

10-1-2008

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Learners' Perspectives about Uses of Synchronous and Asynchronous Conferencing Systems within an Online Graduate Course: Interpretations through an Activity System

Abstract

Synchronous voice-enabled communication is an established communication technology that is becoming increasingly available in learning management systems. Instructors can implement live voice chats to create engaging learning environments. While research has been reported using synchronous text-based chat, little is known about the experiences distance education learners in graduate study programs have using synchronous voice communication. This article presents findings from a qualitative research project designed to explore graduate students' perceptions about the effective use of both synchronous and asynchronous communication within a graduate course offered through a *WebCT* online environment supplemented by *Groove*. A constructivist theoretical perspective and grounded theory framed the study. Data sources included questionnaires and individual computer-recorded and transcribed interviews. Content was analyzed by the researcher for themes and confirmed through ongoing member checking with participants. The following five overarching themes were identified and used to understand learners' experiences with and perceptions of synchronous and asynchronous communication technology in a graduate distance education course: 1) community building; 2) easing the cost of communicating online, 3) creating a sense of real class and dialogue, 4) instilling a trust in the technology's reliability, and 5) capturing and preserving knowledge.

Key Words: synchronous communication, asynchronous communication, online graduate learners, media richness theory, information delivery, social conversation, cognitive presence

Introduction

Emerging technologies are offering alternative ways to conceptualize and deliver education, and in the process are changing how learners think, build community, and construct and preserve knowledge (Stodel, Thompson & MacDonald, 2006). All of these activities occur through communication. In the online environment, communication occurs through asynchronous and synchronous avenues. Instructors, learners, and researchers have long recognized the link between asynchronous text-based interaction and the achievement of higher levels of learning and learner satisfaction in online

learning environments. Interaction in text-based discussion forums available in course management systems with peers designed under the right circumstances with appropriate facilitation promotes conceptual change through grounding and offering multiple perspectives, leading toward the co-construction of shared meaning (LaPointe & Gunawardena, 2004).

Today many forms of synchronous interaction are also available through course management systems and Web 2 technologies. These forms include text-based chat, whiteboard presentations, Voice over Internet Protocol (VoIP), Web casts, and web conferencing. Research concerning synchronous forms of communication, however, has largely focused on text-based chat and audioconferencing systems. VoIP is frequently discussed in the computer-assisted language learning systems. However, little outside the language field has been reported on VoIP, its place in online learning, and its advantages. Despite the growing body of favorable research supporting online learning, the concern that Garrison, Anderson, and Archer (2001) shared in 2001 that our adoption of computer-mediated conferencing systems has quickly surpassed our understanding of how to best use them to facilitate learning and community building still is of concern today. The growing number of emerging technologies is widening this “gap” and increasing the importance of how to use and design for best use.

The author has designed, developed, and taught online undergraduate and graduate academic courses since 1997, as well as developed online compliance training for healthcare professionals. All academic courses have been evaluated at the conclusion of each semester, and results of the evaluations have frequently led to changes in the course design and instruction. Learners enrolled in classes taught solely using

asynchronous forms of computer conferencing often indicate that they enjoy the classes, are stimulated by class discussions, and are able to learn online. However, some learners have reported that they miss the spontaneity and contact of “an in-class” discussion. Other learners enrolled in classes incorporating weekly voice chats enjoy the spontaneity of the synchronous discussions yet still do not feel they are part of “a real discussion in a real class.” Understanding learners’ perceptions about their online experiences using both synchronous and asynchronous conferencing systems is important for the effective design and development of activities and implementation of appropriate technologies to best facilitate the learning cycle in online learning environments.

The purposes of this study were to explore learners’ ideas about their experiences using synchronous and asynchronous conferencing systems and to gather their impressions of the effective use of both types of conferencing systems in facilitating learning. The current study focuses on an online graduate course, where participants volunteered to participate in face-to-face interviews in addition to completing online questionnaires. All participants gave their informed consent.

Asynchronous Conferencing Systems

Asynchronous text-based communication is defined as written communication that takes place on a bulletin board, blog, and wiki in delayed time. Asynchronous communication does not require the simultaneous participation of instructors and learners (Johnson, 2006). Learner participation in asynchronous communication relies heavily on good keyboarding and literacy skills of reading and writing. However, today’s learning management systems also offer the capability to record and post audio messages to a forum.

Asynchronous text-based communication is best known for its capability to provide the opportunity for high-level, in-depth interaction among all members of an online classroom (Jarvela & Hakkinen, 2002). Asynchronous text-based CMC promotes in-depth interaction through its facilitation of a critical component of learning—reflection (Feenberg, 1989). Reflection, defined as searching for connections and attaching networks of present experience to past, developing comprehension and complexity, results in actual changes in the brain's structure (Zull, 2002). Reflection helps the learner integrate and recognize global patterns and relationships, which lead to knowledge creation (Bielaczyc & Collins, 2006) and intellectual development. Vygotsky (1978) referred to this as internalization of social processes from working with others.

Synchronous Conferencing Systems

Synchronous voice-enabled CMC is defined as real-time voice communication that takes place with learners and instructors assembled at the same time, usually in different locations—at their homes, work sites, or campus computers—using microphones and headsets. Learners can speak to and hear each other in real time. Synchronous communication tools—text chat, videoconferencing, whiteboards, interactive Web casts, web conferencing, videoconferencing (National Center for Accessible Media, 2005), and text and voice chat in Second Life—are becoming increasingly important concepts of online learning.

Little has been written about synchronous voice communication in online learning environments. More research has been conducted on synchronous text-based communication tools like chat. Synchronous text-based chat is known for its spontaneity,

informal writing style, multiple overlapping conversations, and use of emoticons and acronyms.

Synchronous voice conferencing relies on good speaking, listening skills, and turntaking as well as good facilitation skills that ensure attention is given to all participants and their views. There is opportunity to direct questions and responses as well as to request elaboration and easily receive and give timely feedback. Voice conferences can be recorded and archived. Multitasking by typing and reading the text-based chat while listening to the voice discussions may create conflicting attention demands. Likewise, typing, watching the avatars, and moving around the setting in Second Life may overload the online learner. However, as of yet, no research has been reported on these phenomena in CMC.

Learning as an Iterative Series of Phases

A review of current studies suggests that meaningful learning has purpose and results from a series of phases. The phases of learning can occur in an online learning community. An online learning community is defined as “a fusion of individual (subjective) and shared (objective) worlds (Garrison & Anderson, 2003, 23). Learning in a learning community is an iterative process, with learners moving between their subjective, private worlds and the public, objective worlds, developing deeper and more elaborated understanding and further questions, resulting in conceptual change.

Garrison and Anderson (2003) describe a community of inquiry with three key elements: (a) cognitive presence, (b) social presence, and (c) teaching presence. Cognitive presence is further discussed in this article. Cognitive presence integrates the public and private worlds of the learner as well as recognizes the phases of learning. The

phases of learning include (a) a triggering event, learning activity, or problem initiated by an instructor or facilitator, (b) an exploration of the problem, (c) integration of and reflective observation on new ideas with prior knowledge, and (d) resolution of the problem that usually requires testing new ideas for viability within a community of practice. Testing new ideas through discussion and projects causes conceptual reorganization and builds conceptual complexity, triggering new cycles of learning.

Learning is then both an individual responsibility as well as a shared undertaking (Garrison & Anderson, 2003). The shared, public world of the learners includes (a) the triggering event posed by the instructor or tutor and (b) testing the resolution and receiving feedback through discourse with others. The individual private world of the learners includes (a) exploration through information searches and (b) reflection and integration of ideas.

However, learners do not automatically move from one phase of the learning cycle to the next. Active learning (understanding) occurs when learners select relevant material, organize selected material, and integrate selected material with existing knowledge in order to construct a coherent mental representation of experiences (Mayer, 2005). Moreno and Mayer's (2000) work on social cues in multimedia learning further distinguishes the processing learners undergo depending upon their perceptions of the learning situation. When learners perceive a learning situation to be an information-delivery scenario, learners try to acquire and recall information rather than understand it. When learners perceive they are engaged in a social conversation, their social conversation schema is activated, and learners are more likely to act as if they are engaged in a conversation with others. Learners try more diligently to make sense of

communication by engaging in deep cognitive processing, asking for clarification and elaboration from others. Deep cognitive processing results in meaningful learning outcomes and meaning making, which better enables learners to apply or transfer what they have learned to new situations.

Relationship of Phases of Learning to Asynchronous and Synchronous Communication Technologies

It has been well documented that asynchronous conferencing supports the reflection and integration phases identified by the learning model described above. Asynchronous conferencing provides learners the opportunity and time to connect new ideas with past experience and to consult additional learning resources as they search for relevant information that supports or contradicts their previous ideas and begin to form new abstractions. Learners can take as much time as needed to process input from others and as much “talk time” as needed to express their ideas. Learners have the time to clarify their ideas for themselves and others, find the gaps in their thoughts, and take the time to find the right words to express themselves—all of which lead toward integration of new and prior information and the formation of a new abstraction—a tentative new construction of meaning.

Although it is possible that the testing of a new abstraction can be completed in an online learning environment, the literature reports that asynchronous text-based discussions rarely move beyond the reflection and exploration stages. Gunawardena, Lowe, and Anderson (1997) report that in a discussion framed as a debate, 93 percent of the messages posted were in Phase 1, sharing and comparing information. Kanuka and Kreber (1999) describe similar findings in an online undergraduate class that employed a variety of instructional methods: (a) question posing, (b) brainstorming, (c) debate, (d)

small group discussion, and (e) case studies. Their results overwhelmingly found comments posted to the discussion were categorized in the first phase of knowledge construction (approximately 90 percent in phase one for all instructional methods). The failure of online discussions to move beyond sharing and exploration of the topic could be related to design and facilitation of the discussion, the discussion topic, or the characteristics of the technology. Regardless of the cause, the findings are important, for integration of new and prior knowledge is necessary for learning and building a shared knowledge base (Andriessen, 2006). The lack of opportunity to integrate and test new knowledge is a serious concern.

To test new knowledge, the learner and learning community need to accomplish more than the simple task of generating and sharing ideas, especially when assigned tasks and discussion topics have no right answer. The members of the learning community must negotiate and resolve conflicting viewpoints, by prioritizing information explored and compared, resolving conflicts of interest (McGrath, 1984), and reaching consensus. To do so, learners make their new knowledge public by sharing their model of the situation, setting out their underlying assumptions, providing a rationale or justification, helping others understand, and offering a way to test the new abstraction. Others agree, offer divergent information, critique, and ask for elaboration. The active negotiation in presence of others creates a concrete experience and gives information about the validity of one's ideas (Zull, 2002).

To complete the learning cycle and test new abstractions, the technology that provides more group decision support tools, immediacy, and spontaneity allows learners to more directly connect their ideas to others orally, scaffold others' ideas and

knowledge, represent conceptual ideas and their relationships visually, and immediately and more explicitly react to others' messages, reflecting more sophisticated interpersonal and communication skills. Few group decision support tools have been generally available in course management systems (CMS); however, some CMSs do provide the polling feature. More commonly, group decision support is facilitated through immediacy of the technology and facilitation of the discussion.

Synchronous CMC provides that sense of active engagement in discussions in the presence of others. Learners have the direct attention of others and reduced uncertainty about mutuality, significance, and sincerity. Learners also have the advantages of voice and paralinguistic variables, such as loudness, pitch, tone, enthusiasm, speed, as well as hesitancy and silence, which provide richer information during the negotiation to reveal emotional states and when speakers are ready to yield the microphone and take turns speaking. Learners can verify classmates' communicative intentions to participate in a conversation, inquire as to relevance, and confirm inferences as well as better direct attention and responsiveness. It seems, therefore, that an online course would benefit from including both synchronous and asynchronous CMC to facilitate the full learning cycle.

Media Richness Theory

Effective communication is an essential component of the learning cycle that must be facilitated through CMC. Effective communication is a multiple-channel phenomenon that simultaneously carries emotional expression, cognitive states, and social integration through facial, body, and eye movements as well as with vocal and verbal behavior (Druckman, Rozelle & Baxter, 1982). Media Richness theory has been

used to examine the effectiveness and appropriateness of various media for various communicative purposes. According to Media Richness theory, media differ in their capabilities to provide immediate feedback, number of nonverbal cues, facial expression, voice tone, message personalization, and natural language (Daft & Lengel, 1984, 1986). The theory predicts that the more capabilities the medium possesses, the richer the medium.

Research conducted on traditional communication modes—face-to-face and via telephone, letters, and memos—has confirmed that the perceived media richness of traditional communication media is higher with increased multiplicity of cues and increased immediacy of feedback (Johnson & Keil, 2002). Studies of newer media such as e-mail have suggested that media richness is not a property of the medium per se but rather an emergent property of the interaction of the medium with (a) the organizational context (Lee, 1984), (b) the individual's experience with the medium (Carlson & Zmud, 1999), (c) interaction between the individual and the medium (Rice, 1992), and (d) perceived ease of use (Fulk & Schmitz, 1995). Learners' perceptions of the richness of asynchronous and synchronous communication technologies also may be influenced by course design, structure and facilitation of the discussion, orientation to the technology, and prior individual experience with technology in general. Whether learners perceive synchronous communication as a richer medium than asynchronous communication is currently unknown.

Methodology

Context

Design and Development of Online Learning is an elective course offered online to graduate students at a university in the western United States. Most learners are enrolled graduate students, although some learners are enrolled in neither a master nor doctoral program at the university but have been charged by employers to design online curricula for school systems and state or federal agencies.

The course work was completed online using a *WebCT* course management system with three face-to-face sessions held at the beginning, midterm, and conclusion of the course. The primary media for communication, instruction, and assessment were asynchronous text-based threaded discussion forums within *WebCT* and synchronous voice conferencing conducted in *Groove Virtual Office 3.0*. *Groove* is a peer-to-peer workgroup communication and collaboration program that provides a set of tools to support workgroups operating over distance. *Groove* provides multipoint voice conferencing using Voice over IP (VoIP), in both “press to talk” and open microphone modes.

The asynchronous discussions were moderated by the instructor, and the synchronous discussions were moderated by the instructors, mentors, guest speakers, and students. Course requirements asked students to post at least two comments per week to the asynchronous discussion. Expectations for and samples of quality postings were discussed and posted in the course materials. A rubric used to grade comments was also posted and discussed. Students completed a series of readings, posted text-based discussion answers and questions, attended weekly voice chats designed as seminars, and developed and tested two modules of an online course during the 16-week semester.

Participants

Participants in the study were eight graduate students enrolled in master and doctoral programs within the Colleges of Education and Sports Administration. Four students were male, and four were female students. Ages ranged from 23 to 48. Five participants were working full-time; three worked part-time. Participants identified their nationalities as Black (1); Hispanic (1); Caucasian (6). All participants signed a consent form. Six had no prior experience as a learner in a distance education course.

Procedure

The purpose of the study was to explore online learners' perceptions of their experiences interacting with classmates, the instructor, mentors, and guest speakers in an online course using both online synchronous voice and asynchronous text-based computer conferencing. The research questions guiding the research were: (1) Are there specific and distinct purposes for the synchronous and asynchronous communication in an online course? (2) Are there specific and distinct benefits of synchronous and asynchronous communication in an online course?

This study was framed from a constructivist theoretical perspective under a naturalistic inquiry paradigm. Data sources included two questionnaires and eight audio-taped and transcribed interviews. The in-depth, semi-structured interviews took place after the course was completed and students had received their final grades. Participants granted the researcher permission to audiorecord the interviews. Transcripts were transcribed verbatim. Content from these data sources was analyzed by both the primary researcher and an assistant.

Data Analysis

The transcripts were thoroughly read and reread and the iterative, constant comparison was used (Glasser & Strauss, 1967) to analyze the data and to create the categorization and coding scheme that led to the themes that were identified and examined. Data analysis continued until the categories were saturated. Participants' comments were used to illustrate the emerging categories and present the voice of the participants. Pseudonyms are used when participants' comments are reported. Trustworthiness was established through ongoing interaction and member checking with participants to ensure authenticity. The findings were interpreted using the online learning as an activity system (Sherry, 2001).

Findings

The following five themes emerged from analyzing the questionnaires and interview data. The themes represent learners' perceptions of key areas of communicative behaviors that facilitate learning and community building online. The five themes were (a) building communities that were to become trusting environments where ideas could be shared, (b) the cost of communicating online, (c) creating a sense of a real class with authentic dialogue, (d) developing a trust in the technology's reliability, and (e) capturing, preserving, and managing community knowledge. The themes are data-driven and presented in order of the relative frequency in which they were mentioned by the participants.

Building Communities of Trust Where Ideas Can Be Shared

All participants commented that both synchronous and asynchronous communication continued the community building that began during the face-to-face orientation. The orientation was held during the first week of the semester and was the

first of the three face-to-face sessions held during the 16-week semester. During the week following the orientation, participants posted expanded introductions of themselves in the asynchronous discussion. Participants felt the expanded introductions captured in text and permanently posted in the course management system stimulated recall of the initial introductions and provided additional information that was later useful in getting to know their classmates.

Several learners described referring to the written introductions throughout the course, especially after participating in synchronous sessions and when they felt a sense of isolation. Sherry noted:

“I reread the introductions in WebCT after the synchronous sessions moderated by my classmates. After Lane presented his course and led the discussion, I thought how smart he was and how much he knew. I reread his introduction again to remind myself about his background and experience.”

Laura also mentioned rereading her classmates' introductions after synchronous sessions to “visualize my classmates and recall the words they had spoken during the face-to-face orientation.” Both Sherry and Laura used the synchronous and asynchronous communication channels to maintain and revise their models of their classmates.

Anne sometimes felt as though she “wasn't participating in a real class since she rarely saw her classmates, but nobody knew I felt that way.” She would reread the introductions when she “was feeling isolated” to vicariously reconnect with her classmates.

The synchronous communication further continued the community building each week by signaling who was speaking, providing the familiarity of classmates' voices, directing attention to the group, and allowing spontaneity. Groove allowed participants "to see who was speaking" by placing a microphone icon next to the person speaking. The speaker icon also made it easy for learners to follow the conversation and to respond to individual members of their group. The icon helped them learn participants' names, voices, and speaking styles.

Learners communicated with each other and the instructor only when needed in the ways they preferred. They did not converse unnecessarily, for instance in the asynchronous *Student Lounge*. Learners developed individual preferences for other ways to communicate with members of the community outside of class when necessary. Jane reported having less anxiety as she knew that if she had a question, she would be able to ask the question at the next synchronous meeting and get an immediate response. Gerald reported the opposite, remarking, "Whenever I have a question or needed some clarification, I can leave a message in the discussion forum marked 'Questions' or use e-mail, and I can get a quick answer before the next *Groove* session." Laura preferred sending voice-mail recorded messages attached to her e-mail messages to others and preferred getting voice messages in response. Others accommodated their classmates' preferences.

The Cost of Communicating Online

Learners reported that the disadvantages of asynchronous discussions fell into three categories—(a) the cost or burden of interacting, (b) lack of feedback, and (c) disengagement. Kevin expressed a frustration with the lengthy process of participating in

a scholarly discussion in the *WebCT* discussion forum. He felt a great deal of pressure and effort was necessary to:

“read the numerous, often disconnected comments posted by my classmates. Then I have to reconstruct the course of the discussion and summarize the comments. Then I have to respond brilliantly because my comments will show forever.”

The permanent nature of his postings plus server restrictions limiting the amount of time he could be logged into the university course management system further hampered him. To avoid being disconnected by the server in the midst of composing a response, he had to remember to first compose offline in Word and then copy and paste into *WebCT*, adding several required steps to interacting.

Receiving timely feedback from others served a critical function for several learners. Kevin used the discussion forum as “a sounding board for my thoughts.” He reported that the silence he felt when no one immediately responded to his posting was “psychologically damaging,” adding that:

“In the face-to-face classroom, someone soon politely responds even with a comment such as ‘that’s interesting,’ which relieves my anxiety.”

For those reasons, Kevin reported the asynchronous discussion made him feel like a “lone wolf taking a course in a box.”

While learners reported that they did enjoy reading their classmates’ asynchronous contributions, Laura and Sherry worried if they were “getting it,” which they described as the uncertainty as to whether they were fully comprehending their classmates’ postings. Sherry wanted “additional cues such as loudness, intensity,

inflection, repetition, and tone especially when encountering new information for the first time” for processing.

Laura reported that as her anxiety grew about whether she was “getting it,” she began to lose interest in the asynchronous discussion and merely began to post the required number of comments. After doing so, she never returned to see if anyone responded to her comments. Like Kevin, she reported her perceived lack of timely responses adversely impacted her learning. Interestingly, when Laura and the researcher discussed the findings from this study, she subsequently had taken another online course where the asynchronous forum provided the only means of communication. She reported that she became very stimulated by the asynchronous discussion in the subsequent course. She felt the nature of the discussion, which asked participants from many diverse disciplines to share personal applications of course content to their disciplines, intrigued her.

Creating a Sense of a Real Class with Authentic Dialogue

With regular time scheduled for class meetings, the course felt more like a “regular class” than an online class. Everyone in the course blocked time out of busy schedules to assemble strictly for the purpose of learning and talking together. Laura and Lane found blocking out time to participate in synchronous discussions easier than setting aside time for participating in asynchronous discussions. Sherry reported that donning a headset and microphone helped her focus and commit herself to the class sessions. Sherry usually participated in the synchronous discussions from her home and workplace, and the equipment signaled to her family and coworkers that she was unavailable as “class was in session” and gave a “sense of exclusivity as to who could participate in the class.”

Additionally, learners reported that their classmates and instructor responded immediately after they spoke in the synchronous discussions. The emotion, speed, tone, hesitancy, and degree of enthusiasm in the responses indicated whether their classmates were processing their contributions and provided clues as to what degree others recognized, evaluated, and accepted their contributions. Learners could tell if they were “getting it” from the immediate feedback they received and then could better tailor their messages and requests for more information. Anne reported,

I do the reading (assigned and on the discussion board), but it doesn't stick with me until I'm really interacting with my classmates in Groove. I visualize my classmates in my mind and see them as they're speaking. I imagine what words they emphasize.

Sam felt hearing his classmates' tone and inflection gave a “more dynamic, emphatic impression of what his classmates were saying” and was glad that the weekly synchronous voice discussions gave him “the voice back.”

Interacting was easy; all one had to do was “press the button” to talk as opposed to accurately type out complete thoughts. That ease according to Sam provided course participants with the opportunity “to more fully tell their story, to deviate into the background of their answer, to include more incidentals like ‘This is my answer, but did you also know? Or what I'd also like to add is’”

Sherry and Laura reported being able to express and be themselves more so in the synchronous environment than in either the face-to-face environment or asynchronous CMC. They both reported that their classmates' quizzical expressions intimidated and silenced them in face-to-face discussions, and they felt more confident speaking in the

synchronous environment when such visual cues were absent. Additionally, Sherry was located at home with her young family safely assembled around her; she could focus on the course and the discussion at a specific time in contrast to (a) the anxiety she often felt when away from her family while attending on-campus courses and (b) her inclination to become distracted when working asynchronously.

All learners initially mentioned struggling with the multitasking nature of synchronous voice communication. Reading the ongoing text-based chat that frequently accompanied the live voice discussion and the PowerPoint presentations divided their attention and caused them anxiety initially. They worried about the possible disrespect the text chatting showed for the speaker. They frequently discussed posting ground rules to prohibit or determining when text-based chatting was appropriate. However, despite the suggested ground rules for eliminating and regulating the text-based chatting, the text chatting occurred throughout the semester. Many subsequently felt it contributed to community building and provided a way as Sam mentioned to “substitute in some of the missing nonverbal feedback.”

Despite the immediacy and community built, learners also pointed out discrepancies between synchronous communication and their perceptions of online learning. Two perceived distance education meant students could log onto courses at times convenient to them, and the synchronous discussion “thwarted the convenience, flexibility, and purpose” they expected. One learner expressed a preference that attendance at the synchronous conferences not be required weekly.

Developing a Trust in the Reliability of Technology

Other disadvantages the learners reported regarding synchronous discussions fell into three categories—(a) the technology's not being ready for "prime time," (b) their not feeling accustomed to synchronous technology, and (c) their perceptions of online synchronous communication. Kevin, Gerald, and Lane described that when they initially heard they would be participating in weekly synchronous voice-enabled discussions, they immediately foresaw potential technological problems that would cause them frustration and interfere with the precious little time they felt their lives allowed for learning. None had previously heard of Groove and, therefore, expected to encounter a compatibility issue between it and their home computers. Kevin was a Mac user, and Groove was incompatible with Macs. Lane lived in a rural area where high-bandwidth connections were unavailable, and he wondered if he would be able to receive the discussions. Synchronous voice conferencing to him presented an image of "going out, making dinner, feeding the baby, burping the baby, lighting a cigarette, and continuing to wait" to receive the class discussion. Gerald was using a PC with Windows 95, which was incompatible with Groove, and would require him to attend class from a university computer center. He was also uncertain about where he would get a microphone and headset.

Additionally Kevin reported being concerned about using VoIP as he was unaccustomed to the idea of participating in synchronous voice-enabled discussions in an online course and initially did not see the benefit, although he did come to "see how all came together to focus on an idea or a page in the textbook and it's almost as if you're sitting in class together." Lane reported his experience with phone conferencing as being

a more stable, reliable way of providing synchronous communication and wondered why the instructor would choose an “untested means of communication” through VoIP.

Kevin expressed anxiety caused by logging off after the conclusion of the discussion. He felt a sense of uncertainty regarding when and how to log off. Frequently students and the instructor stayed logged on to continue talking after the formal discussion concluded. He felt uncomfortable logging off first as he “might appear too eager to leave.”

Most of the learners even after hearing the instructor’s description and explanation of synchronous voice communication at the orientation imagined online chatrooms, which few had participated in but all had heard shocking stories about. Some initially questioned the use of online chat in an academic course and wondered whether they would enjoy or benefit from the experience.

Capturing, Preserving, and Managing Community Knowledge

All participants mentioned that the asynchronous discussions also served as a valuable knowledge management repository. The permanent nature of the discussion preserved their classmates’ and instructor’s comments and the resources shared. They referred back to and used the discussion comments and resources posted and shared in their course projects.

Discussion

This study shows that the interaction among participants in this online graduate course was shaped by the technology and their perceptions of the usefulness of the technology. The participants shaped their intellectual activities according to the technology and their classmates’ use of the technology. The technology in turn shaped

the participants; the participants determined how to incorporate technology into their intellectual activities. These findings are consistent with Sherry's (2001) view of online learning as an activity system, wherein the learning environment offers the tools and technology used to connect people into a community with a purpose or object and then has contextual effects upon the learning environment and community. In turn, one student's use of the technology and tools affected others' uses.

The tools used and the way thoughts were shared through the tools were conditioned by the context, the rubric presented by the instructor, the asynchronous conferencing offered by the WebCT course management system, and the synchronous voice conference provided through Groove, and rules the community built. Therefore, learner activity was shaped by WebCT and Groove, and their activity in turn shaped the development processes of learners in the class. Accordingly, their surroundings and their learning community co-evolved and transformed. Throughout the semester, individual motives and goals changed and further constrained or provided opportunity for further individual and collective intellectual development to meet the course objectives.

The two conferencing systems provided opportunities for and constraints on participant interaction. The opportunities and constraints interacted with learner perceptions of the usefulness and use of the technologies (Lee, 1994) and the students' previously held models of classroom activity, online learning, and expected learning outcomes. From their comments, it appears learners initially understood and adopted the instructor's description of the online course as a learning community where all participants would learn from each other and adopted the rubric and rules presented by the instructor. Learners wanted to take responsibility and control of their learning as

assigned through posting comments to the online forum, diagnosing misconceptions, building upon each others' ideas, and negotiating meaning. They understood their responsibility to contribute mindful comments and resources that served as meaningful input for their classmates. The permanent, public nature of the asynchronous discussion provided motivation to post fully formed, sophisticated thoughts for others to read. The asynchronous discussions provided the opportunity for learners to fully develop their thoughts by using the advantage of time to be critically reflective and consult resources before posting their comments. It also required them to sometimes restructure the discussion before they could post and to be mindful of institutional policies that limited their time online.

While the extended time provided by asynchronous communication provided an advantage in writing responses of a more intellectually demanding nature, the extended time learners had to wait for others to respond to their postings, questions, and requests for clarifications presented disadvantages. Learners needed immediate feedback and dialogue with others to help them monitor the clarity and accuracy of their own thoughts and to ensure they understood their classmates' thoughts and ideas. When Anne reported she especially needed additional feedback from others when encountering new information, she was seeking help from others to organize new information into a schema that she herself did not yet have. Anne understood and valued the processing efforts undertaken by her classmates to stimulate her own individual intellectual activity.

Timely and immediate feedback from others is considered a must for a successful learning experience. The attributes of asynchronous communications technology may,

however, support an independent, intrapersonal rather than a group-based approach to learning. Learners see evidence of their classmates' presence and thoughts but are left without a timely reciprocal mechanism for (a) confirming understanding, (b) asking for elaboration, and (c) receiving external feedback, resulting in an extended length of time necessary for discussions to mature (Branon & Essex, 2001). While awaiting external feedback, learners learn from unsupervised feedback, defined by Churchland and Sejnowski (1999) as feedback that learners provide to themselves by (a) intuiting information from previous messages posted and (b) predicting how their responses might be received by others. As a result, learners interact internally with their own interpretations of their classmates' messages. Learners using deep processing seek out others and resources that can scaffold their learning. Learners with critical thinking skills direct their own attention, reading widely beyond the textbook to create their subjective engagement with others and make meaning.

The degree to which learners engage in interaction with others is dependent upon their own (a) reflective abilities to create engagement with the minds of others (Mitchell, Banaji & Macrae, 2005), (b) epistemological beliefs (Braten & Stomso, 2006), and (c) motives (Tikhomirov, 1999). To create simulated engagement with others, learners use self-knowledge to infer the mental states of others and then relate or compete with others. They know the critical questions that others would ask them, requiring them to examine their underlying assumptions, question the origins of their beliefs, scrutinize their clarity and accuracy of thought, and explain how they know what they know. Contrastingly, learners accustomed to passive student roles may not actively engage in such internal dialogue and inquiry and may be unable on their own to recast their thinking. These

learners use less cognitive energy and without timely reciprocal feedback lack the opportunity to negotiate meaning (Ahern & El-Hindi, 2000) on their own. Therefore, they may forego sensemaking and merely try to apply rote learning techniques of memorizing (Mayer, 2005), reproducing, and assimilating the words of others instead of interacting with or building upon them. Students who believe in quick learning and those who believe knowledge is given and stable are less likely to use Internet technologies to discuss and co-construct knowledge with others because mutual negotiation and perspective taking are viewed as unproductive, confusing, and even harmful to understanding.

Such epistemic beliefs, interests, and motives are interrelated sources of a learner's activity and critical to knowledge construction. Individual interest defined as a deep and enduring relationship to a particular subject enables learners to set challenges and goals for themselves, stretch their understanding, and persevere through their frustrations. Individual interest affects attention and directs the choice of intellectual activities. Their motives set conditions for developing actual intellectual activity, influence its productivity (Tikhomirov, 1999), and change brain structure (Edelman, 2006; Montague, 2006). Each learner's internal, mental activity or thoughts lead him or her to use artifacts, tools, and technology to externalize his or her internal, mental activity. Learner activity changes initial motives and generates new motives, which become the source for new activity and levels of development. Learners who have not encountered critical thinking skills or are unfamiliar with the steps to make an unfamiliar idea familiar may struggle while he or she awaits feedback from other class participants in asynchronous conferencing.

Many explanations come to mind regarding Sherry, who came to post messages but never checked to see if her classmates responded. Sherry may have been attempting to lessen her worry that she wasn't "getting it" by avoiding further interactions that caused her additional stress. Possibly she did not perceive herself as engaged in a conversation and, therefore, failed to do her part to encourage a conversation. She like Anne may have needed her classmates' models to speed up the slow work of reading, framing, consulting other resources, synthesizing, and constructing her own understanding. She may have been uncomfortable with the learner-centered nature of the course and its corresponding "grayness" as opposed to the "black and white" thinking that she may have preferred. At some point during the semester, the cost of posting her mindful comments outweighed the value she perceived she was gaining, and she stopped actively participating.

Lane, too, was put off by the costs and demands of communicating through the online discussion forums, which reduced his engagement in the course. He, like all speakers, strove to maximize the effect of his communication while minimizing the effort involved in producing and processing it (Littlejohn, 1996). All these possibilities offered here attempting to explain Sherry's and Lane's behaviors and perceptions reflect that despite course requirements to participate in the online forum, learner autonomy in online learning environments is high and intrinsic motivation overshadows course requirements in inspiring behavior. The reduction in participation is important, for Schellens, Van Keer, Valcke, and Valcke (2005) have reported that students who participate in groups with lively discussions perform at qualitatively higher levels with such learning situations ranked higher by researchers and tutors. Whatever Laura's, Sherry's, or Lane's original

motives were, when they changed their motives and reduced their participation in the asynchronous discussion, they reduced or changed the benefit and value their classmates could derive from the asynchronous discussions.

Since both asynchronous and synchronous communication tools were available and a schedule for the synchronous sessions had been previously established, some of the learners may have saved interaction for the synchronous sessions. The synchronous communication provided richer media that could better assure speakers that others were thoughtfully processing and responding to their contributions. They could hear voice, tone, speed, inflection, and immediacy. Learners received more timely feedback, asked for clarification, and identified underlying assumptions. Learners felt they had the direct attention of their classmates, and it was easier to direct feedback and be spontaneous, following new lines of thought. The synchronous discussion still provided a degree of safety and confidence for learners as the visual cues that sometimes keep them silent were absent.

Initially learners shared a context for understanding asynchronous discussions, which they did not have for synchronous discussions facilitated through technology. They felt familiar and comfortable with the attributes and requirements of the asynchronous technology, even though the majority had not previously participated in online learning. The asynchronous discussion was similar to e-mail and technologies they had expected to use in an online courses. The lack of familiarity with the synchronous technologies initially caused concern for some while being motivating for others. Individual perceptions of the technology were influenced by learners' experience with technology in

general, prior experience with synchronous technology specifically, perceived usefulness, and perceived ease of use. Learners regularly experiencing incompatibility issues with software and Macs, those using low-speed connections, and those with old operating systems knew they would most likely have to find ways to overcome technological hurdles in order to participate in the synchronous discussions. One learner borrowed a PC, and two went to campus to use university computers. Finding headsets with microphones initially seemed to cause concern for all learners but quickly dissipated when learners discovered finding headsets was easy and learning they were inexpensive to purchase. Alleviation of these concerns plus the instructor's and mentors' guidance and reassurance positively influenced learners' perceptions of the ease of use and usefulness of the synchronous technology.

The permanent nature of the asynchronous discussion provided a place to store information and knowledge, which was referred to throughout the course. Learners accessed content and personal information about each other. This provided a useful archive and community memory, in contrast to the ephemeral nature of the synchronous discussions, which were not recorded.

Limitations

This study has a number of limitations. First, the research sample consisted of a small number of participants, so it is questionable whether the findings can be generalized to other online courses, content areas, and educational levels. Age, gender, and nationality were not pursued. The study participants were interviewed by the course instructor and may have given answers that they thought the instructor would want to

hear. This was the first experience using synchronous technology throughout the semester in an online classroom for all participants, including the instructor, and the initial fantasy effect with the new technology may have impacted attitudes and perceptions toward the new technology. The impact of both technologies on the design, development, and testing of the final projects was not assessed.

The focus on the present study was on the technology, not on the other aspects present in an online learning community. The instructional design, facilitation of the asynchronous forums and synchronous voice chats, and learning activities were neither considered nor assessed in this study. Analysis of the transcripts of the asynchronous forums and audiotapes of the synchronous voice chats would provide more insight into the study.

The nature of the tasks and discussion topics as well as the instructor's moderation of the asynchronous discussions may also have impacted learner participation. The learners may have come to feel the tasks and topics were uninteresting or too complex, too straightforward offering no challenge, or too much work in light of the main course objective to design, develop, and test an online course. However, this was not explored in this study.

Data on other learner characteristics such as introversion/extraversion were not collected, which could explain perceptions of and judgments about synchronous and asynchronous conferencing.

Implications for Practice

Notwithstanding the limitations of the present study, some implications for practice can be drawn. A learner's beliefs and perceptions toward technology have an important influence on initial intentions to use and guides usage. Positive attitude towards technology leads to gaining experience, knowledge, and continued use of technology to contribute toward learning outcomes and community building. Accordingly, negative attitudes lead to avoiding use of the technology. As technology challenges will arise during a course, all learners can benefit from support when coping with the demands and inevitable frustrations that will arise and challenge their cognitive and metacognitive strategies and understandings (Braten & Stromso, 2006).

Clearly this study points out the importance of the instructor's role to proactively help learners see the clear connection between the asynchronous and course outcomes and guide intellectual development not only through course assignments and learning activities but also through learners' use of the technology and understanding the value of their involvement in discussions. Instructors can use orientations to (a) provide skills needed to use technology, not just show how to operate the technology but how to learn independently and work when they need to (b) how to access and use the technology and find and use technology support services and materials, (c) link the technology to the course requirements, protocols, rubrics, and assessments for participating in the synchronous and asynchronous discussions to the course value, (d) show the benefits for the learner and the community when each participant is actively involved, (e) point out learner support and scaffolding materials that help learners stimulate critical thinking to generate mindful feedback for themselves and their classmates, and (f) set out all participants' responsibilities to help the community learn. During the course, instructors

and mentors model participating in synchronous and asynchronous class discussions, monitoring, and guiding learners as needed to acquire and use metacognition and regulation strategies, make decisions, question the source of information.

Conclusion

This project extends existing understanding of interaction facilitated by technology by describing graduate students' reflections on their own experiences by identifying five overarching themes: (a) building communities that were to become trusting environments where ideas could be shared, (b) the cost of communicating online, (c) creating a sense of a real class with authentic dialogue, (d) developing a trust in the technology's reliability, and (e) capturing, preserving, and managing community knowledge.

This research study found that learners value and seek interaction. They want feedback to their contributions and want to know what their classmates and instructor are thinking. Processing and attention are stimulated by classmates and their voice and paralinguistic variables; the sense of a real class and authentic dialogue are based on the co-presence of others; and a sense of interdependence develops to help learners develop confidence in their own thoughts. Participants did not mention how the combination of synchronous and asynchronous conferencing systems facilitated their path through learning cycle. However, they did mention that asynchronous provided convenience and flexibility and promoted development of their thoughts while synchronous communication provided the timely responsiveness they seek. A sense of value derived from their communicative efforts guides their continued participation. This valuable

information should be used to guide course design, learner support, and discussion facilitation.

Further research is needed to understand how information processing, construction of meaning, and the learning cycle occur depending upon the media used and the senses involved in receiving information. Future research must go beyond gathering learner perceptions to comparing learning interventions and outcomes—mastery of course requirements, representation of schema, learner satisfaction, and learning transfer—in both asynchronous and synchronous modes as well as in combination. Systematic and objective research examining individual learning styles and learner preference of synchronous and asynchronous conferencing are also required. Clearly more opportunity and need exist to continue similar studies and then develop pedagogies and best practices across a range of disciplines that will promote the effective use of the emerging technologies in changing learning environments.

However, instead of “asking which is better for what,” we should instead ask “which instructional techniques with what media help guide learners’ cognitive processing of the presented content?”

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