Bringing Distance Communication Closer

David Lumerman, Robert Krull, Mike Madaio & Dustin Kirk
Rensselaer Polytechnic Institute

The study of Distance Education has far reaching applications outside of the classroom. This study tested and reviewed multiple aspects of distance education to better improve communication. How we participate, exchange ideas and build on the thoughts of others dictate how we digest the interactive experience.

Through the use of user testing and direct observation of classroom and seminar sessions at Rensselaer Polytechnic Institute, this study tested and reviewed multiple aspects of distance education to better improve communication and interaction for on-site and distance students, staff and presenters. These observations were categorized through affinity diagrams to arrive at a set of common problems, observations and thought-provoking takeaways. This document highlights and discusses the major findings, possible solution areas and external applications based on this research.

BACKGROUND

In the spring of 2007 different distance education techniques were studied as part of an ongoing investigation into Technology Mediated Communications at Rensselaer Polytechnic Institute [This was supported by a grant from the Society for Technical Communication]. As part of this study two distance education tools were reviewed and tested with on-site and distance students. Additional observations were made of classroom and seminar sessions. These observations were categorized through a diagramming technique that clusters similar observations to create a hierarchy of observations called affinity diagramming. This produced a set of common problems, observations and thought-provoking takeaways.

LITERATURE REVIEW

As social creatures, we gain increased quality of life by engaging in collaborative efforts, we gain learning, and work benefits from collaborative action. [1] Distance students who feel better connected to other students and the instructor, and technical communicators who are better able to collaborate on work-related tasks, should be more productive and feel more positively about the process. Similar tests and observations from the studies polled substantiate our general findings. Users who had the option of simpler interaction gravitated toward that interaction option.

Any methods used to include users make happier and more connected users. The act of communicating with others helps individuals feel part of a community, and thus provides a set of others to reach out to for social support in times of need [2]. The more a user felt connected, the more satisfied with their learning experiences and more willing to continue being involved in distance learning [5].

As a result, instructors who effectively included distance participants as part of the learning experience scored higher in student satisfaction surveys, and found that frequency of contact was not as important as quality of engagement in course activities.[5] Timely feedback from the instructor and interaction with the instructor were reported as significant in several studies. [3]

Groups that create common understandings about their goals, the meanings of activities and concepts, and communication practices collaborate more effectively. Creating common practices and common meanings becomes the cornerstone of collaborative practices. [1] Our findings related to similar studies where users who had the ability to effectively create content using learned conventions and iconography completed the tasks easier. When users did not have a solid base for this creation, minor issues became magnified, leading to longer task completion times and greater task abandonment.

"No man or woman is an island", and the student is no exception to John Donne's general observation about humankind. A distance learning program that strives for quality and for the goal of self-discovery demands that there be student-to-student and student-to-instructor interaction. Students must willingly participate as team members with other students in the class, evaluating work, exchanging ideas, and building on the ideas of others." [4]

METHODOLOGY

This study of distance education has many moving parts, and as such, a great deal of this study included the observation of different types of collaborative interaction. The processes studied for this paper user tests for two products and direct observation of both seminar sessions and classroom sessions. Approximately 280 observations were cataloged.

Two sets of user tests were conducted using software designed to facilitate collaborative interaction. In each set of tests a different collaborative product was used.

Each product test required the participants to:
• Utilize a collaborate tool
• Interact with a second participant, and/or facilitator
• Produce a whiteboard screen (single slide) for presentation.

Product User Test Methodology

Participants were observed during the testing process and, when possible, utilized the think aloud protocol through voIP, direct observation or phone. Participants were also directed to use any method feasible in the creation of the whiteboard slide.

Each participant was instructed to create a work product containing three categorized lists based on their experiences with distance education. The result tended to look quite a bit like a slide from a presentation program such as PowerPoint.

Participants were instructed to utilize any interaction tool they deemed appropriate; these tools included Voice over IP (VoIP), phone conference line, whiteboard, or chat functionality. After each session, participants were questioned about the products, their choice of interaction and relevant items of interest from the test.

Phase II Testing: Current Product

Phase II testing utilized collaborative software in use by Rensselaer Polytechnic (RPI) at that time for distance education. The tests were designed to utilize the commonly used functionality for collaboration as used in the current RPI program.

On-campus and distance students connected to the tool and utilized a sub-set of features to produce whiteboard screens. When possible these screens were created collaboratively.

The functionality utilized included:
• An interactive whiteboard where multiple users could simultaneously add text, images and graphics
• Chat functionality that allowed users to interact with a single person or multiple parties
• Roll Call functionality that allowed users to see who was connected during the session. This function also included emoticons, the ability to raise hands and clap.

Phase III Testing: Alternate Product

The goal and the structure of Phase III mirrored the previous test and designed to measure similar capabilities for collaboration but utilizing a different tool.

What we did NOT do was comprehensively test all the new product's features such as application sharing, or the product's abilities to work with multiple screen layouts, breakout rooms and polling.

Additionally, we did not provide any training. Participants had some familiar with the current product, none of the participants had prior experience using or observing the new product. Because participants had to learn the new product's functionality during the test session, this test of the new product is conservative. With subsequent practice, participants should perform more easily with the new product.

Masters Program Class Sessions

Multiple observers audited classrooms. As part of this exercise notes were taken revolving around the interaction between in-class student, distance education students, teaching assistants and professors.

These notes were combined, with comparisons made among data obtained from laboratory tests and seminar sessions.

Seminar Sessions

Seminar sessions differed from classroom sessions by the nature of interactivity. While classroom sessions were made up predominantly of lecture, the seminar sessions contained more interaction between multiple parties. Additionally, masters' program sessions utilized support staff to organize and facilitate the interaction. Seminar sessions had no such assistance.

RESULTS

Technical Issues

The most striking group of findings involved technical issues. The majority of technical issues dealt with entering and organizing text on the whiteboard. Such functionality is typical of similar products from Microsoft, Adobe and other manufacturers. Here the functionality was either missing or implemented in a confusing fashion

Many technical issues were classified as setup issues, and were persistent in both products. In all observed interaction areas, setting some users connected without incident and others had technical problems. The same is true of audio and video problems. Considering these are commercial products and that working professionals rely on such products when trying to advance their education, one would expect the products to launch more smoothly and to cause users fewer problems.

Setup issues became one of the largest categories of issues observed and was broken into three sub-categories including physical classroom setup (on-site issues), student local setup (virtual classroom setup issues), and handoff issues (changing which presenters had control over the channel to the audience).

Audio Communication

Video delay made communication between sites difficult, forcing a studder-stop effect when people would begin talking and then stop when another person began talking in parallel. Other audio issues occurred when audio echo were present when video, VoIP, and conference lines did not work cooperatively.

In both platforms tested there is an electronic ramp-up period necessary between clicking the "talk" button and when audio is transmitted. This ramp-up period causes false starts and broken communication.

The second set (Phase III) of testing had additional audio issues. With this new product audio configuration is more automated and did not provide many controls to fine-tune the audio stream (incoming and outgoing) to adjust the volume to compensate for problems. Along with the lack of adjustment controls, audio-caching problems led every test section to begin perfectly and then to begin distorting or not transmitting at all. Such a high level of failure is surprising in a commercial product. In some instances, turning off then on the audio channel of the person experiencing the problem would reset the audio, but this treatment was inconsistent.

Without being able to trust that the audio is being transmitted consistently, the participants in the test often attempted to re-confirm they were being heard. When the audio issues continued to break down, audio was abandoned in preference to chat functionality. Students preferred two-way audio, no matter which electronic education platform they used.

Interactivity

Interactivity was assessed in terms of how people used the several channels such as video, audio, phone, and collaboration tools together.

Like running water seeking the lowest level, participants in our observations were seeking the quickest and most efficient way to complete tasks. While this could be a psychological expectation of looking competent during the test, interviews indicate this is not the case.

Interaction during class time required students to compile information and present it through virtual whiteboard with short deadlines, and as such any procedure that becomes an impediment to this interaction is quickly discarded. Instant messaging was cast aside in the testing in preference to voice over IP (VoIP) because it allowed the users to multitask by talking and typing simultaneously. Because of the non-intuitive nature of the whiteboard, layout was sacrificed for content.

In distance education class settings there are many things that compete for a user's attention and any impediment to class interaction adds to the user load. For example, students may be listening to audio from other students and the instructor while simultaneously interacting via text chat. Technical problems such as audio delay force students to prepare their thoughts, to type them or speak them, to select specific recipients, and to determine whether their comments are still relevant after the time delay.

Additionally, a number of multi-step processes where identified that increase students' cognitive and mechanical work when communicating with others. Specifically pressing the chat button and needing to wait (judging the approximate time) before speaking and selecting participants and then directing text were impediments to the interactions.

Collaborative interaction

Observations highlighted interaction processes that worked efficiently. For example, division of roles permitted one student to complete producing text, while another searched for information for the next task, and another student to organize the structure for the next category of information to be delivered on the virtual whiteboard."

In general, off campus students are multitasking through chat, lecture (video) and other offsite demands such as family, work and other connections such as email. The in-class audience was quick to forget those at a distance and instructors forget to note changes of the presentation slides, leaving distance students to fend for themselves.

When etiquette was established such as round-robin participation and noting of slide changes or speaker changers the interaction was easier for all parties.

A major difference between the two electronic support platforms tested was how their displays worked. In the Phase II environment, distance students have control of how their own computers size and placement of windows. In Phase III, there were three different standard layouts available. Each of these was designed for different user tasks, with complementary collections of windows of information set as defaults. A user can manipulate the "pods" to rearrange the screen. The major problem, however, was that the screen layouts of all the students were interconnected. One student customizing a window layout affected the layout seen by all other students. Several users attempted to manipulate their own screen, only to later realize that they had changed the screen for everyone in the session.

This system was not clearly signaled to students. It was not obvious that students had equal privileges in altering the contents of the virtual whiteboard and the window layouts.

Additionally, the task-specific layouts provided defaults that revealed some functions and hid others. If students switched from one task-specific layout to another, they could find that windows containing work they had been doing would be hidden from them.

DISCUSSION

Classroom education follows a generic regardless of whether collaborative tools are used to include external participants or not. Where distance education intersects becomes a matter of where (and if) the collaboration takes place.

The distance education general use case consists of:

1. Setup/Introduction Phase
Applications are launched and classes begin

2. Lecture Phase
The professor presents material to the class

3. Teamwork Phase
Students are asked to complete a task either independently or in small groups. This interaction can take place though chat and the whiteboard

4. Presentation Phase
Students report back on their task. As group work it is common for students to take turns presenting though voice-over-IP, presenting whiteboard screens and coordinating though the collaboration tool

5. Wrap-Up Phase
This usually consists of a continued lecture or dialog though moderated chat. In some instances voice-over-IP is used. In other instances chat is used and the moderator interjects in in-class discussion.

The best learning experience was observed when all parties involved participated. This participation however does not happen by accident and cannot be facilitated through access to software alone.

When a facilitator actively uses the technology to include ideas and thoughts from all groups participating the groups feel more connected, more engaged and satisfied to be part of the collaborative process.

Managing the many data streams of chat, whiteboard, emoticons, audio and video is not easy, and was made less difficult by having assistants monitoring the various streams, and interjecting as appropriate. This interaction was also successfully accomplished when facilitators periodically polled the locations for input as part of the process.

Collaboration was best when it was transparent. Alignment of cameras, initiation of collaborative sessions, and general application launch issues were intrusive, but were within the instructors' or technical support staff's control and could be managed by allowing set-up time before classes formally start.

Handoff issues occur when instructors or students switch among media or when they switch roles from presenters to audience members. Handoff issues should be addresses as part of setup. For example, if a presenter is planning on using application sharing the interface should be tested, if possible from both sides. By identifying application quirks, having dedicated setup time, testing end user connections and previewing handoffs a large majority of setup issues can be eliminated.

SUGGESTED APPLICATIONS BY PROFESSIONAL TECHNICAL COMMUNICATORS

Outside the Classroom

Many of the observations made within the learning environment of electronic classroom can be transferred to collaborative work in the corporate world of the technical communicator.

Real-time interfaces for video and audio help participants communicate more effectively than near real time interfaces such as chat or hand raising.

Arranging pre-tested interactions for phone bridges, application sharing and audio/video should be common practice. Doing this reduces the disconnected feelings by external parties and sets up the expectation that the connection is trusted.

Pre-testing however is not enough. The facilitator needs to be an active party in including the distance sites into the discussion. This active facilitation increases when the use of the many available alternate media streams are integrated. Not surprisingly, this facilitation decreases when video is used because along with video come visual cues such as body language and facial expressions that are not present in media such as audio conferencing and chat.

Designing for Diverse Audiences

There are many types of users who interact through distance education software. These users may have particular roles such as professor, moderator, technical support, and student. The users my all have different technical skill levels as well as take on multiple roles during a class or work session. As the number of users increases, the more likely it is that roles such as moderators and technical support are needed. Also, the needs for different learning styles, whether lecture style, semi-collaborative, or 'round-table' where everyone has an equal say, each place different demands on the software. In addition, the need to support different levels of connectedness in terms of synchronous, asynchronous, video and audio capabilities, as well as bandwidth all play a role in a user's ability to participate.

REFERENCES

(1) Haythornthwaite, C. Facilitating Collaboration in Online Learning. Online: http://www.sloan-c.org/publications/jaln/v10n1/pdf/v10n1_2haythornthwaite.pdf

(2) Haythornthwaite, C., M. M. Kazmer, J. Robins, and S. Shoemaker. Community development among distance learners: Temporal and technological dimensions. Journal of Computer-Mediated Communication 6(1): 2000. Online: http://www.ascusc.org/jcmc/vol6/issue1/haythornthwaite.html.

(3) Johnston, J., Killion, J. and Oomen, J.. Student Satisfaction in the Virtual Classroom. The Internet Journal of Allied Health Sciences and Practice. Vol 3(2): 2005. Online: http://ijahsp.nova.edu/articles/vol3num2/johnston.htm

(4) Leonard, D. C. (1996). Using the Web for graduate courses in technical communication with distance learners. Technical Communication. 42(4), pp. 388-401

(5) Shin, N. and Chan, J. Direct and indirect effects of online learning on distance education. British Journal of Educational Technology. Vol 35(3): 2004.

David Lumerman
23 Nautilus Avenue
Plainview, NY, 11803
516 931-0596
dave@lumerman.com

David Lumerman an Application Engineer for New York Life Insurance with a background in user centered design, HTML and game development. David has worked in the publishing, game design, Internet and print fields for various companies.

His varied experience includes developing interfaces for financial web sites such as New York Life, package design for King Features Syndicate and, game design and development on Family Feud and To Tell the Truth. He toddler oriented reading website (www.lil-fingers.com) and is a recent graduate of Rensselaer Polytechnic Institute's HCI Masters program.

Robert Krull

Robert Krull is Professor of Communication at Rensselaer Polytechnic Institute and is an Associate Fellow of the Society for Technical Communication and a winner of the IEEE-PCS Goldsmith Award. He conducts research on performance support and instructional design.

Mike Madaio

Mike has been creating online user interfaces for more than 10 years. He currently serves as Chief Internet Architect at QVC, overseeing the online customer experience team, including user interface design, site navigation, information architecture, usability testing and integration of new technologies, and is studying towards his Masters in HCI at Rensselaer Polytechnic Institute.

Dustin Kirk

Dustin Kirk, a multi-disciplinary Interaction Designer at HP, has a B.S. in Computer Science and Psychology and obtaining a M.S. in Human Computer Interaction. In addition to his scholastic background, he has strong interests in the fields of marketing, business, and sociology. Professionally, Dustin has fused his interests to tackle design issues related to data scalability while maintaining effective and efficient user interfaces. His work has been utilized for improving meeting processes & collaboration, contact management, online health benefit management, advanced RSS aggregation, web browsing history, photo management, and most recently web printing.