

UNDERSTANDING DISTRIBUTED COGNITION IN MODERATED CHAT ROOMS: A PRELIMINARY ANALYSIS

Edward J. Glantz
and
Michael D. McNeese
The Pennsylvania State University
University Park, PA

This study evaluates higher order perception, cognition, and individual-cultural differences under which moderated chat rooms may provide an effective alternative for students reviewing business information system course material in preparation for examination. Chat rooms comprise a form of groupware that can facilitate distributed cognition among higher education participants in the form of information-sharing. This study continues previous research (McNeese, et. al., 2002) that indicated problem solving and constructivist learning are socially constructed, situated in practice and context specific. The premise of this paper is that with proper design a cognitive task, such as students reviewing for exams, can be effectively supported even within the possible constraints of simple chat rooms. A potential benefit to students, based on previous research, is that groupware such as chat rooms can provide a constructivist learning environment and an equality of participation in group discussions (Benbasat and Lim 1993). Initial results indicate the possibility to create social constructs whereby students with limited individual problem solving capabilities can be trained in a naturalistic setting to successfully acquire and transfer knowledge.

INTRODUCTION

This paper seeks to discover whether distributed cognition, as facilitated by chat rooms in groupware, has the potential to create intimacy and relevancy supplementing the social construction of knowledge (Salomon, 1993) in large section classes typical of introductory courses in colleges and universities. Currently chat rooms are underutilized and perhaps not understood from perspectives that emphasize cognitive processes such as knowledge acquisition and transfer (McNeese, 2000). By aligning a cognitive task, such as reviewing course material in preparation for an exam, with chat rooms, this paper hopes to envision other creative implementations of chat rooms in complex systems. To do this we need to understand the use of groupware in situated learning (McNeese et al. 2002), as well as decompose the process of exam preparation.

Groupware, such as the chat rooms used in this research, meet the needs of groups by integrating the information-sharing functionality found in email, listservs, newsgroups, shared network servers, and web pages (Greenlaw, 1999). Greenlaw notes that the theoretical basis for the use of groupware in situated learning comes from an active learning paradigm known as "constructivism." This is in contrast with traditional lecture pedagogy, for example. Constructivist proponents argue that students learn more when required to construct their own understanding of source materials. By its very nature, groupware may provide a virtual arena for constructivist learning by providing students a forum to interact, construct, take issues and reevaluate positions (Greenlaw, 1999, Klem, 1995 and Jonassen et al., 1995).

The benefits of groupware, according to Manning and Riordan (2000), include increased user participation, automatically recorded comments and votes, more structure imposed and faster progress.

All of these features are seen as desirable for computer-supported cooperative learning groups. As might be expected, an empirical study reported "higher levels of self-reported skill development, learning and evaluation of classroom experience than in comparison groups not using groupware" (Alavi 1994). This supports personal use of this type of system. In two large sections (200-400 students each) of an introductory business course to business information systems, Penn State's ANGEL system has been used for threaded discussion, file sharing, announcements and other course materials.

Penn State deployed its current groupware software system called ANGEL ("A New Global Environment for Learning") as a course business system in the spring semester, 2002. ANGEL is the groupware product from Cyberlearning Labs, Inc. (<http://www.cyberlearninglabs.com/>). Though adoption by faculty was optional, its use was hastened by the elimination, in some cases, of other web space areas traditionally used by instructors to post course material. The chat features in ANGEL are fairly modest, including the ability to create chat logs, filtering, private rooms and private messages, as well as course control of member access.

One year prior to beginning this research, Penn State's information technology group had conducted a post-implementation survey (Stout and Obieta, 2002). This survey polled faculty and students on the effectiveness of ANGEL's various groupware features, including message boards, chatrooms, lesson folders, calendar, email, dropboxes,

quizzes, survey and link organization. During the time of that survey, 52,793 students were enrolled in ANGEL enhanced courses at Penn State, including commonwealth campuses. Also, over 1,000 faculty were registered as the instructor of record using ANGEL for their courses

The most useful features, according to the survey, were the lessons tab, on-line syllabus, email and drop box. At the other end of the spectrum, the chat room was perceived to be the least useful. Personal experience in using ANGEL suggest the logistics of using the chat room and then evaluating logs to conduct student assessments seemed prohibitive, especially for large sections. Without the assessment, there might not be sufficient reason why students would “chat.”

Another issue is that the ANGEL chat room offers limited affordances (stimulus-response compatibilities) in comparison to specialized chat room software. Though ANGEL’s chat rooms do allow logging, filtering, private rooms and private messages, specialized chat room software providers may include voting, threading with notation or multiple frames where discussion takes place in one frame and shared material is presented in another. Potentially ANGEL’s limitations may restrict its usefulness to supplement in-class discussion and tutorials with virtual chat sessions. However, it may be possible to design applications around missing features and justify changes made to ANGEL’s feature-set.

The main purpose of this study is to explore the effectiveness of distributed cognition in the form of review sessions held online for an introductory course in business information systems. This study also provides the opportunity to explore individual differences such as age, gender and ethnicity that may impact how groups construct knowledge.

THESIS (HYPOTHESES)

Specifically, our hypothesis is:

With proper cognitive systems engineering, is it possible to facilitate a distributed cognitive environment using moderated chat rooms that supplement other learning processes? Further, what is the role of the moderator in this setting? Do student personality types, computer attitudes or individual and cultural differences play a role? What are the minimal features needed by the chat room to create a naturalistic environment capable of enhancing the social construction of knowledge?

METHOD

Participants

The participants are selected from students enrolled in two spring semester 2003 sections of an introduction to business information systems. These two sections represent a total of approximately 600 students. Three research sessions will be conducted during the semester with groups of 30 to 60 students in each session (see table 1).

Table 1
Individual-Cultural Information of Surveyed Students (N = 60)

Individual Variable	Frequency	Percent
Age (Years)		
18	45	75
19	11	18
20	3	5
Unknown	1	2
		100
Gender		
Male	29	48
Female	31	52
		100
Ethnicity		
African-American	4	7
Asian/ Pacific Islander	3	5
Latino	4	7
Middle-East/ North Africa	0	0
Caucasian	45	75
Unknown	4	6
		100

Setup and Procedure

The traditional “live” course review sessions are held at night the week before the exam. There are three exams per semester, and thus three review sessions that students from all sections are welcome to attend together. Approximately 200 students typically attend, representing one-third of the enrolled students. About half of those students leave after the introduction indicates which sections from the text material will be emphasized. The remaining 100 students ask questions for about 20 minutes. Students then prepare for the exam held in class the following week by reviewing lectures, readings, self-test questions (self-test questions are provided interactively with feedback in ANGEL), and a course pack with most lecture notes.

More frequent review sessions have not been conducted due to room and time constraints, though participation in review sessions increases with each of the 3 exams

It is not intuitive whether online review sessions could replace these live review sessions. Offering them in parallel and seeing where students choose to spend their time is part of this *use experiment*.

It is also important that the sessions be moderated. This means the chat rooms are only turned on during instructor supervision. Though students can and should query each other, it is important that an instructor manages the tone and accuracy of the meeting. Also, the instructor needs to have seed questions ready to get the ball rolling.

Materials/ Tasks

The Penn State ANGEL chat room will be used for three online exam review sessions with the instructor as moderator. In addition, weekly online review sessions will be held to review material and reinforce problem solving and higher order cognitive techniques (see McNeese et al. 1992) such as concept mapping of course material and case analysis. Three live exam review sessions will be conducted during the semester as well.

Surveys will be conducted following each of the three course exams to correlate participation in live and/ or virtual review sessions with exam performance. In addition, surveys will assess review-format satisfaction criteria, individual-cultural differences, personality types and attitudes towards computers. This data will be supplemented by noted observations of instructors.

Particular attention will be given to techniques that create a constructivist learning opportunity for both exam-review (live and virtual) settings.

The course used in this experiment requires three multiple-choice exams, each with 60 questions representing approximately 4 chapters of material.

RESULTS

The results in this paper are preliminary but will continue to expand in depth as assessments of the next two sequences are analyzed. So far, only one of the three scheduled review, test and then survey sequences has been conducted.

It is expected that further analysis of student reactions to the online review sessions will lead to an effective alternative for students reviewing introductory business information system course material - a real, practical outcome for engineering distributed cognitive systems designed to advance knowledge acquisition and transfer. This is anticipated since room and schedule conflicts can be offset with flexibility in meeting times. Further, an opportunity exists to generate and distribute a log file that can be posted and reviewed asynchronously. The log file can even benefit non-participants, thus extending the reach of this method. In addition, it is possible that students who might not participate in a classroom setting may participate in the relative anonymity of a safe and convenient chat room. This may be especially true given individual differences and preferences (see table 2).

Other observations include the need for moderation, the development and adherence to "netiquette" for chat rooms, and several other items as outlined below:

Moderation is critical. Without moderation, chat sessions would be chaotic and thus unproductive. Further, students probably would not participate (at least initially) if they didn't think an instructor (or authoritarian source) was present. As in a classroom setting, the moderator can decide whether to answer queries directly or redirect student questions back to the group for discussion. At this point students can respond at will,

without the classroom constraints of being recognized (and potentially overlooked).

Development of "netiquette" for chat rooms is critical, even with moderation. This behavior, once explained, can be quickly internalized allowing for more efficient sessions. We post an agenda for questions and expectation that students joining late wait to see where we are before joining in. Our session requires authentication and actual names to be used, creating a responsible exchange.

Table 2
Review Session Participation and Survey Response Examples by Student Participants (N = 60)

Individual Variable	Frequency	Percent
Review Session Participation		
In-person	18	30
Chat room	15	25
Both	7	12
Neither	19	32
Unknown	1	1
		100
Review Session Usefulness		
Helpful	35	58
Not Helpful	19	32
Unknown	6	10
		100
Chat room Review Impression		
Not Profitable	8	13
Somewhat Profitable	23	38
Very Profitable	15	25
Not Applicable	12	20
Unknown	2	4
		100

Technology changes. Our chat room is the simplest of chat rooms available. We can see when students join or leave, and can only type simple messages (no cut and paste of multi-line text, for example). We have identified several changes necessary for the chat room to be viable.

- Improvements in the ability to generate and publish logs of the sessions have been proposed. The logs are a critical resource not only for the participants, but as a tool for non-participants, creating a secondary learning opportunity.
- Students joining after the session start are occasionally met with "dead air." This creates frustration and a sense that the system is not working. If a student joins during a pause in chat activity (i.e. participants are pondering a moderator query), it appears that the chat room is not working. Two solutions are to address this in the netiquette/ agenda note (scalable), or to "welcome" students as they join (not scalable).

- It is necessary to differentiate moderator comments from students. As instructor/moderator, we type in capital letters. Brackets for side comments are used as needed.

Shift watchers to more active state. Of students participating in chat room reviews, approximately 2/3 appear to be “watchers.” They are basically unsure or afraid to participate, but hope that others do. It may be possible to train these 2/3 to improve their problem solving skills “by example” and move them to a more active role.

Learning modifications are necessary, yet naturalistic constraints (limited rooms for evening review sessions, limited time by instructors and students, etc) reinforce last minute studying. Initial results indicate attendance in pre-exam review sessions overwhelms weekly review sessions. However, students may be trained to expect weekly review sessions reducing the need for last-minute learning. Further, the nature of these sessions (safe, convenient, equal opportunity) may allow a more efficient and naturalistic learning environment.

constructivist learning. Though familiarity with chat is a plus, students need training to use chat rooms for constructivist learning.

DISCUSSION

The value of this research is threefold. First, better insight into the cognitive process of preparing for exams by students can be provided. Second, the introduction of an application such as a virtual review session may begin the conversion of the “least useful” groupware component at Penn State into a tool that can create a naturalistic setting that facilitates distributed cognition in the review and application of course material. Third, the insight into student attitudes, preferences and cultural orientations may guide future development of other distributed cognitive applications mediated by chat rooms.

ACKNOWLEDGEMENTS

Special thanks to Joaquin Obieta, Pennsylvania State University, for tireless support as a research assistant on this project and Roxanne Yvetta Toto, Pennsylvania State University, for ideas on research instruments used in this study. Also, special thanks to Douglas Lloyd, University of Virginia, for making the Lloyd/ Gressard Computer Attitude Survey (Brenda H. Loyd and Clarice P. Gressard) available to us.

Table 3
Survey Response Examples That Will Be Used To Inform Chat System Use, Design and Distributed Cognition

Chat Room Review	
Major Barriers	Typing slows my thought process down Window refreshed too quickly Too many people asking different questions Difficult to express myself when not in person
Improvements	Increase faculty: student ratio Limit topics Increase frequency of review sessions Posting the session log would be beneficial
Major Benefits	Able to participate anywhere Able to get personal questions answered Got to see others needed help with course Asking questions personally, and having other people answer as well Liked participating without feeling self-conscious

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Individual-cultural differences haven’t been scrutinized, but appear to play a role in chat room attendance. Preliminary indications reveal a significant number of female and foreign students in both the chat sessions and research sessions.

Chat is currently seen exclusively as a social tool. Students use chat frequently (some even had personal chat up during the research sessions). It is not intuitive for students, however, to re-appropriate this tool for

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