrespect. However, this behavior may not be indicative of focused attention on the classroom lecture, as one non-user described: "I check my email but I don't respond to email because it's this awareness that the instructor knows that I'm not paying attention. I don't know why it matters that I'm not paying attention but it's almost like I feel bad for [the instructor]. So I try to do things that are not so obvious, things that will allow me to look up every once in awhile and nod my head as if I'm listening."

5.3.1   Level of Distraction

Both survey responses and interviews demonstrated that non-users did not find others using the SIMS Backchannel during class to be a distraction; in fact, all interviewees noted that its use was either barely noticeable or not noticeable to them at all.[23] One interviewee mentioned that from glancing at other users' screens "[she got] the idea that sometimes they are discussing what the professor is saying." Ultimately, she wasn't interested in this usage. "Do I really care if they're missing something in class?"

Non-users mentioned varying degrees of computer usage during class, including checking and responding to email, occasional instant messaging usage, and websurfing; one interviewee did not bring a laptop to school at all. However, all the non-users felt that using the backchannel during class would be too distracting for themselves. As one interviewee phrased it, "I'm paying for this class and I really should pay attention—maybe other people don't take school as seriously."

5.3.2   Non-User Perceptions

Perceptions of what transpires in the SIMS Backchannel varied between users and non-users, as evidenced in our survey results shown in Table 1.

The respondents who selected "other" in response to the question "In general, what do you think the chat room is primarily used for?" mentioned complaining about classes, making jokes, alleviating boredom, and building relationships with other students. Of the Likert scale questions answered by both users

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[23]In response to the statement "I find other students using the chat room during class distracts from the lecture," non-user mean = 3.1. Additionally, we should note that we did not ask professors or lecturers if backchannel use was noticeable or distracting to them.

Response	Non-Users	Users
In-class discussions about lectures	42%	52%
Asking questions about class material	34%	41%
Collaboration on homework or projects	25%	25%
Socialize with students	84%	100%
I have no idea	17%	0%
Other	15%	15%

Table 1: Responses to the multiple choice question "In general, what do you think the chat room is primarily used for? Check all that apply." Responses are sorted between non-users versus users.

and non-users, only three questions demonstrated significant differences in responses. Users expressed mild agreement that using the backchannel benefited their personal experience at SIMS, while non-users disagreed.[24] When asked how beneficial the backchannel had been for students in general, users agreed while non-users were neutral.[25] Finally, when evaluating if the backchannel made a positive contribution to their educational experience, users agreed that it had, while non-users strongly disagreed.[26]

Clearly, non-users have different perceptions of both what the SIMS Backchannel is used for as well as the value it offers to users, since non-users receive no personal benefit from the backchannel. When asked if they were concerned if they might be missing out on a valuable experience by not using the backchannel, all of the non-users said no. One non-user, who opts to not bring a computer to class, stated "If I really felt like it was affecting my social life or that I was really, truly missing out on something I would bring my laptop in and participate. Sometimes you feel like you miss out on a good joke, but overall I could make a choice to change that and I don't. I don't feel like it's going to hugely improve my experience in class."

5.3.3   Issues with Electronic Communication

All of the non-users interviewed used online chat clients such as instant messaging applications rarely. A few mentioned avoiding electronic communications in general, with one interviewee noting that the one time she attempted to use the backchannel she found following the discussion posed a "big cognitive load" because she felt obligated to follow each line of the conversation. She also noted that social context cues normally present in face-to-face conversations but lacking in the backchannel made it difficult to gauge responses from other users, particularly users she didn't know well.

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[24]Responses to the question "Overall, I feel the chat room has benefited my personal experience at SIMS," $t = 10.1, p < .001$.

[25]Responses to the question "In general, I feel the chat room is beneficial for students at SIMS," $t = 2.3, p < .03$.

[26]Responses to the question "In general, the chat room has contributed to my educational experience at SIMS," $t = 6.1, p < .01$.

It appears that the differences in how users and non-users perceive electronic communication environments affected their willingness to participate. For example, one interviewee mentioned that she preferred to lurk in multi-user chat environments, and due to the lack of anonymity in the backchannel, she thought that option was impossible and felt pressured to contribute to the conversation. "On the [backchannel] you know the people that you're talking to, and you have to be careful. I think I'd be more willing to participate in something more anonymous than something where you have to think about what you're saying." Interestingly, these opinions are generally in opposition to those expressed by active backchannel users. Not only did users mention that they did not feel obligated to follow each line of conversation (and could often ignore the chat client when needed), they also felt free to lurk in backchannel conversations.

6   Spatial Interactions

To what degree do the spatial dimensions of frontchannel and backchannel participation interact with and influence each other? In this section, we examine how backchannel discussion is highly tied to frontchannel context. Additionally, we analyze the ways in which backchannel content can influence frontchannel interactions. Finally, we examine how users manage simultaneous communications in both the frontchannel and backchannel at the same time.

6.1   Frontchannel to Backchannel Influence

Though the SIMS Backchannel is used both outside of the classroom and the physical boundaries of the U.C. Berkeley campus, the predominant usage occurs within the classroom. As reported in our survey findings, 97% of SIMS Backchannel users login while in class.[27] As a result, physical proximity is a crucial component of SIMS Backchannel usage.

Even when interviewees discussed their in-class social usages they noted that they were highly influenced by what was occurring in the classroom at that moment. According to one subject, "The benefits and uses are definitely at that moment... it's a real-time thing, [and] it changes constantly." As topics and issues are raised in the frontchannel, the backchannel responds in real-time, "add[ing] to what was going on in front of the classroom." At the same time the stimulus in the frontchannel can be something physical, such as a gesture made by the lecturer, that inspires commentary in the backchannel. "It's tied into the moment," said one interviewee, "something we're all experiencing together in person." Another interviewee said that when users who are not co-present join the backchannel during a class, other users often have to provide context: "I imagine that reading the transcripts without knowing what was going on would be almost incomprehensible. So much of it is sparked by something that's going on in the [physical] room."

6.2   Backchannel to Frontchannel Influence

While the nature of backchannel discussion is largely reactionary to frontchannel stimuli, there are numerous occasions in which backchannel discussions filter up into—or influence in some capacity—the frontchannel content. As Cogdill notes "In face-to-face conversations, whispering, passing notes, and other private conversations can seem rude, disruptive, or otherwise nonparticipatory. In virtual conversations, however, backchannel discourse can help focus and define the mainchannel conversation by influencing both process and content."[3] The mechanisms by which this process occurs in the SIMS Backchannel are varied.

Several interviewees described using the backchannel as a "testing ground" for ideas or comments that they were uncertain about sharing out loud in class:

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[27]While we have previously discussed the occasional behavior of offsite presence sharing (Section 5.1.6), for the most part there is little overlap between in-class and outside-of-class backchannel usage.

"If I was hesitant for some reason, I might make a comment [in the backchannel]." Accordingly, survey findings show that of the 78% of users who reported asking questions in the backchannel during class, many also agreed that they had asked a question in the backchannel that they would not have asked aloud in class.[28] Based upon the reaction to the topic in the backchannel—whether it garners enthusiastic debate or goes largely ignored—the individual can gauge the merit of the idea before vesting it in the potentially less "safe" and "more official" environment of the frontchannel. Additionally, the discussion surrounding the idea in the backchannel can lead to further refinement of the original idea, possibly allowing the individual to determine the most interesting or relevant portion of the thought, so that their comments to the frontchannel are then more developed.

The social dynamic of encouragement plays a large role in moving ideas from the backchannel to the frontchannel. We observed on numerous occasions that when an individual asks a question or makes a comment in the backchannel that other users find particularly interesting, the group will frequently encourage the user to raise it aloud in the frontchannel, even suggesting appropriate moments for this event. The nature of this encouragement can be particularly enthusiastic, occasionally even involving capital letter exclamations of "ASK!", "SAY IT!", and "NOW!" If the individual capitulates and raises the issue in the frontchannel, they are met with a chorus of affirmation such as "yay", "go [username]!" or even "APPLAUSE". In this regard, the social and "safe" environment of the backchannel provides a space for peers to encourage each other to gain the confidence necessary to participate in what may be an intimidating classroom setting.

On occasion, if the progenitor of an idea is particularly reluctant or shy, another user volunteered to ask the question for them ("to benefit all," according to one interviewee). Depending upon the backchannel participants' perception of the instructor's knowledge and acceptance of the backchannel, the question asker may or may not reveal that the question is a result of backchannel discussion.

Similarly, multiple teaching assistants who have participated in the backchannel during class revealed to us that they mined backchannel discussions as a pedagogical strategy to bring relevant questions into the frontchannel for discussion. This behavior was confirmed in interviews with student backchannel participants. One interviewee mentioned that in instances where he uncertain about the appropriateness of a question, a backchannel-using teaching assistant aided by asking the question for him in class, in order to raise a valid critical perspective but protect the identity of the specific student, who was not comfortable making such a statement on his own.

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[28]In response to the statement "I have asked a question in the chat room about class content that I wouldn't have asked of the professor/lecturer," user mean = 3.9.

6.3   Managing Simultaneous Channels of Communication

With communication occurring simultaneously in two channels, how do SIMS Backchannel participants manage allocating attention between them? Does paying attention to one channel necessitate ignoring the other? While users may enjoy the novelty of the shared experience of being in an environment where one can conduct a side conversation silently alongside the formal frontchannel discussion, the backchannel certainly provides competition with the class lecture for users' attention.

While users generally disagreed that the backchannel helped them to focus on the lecture,[29] they also agreed with apparently contradictory statements that the backchannel was beneficial to students and contributed to their educational experience.[30] This could be reflective of many factors; one explanation might be that users are adept at multi-tasking, good at switching their attention between the frontchannel and the backchannel in what McCarthy calls "continuous partial attention," the "cognitive model for allowing simultaneous front- and backchanneling."[22] One participant referred to it as a "replacement of extra bandwidth."

Hembrooke[9], in a experiment investigating attention and laptop usage in the classroom, found that laptop users scored significantly lower on a quiz testing recall and recognition of lecture content than a control group prohibited from using laptops during an identical lecture. However, Hembrooke also observed differences in the types of online behaviors students exhibited and the effects they had on multi-tasking abilities; specifically, student performance was directly related to the proportion of time a student was able to spend "on" or "off-task," and not to the relevance of the online content (web browsing, email, chat, and instant messaging) consumed during the lecture. Sustained distraction was key in predicting poor performance, even if the student was consuming relevant content, while students adept at "many and shorter browsing sessions during a class period, irrespective of content, [had] higher class grades."[9] This finding corroborates what interviewees told us as well as our own participant observation—that while the SIMS Backchannel offered a refuge for students who were bored (and disinclined to pay attention regardless), backchannel usage could also be managed in such a way that it contributed to their classroom experience. As one user described:

> "I don't think people tend to be solely in one medium, [that] if they're using [the backchannel] they don't do anything else. With me, I'll be in [the backchannel] or surfing the web and I'll hear something that sounds...more interesting and start paying atten-

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[29] In response to the statement "In general, the chat room helps me focus on the current classroom lecture/discussion," user mean = 2.1.

[30] Mean responses of users to the following statements are: "In general, discussions in the chat room about class content that occurred while in class were useful," 4.2; "In general, participating in the chat room has helped me with understanding class material," 3.5; "In general, the chat room has contributed to my educational experience at SIMS," 3.9; "In general, I feel the chat room is beneficial for students at SIMS," 3.9.

tion. I feel like I'm one of the more frequent contributors in all of
my classes...but I feel like I do that in spite of or even concurrently
with being on [the backchannel].

6.4   Summary

Real-time, co-located backchannel usage gives listeners an immediate oppor-
tunity to ask questions and comment as a lecture occurs in the frontchannel.
This usage, in turn, influences the types of communication that filters up to the
frontchannel—typically questions that the backchannel users as a group find
compelling or relevant.

While concerns that backchannel usage may negatively impact attention
in the frontchannel are understandable, both Hembrooke's work, as well as
the experiences related to us by SIMS Backchannel participants, offer contrary
views to this perception. However, even backchannel users note that the ability
to multi-task between the front and backchannels is as much a matter of self-
discipline[31] as well as a feature of textual chat.[32] As one interviewee phrased
it, "focusing on one person who's talking to you as if you're paying attention to
only them is hard when there's somebody whispering in your ear."

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[31]One interviewee, for example, expressed his opinion that a backchannel would be impos-
sible to use among a population with undisciplined time-management skills, such as younger
undergraduate students.

[32]Several users report the ability to ignore the backchannel when needed and return to it
later by scrolling through the lines of conversation allowed them to easily shift their attention
between the front and backchannels.

7   Participation

Backchannels represent a relatively new technology for classroom usage. In this section, we explore how users know or learn how to comport themselves in this new communication environment. We also examine the ways in which users participate and the factors that encourage their participation. Finally, we consider how backchannel usage fluctuates over time, and examine the factors that contribute to declines and cessation of usage by some participants.

7.1   Overcoming Fears and Learning from Peers

While some users were already experienced with using IRC and other chat environments before joining the SIMS Backchannel, none of our interviewees previously participated in a similar environment. Thus, the rules of engagement were largely undefined, and many users had no context for what to expect and how to act in the backchannel. Several users expressed initial trepidation when they first joined the backchannel, particularly users with no previous IRC experience. One of the non-users we spoke with found her singular experience joining the backchannel so overwhelming and intimidating, particularly for fear of "saying something stupid" in front of her peers, that she never returned. Another user who was also new to the backchannel stuck with it, though he admitted he was also intimidated. "It was an environment that I felt foreign in—I had less of a technical background than a lot of the people in the program and it seemed to be very dominated by technical people. There [was] knowledge I [didn't] know." However, this user mentioned that he found the more experienced users to be extremely helpful in offering advice with both technical information and backchannel etiquette, though he occasionally asked other users for advice off-line "because [I didn't] want to be embarrassed in front of that group."

 This learning process mirrors Lave and Wenger's situated learning theory of "legitimate peripheral participation," where learning occurs through a process of social participation within a community of practice.[20] Wenger defines a community of practice along three criteria: the community's topicality and how it is understood and continually renegotiated by members; how the community functions and binds members together as a social entity; and the shared resources the community produces over time, such as "routines, sensibilities, artifacts, [and] vocabulary."[31] Measured by these criteria, the SIMS Backchannel represents a community of practice: its meaning is defined by its members' association with the school (and renegotiated as one class graduates and another joins); backchannel users have formed a subcommunity within the larger SIMS community based upon backchannel usage that unites them; and, the backchannel community created shared resources though participation, including tangible resources such as a database of memorable backchannel quotes, and intangibles such as shared jokes and customs of participation.

 In the backchannel, participants learned both the mechanics of using IRC as well as the norms and customs specific to the backchannel from other users with prior experience using IRC and participating in online chat environments. As

one user described, he learned to use the SIMS Backchannel by observing other participants. "It [now] feels safer than the larger class—initially I wouldn't have tested something out on [the backchannel] first, but now if I was hesitant for some reason, I might make a comment [in backchannel]" instead of speaking out in class." Experienced users brought their outside knowledge to the SIMS Backchannel where the process of engaging with less experienced users within the larger context of the SIMS community shaped the subcommunity of the backchannel. Through this process of situated learning, new users (at least those not over-intimidated by the unfamiliar environment of IRC) were able to enter this community of practice and make the the transition from periphery to center.

7.2   Types of Participation

Participation varies in the backchannel, not only in terms of frequency,[33] but also in terms of participatory behavior. A broad spectrum of behavior is evident, from those who chat continuously to those who self-identify as "lurkers"—users who join a conversation primarily to observe the exchange. It is important to note that while some users exhibit these characteristics consistently, others vary their participation based on multiple factors, such as: interest in the immediate conversation, demands of the physical location,[34] time of day, and even mood.

Indeed, what might be most striking about participation in the backchannel is that because the space is not circumscribed by a singular type of usage (such as classroom usage only), it is free to take any form that the user prefers. Users can contribute as much or as little as they wish, and some might only contribute to academic discussions while others' contributions are purely social. Furthermore, users are free to move between these modes of usage at will; community norms and feedback from concurrent users will dictate the level of interest as well as the appropriateness of the conversation at that moment.

Participation is also aided by the lack of inhibition and restraint users feel within the backchannel, with several reporting that they found it easier to say things in the backchannel that they would not say in face-to-face communication. One interviewee described the atmosphere as one of "hallway conversation," while another described herself as "more sarcastic and impulsive"on the backchannel than in real life. Additionally, users also report that the backchannel functions as a refuge for students who are more reserved to speak their mind: "some of the shyer people chatter in [the backchannel] but they don't talk out much in class." These experiences appear on their face to corroborate with CMC research tying disinhibition and other extreme and impulsive behaviors to the lack of face-to-face social context cues in electronic communication mediums.[16] However, critiques of this approach have noted that context is an important factor to consider when evaluating CMC, and that in particular many of the studies in this area were of experimental or other artificial

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[33]As discussed in Section 4.4

[34]The user might be in a class, for example, that requires she or he pay more attention, versus logging in from home.

environments where participants were not interacting in a natural context.[10] Additionally, other research in the area of online disinhibition focuses upon factors such as anonymity, invisibility, and a lack of integration between online and off-line identities—all factors that rely upon little to no face-to-face contact as a basis for explaining this behavior.[28] These are not factors likely to explain disinhibitive behavior in the SIMS Backchannel, where participants are not anonymous and generally have at least minimal face-to-face contact with other backchannel users.

Hudson [11] conducted a study of the use of IRC in a structured classroom environment and its effect on foreign language learning, and found a lack of inhibition among student users who were physically co-present, a factor they viewed as a learning asset. They note, as we found, that students acted less inhibited in IRC even though they already all knew one another, concluding that the delay in immediacy and the sparseness of IRC as a communication tool encouraged risk-taking and lowered inhibition among students. Hudson also found that the use of IRC appeared to encourage the formation of better friendships between the students, as we have also found. Thus, it would seem that even when backchannel users are previously acquainted and have consistent face-to-face interactions with one another, use of textual computer-mediated communication still encourages disinhibition. While this might be an evident conclusion to draw in the case of users who are shy and prefer online to face-to-face communication, it appears also to benefit students who are not reserved by providing them with a medium in which to connect with shyer students. As one interviewee described, "I'm somebody who's not that socially inhibited, but with some of the people from more technical backgrounds who are maybe a little bit shyer, it allowed me to develop relations with them where I think it was hard for me to do that in the real world."

7.3   Changing Usage Over Time

Participation in the backchannel is not universally consistent, and some users mentioned that their participation declined over time. The primary reason given by both interviewees and survey respondents is that they were enrolled in classes either outside of the school with few or no fellow students, or in classes at the school where usage "is not the norm," a factor that attests to the importance of a critical mass of users in order to motivate usage. Others discontinued their use altogether, concluding that the backchannel was ultimately too distracting to use during class, while others were displeased with the content of the discussions or perceived there was a core group of regular users that gave the discussions "less diversity." Finally, a few noted being "too busy multi-tasking" during class, while others mentioned they had moved to using instant messaging with particular classmates instead of conversing with the backchannel group. In sum, backchannel participation encompassed a range of organic fluctuations that depended partially on the classroom environment as well as upon individual influences on users.

7.4   Summary

Backchannels are new additions to classroom settings, and users typically do not know what to expect or even how to initially act in these unfamiliar environments. In the case of the SIMS Backchannel, users learned how to participate peripherally from other users with experience in similar environments. The norms and values were inherited from the broader school community, of which all backchannel users were members. Once initiated, users exhibited a range of participatory behaviors since they were able to adapt their usage according to their own whims. Finally, usage fluctuated, declined, and even discontinued over time, attributable both to changes in the academic environment as well as individual user preference.

8   "This is our space": Ownership and Trust

Participating in the backchannel became an integral part of the classroom experience for many of its users. As we talked with our interviewees it became clear that many users felt a strong sense of ownership over the backchannel. Because the members generally all know one another on a face-to-face basis, the norms of the greater SIMS community influence the relationships between users on the backchannel. In this section, we analyze the roles of ownership and trust in backchannel usage.

8.1   User Perceptions of Outsider Use

The backchannel is student organized as well as used almost exclusively by students, and thus many students react with wariness when "outsiders" occasionally join. Generally, both interviewees and survey respondents agreed that backchannel use should be restricted to students,[35] with survey respondents strongly agreeing that they would change their behavior if an instructor joined the backchannel.[36] Notably, only a few students reported ever being present in the backchannel on the rare occasions when an instructor was present.[37] One interviewee even expressed that she was initially concerned when the 2005 cohort first joined the backchannel, calling them "interlopers" and worrying that the new users might have an adverse effect on the community.

Feelings were mixed, however, when considering the case of teaching assistants using the backchannel. Teaching assistants at SIMS are typically students from within the department, and thus the peers of participants; survey respondents only moderately agreed that they would change their behavior if a teaching assistant joined the backchannel.[38] At the same time, interviewees expressed a range of opinions about teaching assistant participation. On one extreme, an interviewee stopped logging in entirely after a teaching assistant regularly joined during a class because she felt the backchannel was "something the students had [to themselves]," and the teaching assistant's presence violated that perception. In contrast, other interviewees report positive experiences with teaching assistants as long as the teaching assistant made it clear that they respected the culture of the backchannel and was there to participate in, rather than monitor, conversation.

> "The TA had to prove he was worthy of watching all the banter—
> laughing at it and contributing to it, [but] also have a serious side
> too. I didn't want my TA to be in there saying, 'Well you guys,

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[35]In response to the statement "I would prefer that the chat room was used only by students," user mean = 3.9.

[36]In response to the statement "In general, I would change my behavior if an instructor joined the chat room," user mean = 4.4.

[37]The occasions mentioned by interviewees when instructors joined the SIMS Backchannel did not happen during typical classes, but rather during department lectures open to the general SIMS community.

[38]In response to the statement "In general, I would change my behavior if a teaching assistant joined the chat room," user mean = 3.6.

> this isn't related to lecture so you can't talk about it.' I didn't want
> that monitoring aspect and he proved himself worthy by contribut-
> ing a joke here and there and answering the occasional academic
> question."

This expectation that the teaching assistant had to "prove himself" was shared
by several other interviewees, some of whom mentioned an occasion when a
teaching assistant who was not normally a participant joined the backchannel
one day during a class. The interviewees, perceiving that the teaching assistant
joined to monitor them, quickly moved the discussion temporarily to a different
channel. As one interviewee described it, "When the TA was in the room, he
seemed like he was just there monitoring the [backchannel] for the professor."
The perception of whose side the teaching assistant is on, said the interviewee,
is important for evaluating whether or not the teaching assistant was a trusted
member of the group.

An illustration of the fine balance instructors must manage in order to main-
tain credibility and student trust when participating in the SIMS Backchannel
was provided by one of the teaching assistants we interviewed. He discussed the
challenges of participating in the backchannel as both a peer and as an instruc-
tor. As he considered providing feedback to professors about student opinions
and concerns a part of his job as a teaching assistant, he felt that his partici-
pation in the backchannel contributed to this work. Additionally, while in the
backchannel, he added hyperlinks to information relevant to the lecture as well
as additional context or background to topics in response to student questions.
While he occasionally raised questions aloud in class that were asked in the
backchannel, he claimed that it was difficult to decide "when saying something
would be beneficial versus detrimental," since he did not want to create the
impression that he might breach the sense among students in the backchannel
that they could speak freely. He also noted that while he restrained himself from
"contribut[ing] to the goofiness" that might occur while he was participating in
the SIMS Backchannel as a teaching assistant, he felt that his role was not to be
punitive or to actively direct the conversation but rather to help when needed.
"If I just talked about the content [of the class] it wouldn't work," he observed—
but "playing along a little bit" with the humor or non-academic conversations
in the backchannel while also acting as an information resource was generally
accepted by the users. Thus, by maintaining his identification with the student
status of the other backchannel users, this teaching assistant was able to both
participate simultaneously as both a peer and a teaching assistant.

8.2   Privacy and Ownership

SIMS Backchannel users do not appear to have a strong expectation of privacy
in the backchannel. In addition to the fact any user can log the group's conver-
sations, users generally disagreed that whatever is said on the backchannel is

not repeated outside of it.[39] "If I was going to say something to someone that really shouldn't be heard, or [that] I wouldn't want repeated," commented one interviewee, "I probably would use IM or something where I was only talking to one person." Contradictorily, users appear to trust that they can express themselves freely in the backchannel, perhaps because of its informal, self-organized environment, or their shared student status. Participants understand their role as students within the graduate program and the bounds of acceptable behavior within that role, and backchannel conversations reflect these boundaries by being casual and humorous, as well as confiding and commiserating. The backchannel, said one interviewee, works as a "safety valve" for students to express opinions as well as frustration.

Several interviewees expressed their belief that if the backchannel became "a requirement or monitored," it "[wouldn't] be used." While this sentiment may bode poorly for those who wish to incorporate institutional backchannels into educational or work environments, at the same time this attitude may persist because the SIMS Backchannel evolved in response to the desires and needs of the user community. As one interviewee explained, "This is our space."

8.3   Summary

The strong depth of feeling expressed by many of the interviewees when discussing the backchannel demonstrates the important part it plays in their student experience. SIMS Backchannel users demonstrate a strong sense of ownership over the backchannel, how it is used, and by whom. This study provides a cautionary tale to those who wish to experiment with using backchannels in environments run or monitored by an 'official' entity versus being user created and organized. Clearly, a level of trust among participants as well as a sense of self-determination was crucial in fostering the extent of participation adopted by this user population. In cases where an authority figure is present, SIMS Backchannel users tolerated or assimilated their presence only if that figure was viewed as a peer rather than as an authority.

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[39]In response to the statement "I feel that whatever I say in the chat room is not repeated outside of it," user mean $= 2.1$.

9 Community Aspects

In "real life," the SIMS community consists of the people, past and present, formally affiliated with the school and its educational mission. The SIMS Backchannel is both a virtual manifestation of this community and a subset of it, due to a self-selecting membership of almost exclusively students. In this section, we discuss the backchannel within the context of the definition of a virtual community and discuss the unique relationship between the real life and virtual communities at SIMS.

9.1 The Backchannel as a Virtual Community

While all communities are arguably unique, in the study of virtual communities the SIMS Backchannel differentiates itself by its focus on the real-time sharing of experiences by predominantly co-located participants. Research in virtual communities is generally focused on groups of participants who have little to no face-to-face contact due to the diversity of physical proximity.[27] [30] In this sense, the SIMS Backchannel has more in common with not only the existing research of electronic communication tools in educational environments,[18] [23] [25] but also research in the workplace.[13] [24] At the same time, when considering the SIMS Backchannel within the context of IRC-based virtual communities [15] [21], the SIMS Backchannel clearly exhibits the empirical characteristics of what Liu defines as a "virtual settlement." They are:

- A virtual common public space

- A variety of communicators

- A minimum level of sustained stable membership

- A minimum level of interactivity

We will review each of these factors and examine their relevance to the SIMS Backchannel.

9.1.1 Virtual Common Public Space

Liu defines a virtual common public space as an environment where a significant portion of interactive group computer-mediated communications occur.[21] The SIMS Backchannel is a public space that anyone using IRC can join, though participants who do not have a formal connection to SIMS are discouraged from joining the channel. Any member of the SIMS community, however, can participate, though participants tend to be current students. While there have been some instances of other channels being used in addition to the SIMS Backchannel, the SIMS Backchannel remains the primary meeting space for this community.

9.1.2   Variety of Communicators

Liu posits that a virtual community must have a variety of communicators, specifically "more than two participants for any meaningful interaction to occur" in order to exclude small channels from discussions of virtual settlements. The SIMS Backchannel ranges from two to as many as thirty-six participants observed over the course of a single day, with seventy distinct users of varying usage levels (e.g. users who only log-in during class, users who participate both in and outside of class, users who primarily use for outside of class socializing, etc.).[40]

9.1.3   Sustained Stable Membership

According to Liu, a virtual community must have a membership that is sustained and stable over time. According to our survey, 85% of backchannel users report using the SIMS Backchannel at least a few times per semester, with 60% reporting usage of at least once per week or more.

9.1.4   Interactivity

Liu defines interactivity as "the extent to which later messages in a sequence relate to each other, and especially the extent to which later messages recount the relatedness of earlier messages." Subject interviews as well as participant observation of the chat room demonstrate that messages in the SIMS Backchannel are interactive conversations, with participants conducting (sometimes multiple) discussions both directed at the entire channel as well as with specific participants (as evidenced by the use of specific usernames in messages).

Although the SIMS Backchannel is used by a group of physically co-present members, it clearly exhibits the characteristics of a virtual community. As discussed in Section 9.2, this physical co-presence creates a unique, symbiotic relationship between the virtual community of the backchannel and the real life community at SIMS.

9.2   Characteristics of the SIMS Backchannel Community

When asked to define the real life SIMS community in their own words, interviewees mentioned the people at SIMS (students, faculty, staff) and the physical places where people interacted, such as the student lounge, or at extracurricular events. Interviewees also included the backchannel in their descriptions: "It's definitely an extension of the people I physically interact with." In particular, several interviewees discussed that participating in the backchannel allowed them to forge a common ground with fellow students, especially at the start of the school year when they were new to the program. "It's like an icebreaker," said one, "an easy way to start a dialog and a relationship."

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[40]For a more detailed analysis of amount of users, see Section 4.2 and Appendix A.

9.2.1 Face-to-Face Interaction

Because the SIMS Backchannel is unlike most virtual communities due to the co-presence factor, the face-to-face interactions among participants augments their perceptions of their online co-participants, encouraging reciprocity (such as the sharing of information among participants) and strengthening social ties.[30] "I thought it was a great way to bond with students," said one interviewee. "I felt like we bonded anyway, because we all had lunch and classes together, but I felt like it was just a way to interact on a more casual basis."

Some interviewees noted that they developed friendships with fellow students via the backchannel first, then later reinforced them through face-to-face interaction. One interviewee described the backchannel as "complementing" his face-to-face social life at school. A few interviewees noted that there were people with whom they spoke with on the backchannel but rarely, if ever, conversed with in person. This pattern, however appears to be the exception, rather than the norm.[41]

SIMS Backchannel users appear to be more social in other contexts than non-users. According to our survey results, 30% of users claim they participate in off-campus events once or more times per week, and 50% claim once or twice per semester, versus 8% and 33% of non-users, respectively. While no SIMS Backchannel users said they never participated in off-campus events, 17% of non-users did so. As one interviewee said, "The people who are on [the SIMS Backchannel] are the ones who are social."

At the same time, backchannel users only moderately agree that they are better acquainted with other backchannel users,[42] and interviewees generally did not observe a schism between users and non-users at school. Since many ways exist for students to interact at SIMS, it appears that the general effect of the backchannel on users' sense of community at SIMS is moderate—while it may bring users closer together, it does not alienate them from non-users or otherwise interfere with user/non-user relationships.

9.2.2 Shared History and Experience

Interviewees repeatedly mentioned their enjoyment with participating in the shared experience of using the SIMS Backchannel. The understanding of a shared experience took several forms, most notably in commiseration and complaints about student concerns, the shared history of participating in class together, and running jokes within the community.

One feature of the backchannel that contributes to this shared history is the history of humorous comments and quotes recorded by users; users continually add conversational excerpts to the backchannel bot's database for later recall. Additionally, this shared history and experience is not limited to the

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[41] In response to the statement "I talk to people in the chat room that I rarely (or never) talk with in person," user mean = 2.9.

[42] In response to the question "In general, I am better acquainted with the students who use the chat room than those who do not use it," user mean = 3.7.

backchannel, but bleeds over into face-to-face interactions between users, with one reinforcing the other in the form of jokes and discussions that move back and forth between channels.[43]

Interestingly, several interviewees articulated that what made the experience of using the SIMS Backchannel relevant and interesting to them was the shared experience of sitting in the classroom while simultaneously chatting with fellow backchannel users. One interviewee described it as giving him a "false sense of being in their own world," while another likened it to "virtual note-passing," a way to virtually share thoughts with the person sitting next to you. In this context, the SIMS Backchannel replaced some forms of non-verbal communication between students (such as eye-rolling) that occurs in classrooms where real-time messaging doesn't exist, as well as verbal forms, such as whispering a question to one's neighbor.

9.3 Summary

It is the co-present shared interaction that makes the SIMS Backchannel unique among virtual communities. At SIMS, users view the backchannel as a part of what defines the community, a place that allows them to forge new relationships, strengthen or augment existing ones, and participate in the sharing of a common experience. As one interviewee summed it up: "This is the place I belong."

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[43]Please see the analysis of the relationship between frontchannel and backchannel interaction in Section 6 for more details on this phenomenon.

10   Implications for Future Work

In shaping the conclusions of this paper, we bring to bear the recent significant contributions of Paul Dourish [5] at CHI2006, in order to agree with his assertion that "implications for design" is an inadequate and highly problematic way to conclude a paper which purports to broadly address social factors in human-computer interaction. Thus, we attempt to summarize the significant findings of this research as they relate to the broader picture of the interaction between humans facilitated by a particular technology, rather than attempting to confine them to a disciplinary practice of shaping the findings to reflect how practitioners can "build a better system" for a particular type of behavior.

On that note, we first return to the methodology we chose to employ in this study, and reflect upon the ways in which it influenced the types of results we were able to observe. Particularly in radically new and emerging environments, a researcher's assumptions about the research subject are constantly challenged by new discoveries. Grounded Theory represents an approach that not only enables, but also encourages researchers to adjust and re-frame their research assumptions in an iterative fashion as they encounter new data that challenges previous assumptions. For exploring emerging sociotechnical environments, we believe that a grounded theory approach combined with a mixed-methods methodology enables far greater ability to observe relevant social practices.

We believe, as is stressed in SCOT theory, that all users are *active participants* in shaping the ongoing usage of technology. In the case of the SIMS Backchannel, this particularly novel environment allowed for usages to emerge that were less shaped by the user's previous technological interactions, and more by a shared negotiation between participants towards "discovering" their natural inclinations in this environment. Simply put, studying an existing organic environment allowed us to observe behavior that we strongly feel would not have occurred in an experimental construct.

The SIMS Backchannel represents a technology whose usage has been shaped by the users. Usage of the SIMS Backchannel evolved significantly over eighteen months, at the behest of no one but the users who determined on their own when and how to participate. Indeed, in numerous instances the participants showed us (and in many cases, explicitly told us) that they had and would continue to actively shape their participatory roles in the backchannel, and would rather employ forms of self-moderation and governance than allow their interactions to be "designed" by an outside entity.

The pace of change in usage behavior in the SIMS Backchannel is exceptionally rapid. One aspect that the timing of our study was insufficient to adequately explore was the full extent of the differences in usage between the first year of backchannel adopters[44] and the incoming cohort of students who appear to have adopted the backchannel with some marked differences in usage. What remains an open and strikingly compelling question is how the usage of

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[44]Many of whom will now be graduating and leaving the department, and thus likely abandoning their usage of the SIMS Backchannel.

the backchannel will continue to evolve over the next few years as the transitory user population continues to iterate. As new cohorts of incoming students join, the previous academic year's "newbies" become the veteran users from whom new participants observe and learn how to participate.

Assuming continued popularity, usage of the SIMS Backchannel will eventually "stabilize,"[45] but is likely to undergo further significant change and potential conflict as the population shifts and an increasing number of "relevant social groups"—most notably, with the eventual increasing interest of faculty and administration—begin to take actions with the intention of influencing usage.

With that in mind, we summarize a number of conclusions about our research findings, with the aim to encourage and inform future work in this area:

The spatial context of a communications backchannel highly influences its usage. While the surface environment of the SIMS Backchannel shares many features with pre-existing computer mediated communication environments, it is the contextual relationship of shared physical co-presence among backchannel users that leads to the radically different types of usages. We found that not only does the frontchannel content highly predict backchannel discourse, but also that there exists a vibrant ecology of transmission of ideas back and forth between the two channels of communication, and a variety of conventions that surrounds this practice.

Users are active participants in shaping the usages of a technology. Those seeking to design systems for collaborative backchannel communication— or those seeking to conduct further study on similar environments—must note the importance of the ability for users to be active participants in the process of determining meaning.

Community elements play a strong role in online environments. The elements of community that may emerge between users of the virtual environment, the greater context of the "real life" community in which the users are situated, as well as the relationship between the two, are a significant part in defining of culture of the space in addition to motivating participation.

Backchannel users expressed a strong desire for self-governance. Participants almost uniformly felt that the SIMS Backchannel was an environment that should remain under the control of the student population. Most felt that an "official" backchannel would not be nearly as desirable an environment for interaction. Many of the most compelling emergent uses of the backchannel, such as its ability to function as a safe environment for testing new ideas, are highly dependent upon its status as a place where participants feel free to express themselves as they see fit.

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[45]In SCOT theory, the emergent usages of a new technology eventually stabilize, as interpretive flexibility reaches closure.

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A   Methodology: Log Analysis

Producing meaningful user statistics from the log files of the SIMS Backchannel involved a great degree of complexity. While many IRC networks allow users to register usernames and protect them with a password, the actual implementation of IRC does not require one to maintain a consistent username, known as a "nick." Because of this, a single IRC user may have many usernames, known as "nicks," over a course of time, and may easily temporarily change their username as a playful gesture.

An initial listing of unique nicks in the database found 334 nicks who had communicated in the SIMS Backchannel during the period of analysis. After manually reviewing this user list, it seemed clear that the *majority* of these unique nicks did not correspond to what we would term "actual" SIMS Backchannel users.

There seemed to be a number of factors contributing to the high user count. As previously mentioned, users sometimes changed their nickname as a playful gesture. In addition, when users were disconnected from the SIMS Backchannel due to poor Internet connectivity, the default behavior of many IRC clients was to rejoin the channel after appending an underscore the currently active username. Because the SIMS Backchannel was located on a public IRC network with no access-controls imposed, we found a number of instances in the log files of outside users who temporarily joined the channel, realized it was not the appropriate channel, and then left shortly thereafter.[46]

Therefore, in order to produce an accurate metric of active users in the SIMS backchannel, we faced two challenges: (1) identification of "junk" or non-users, and (2) the identification of unique users with multiple nicks.

A.1   Identifying Invalid Users

We conducted automated logfile analysis on two determining factors to gauge the validity of a nick. The first factor was a simple count of how many lines of communication were sent by a single nick, termed *participation* (p). The second was the overall *tenure* (t) of the nick, which was calculated by measuring the time difference between the time stamp of the first appearance and most recent appearance of a given nick in the logs.

These two variables were carefully evaluated in conjunction with each other, as neither variable was in itself sufficient to make an accurate determination of the likelihood of a nick's legitimacy. For example, a number of valid nicks belonged to consistent "lurkers," who spoke very little in the Backchannel and thus had a very low rate of participation, yet were identifiable by their high tenure.[47]

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[46]A common source of confusion were users confusing the title "SIMS" (the School of Information Management and Systems) with the popular Electronic Arts videogame "The Sims^{TM}."

[47]The importance of including lurkers in our dataset became apparent in our findings about their role as legitimate backchannel participants, discussed in Section 7.

At the determined cutoff threshold,[48] 222 unique IDs were identified as potential junk nicks. To further refine these results, we added a field which allowed us to manually override any of the automated decisions about user validity, based upon evidence from field observation and interviewees. In all cases, these overrides were explicitly noted in the dataset, and a total of nine override decisions were made with the agreed upon consensus of both researchers.

After these steps, a total of 213 junk nicks were identified and considered invalid for inclusion in statistical analysis of active users reducing the pool size to 121 nicks. As these 213 nicks represented a total of only 0.86% of the spoken lines of dialog in the backchannel, we consider our methodology to be highly successful.

A.2   Identifying Duplicate Users

Since multiple nicks identifying a user sometimes tend to begin with the same word stem (e.g. `bsmith`, `bsmith|home`, `bsmith1`), a database field was generated based on the first four letters of a nick (`ROT13` cycled to avoid reviewing bias), and unique nicks that matched in this field were automatically identified as potential duplicates for the research team to manually review. We also briefly considered tracking "nick change" IRC status messages, but due to a number of factors[49] we found it produced highly unreliable results.

After the analysis was completed, fifty-two nicks were identified as duplicates and their adjusted ID was assigned the the primary ID for the unique users they corresponded with, and were considered as equivalent to the primary ID for purposes of statistical analysis, reducing the sample size of unique users to seventy.

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[48] Automated cutoff threshold was set as $p \leq 20, t < 1$.

[49] For example, backchannel users would sometimes temporarily take someone else's name as a joke, and then immediately change back to their normal nick. This behavior did not affect our nick-stem analysis but confused automated nick-change tracking algorithms.

B   Public Release of Dataset

In order to encourage further statistical and frequency analysis on the dataset we obtained from logging eighteen months of chatroom data, we are making available to the academic community an anonymized version of the dataset.

Licensing

The intention to to make this data freely available for analysis by the academic community. Licensing is currently being drafted, pending legal advisement.

Download

This dataset and additional information regarding its usage, including tutorial examples, will be made available at:
`http://groups.sims.berkeley.edu/backchannel/dataset/`

field	type	comment
id	int	ID for log entry (sequential)
ts	DATETIME	timestamp
uuid	INT	unique userid of user for entry
msg_hash	VARBINARY	a salted SHA1 hash of the original message
msg_length	INT	length of the original message (in characters)
bot_cmd	BOOL	did msg begin with a "@" symbol?
ends_question	BOOL	did msg end with a "?" symbol?
ends_exclamation	BOOL	did msg end with a "!" symbol?
ends_period	BOOL	did msg end with a "." symbol?
contains_url	BOOL	did msg contain a "http://" string?

Table 2: Schema for the `public_logs` table.

field	type	comment
uuid	INT	ID for log entry (sequential)
uid	INT	set equal to the UUID of the primary nick for user
nickhash	VARBINARY	a salted SHA1 hash of the original nick
time_first	DATETIME	timestamp of first msg
time_last	DATETIME	timestamp of first msg
tenure	INT	the user's tenure
participation	INT	amount of msgs sent by this UUID
isjunk	BOOL	Was user classified as a "junk" user (inactive)?
isdupe	BOOL	Was uuid classified as a "duplicate" user?
isbot	BOOL	Was uuid classified as a "bot" in the study?

Table 3: Schema for the `public_users` table.

C Acknowledgements

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