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# INTERDISCIPLINARY TRIALS OF SYNCHRONOUS, VOICE-BASED COMMUNICATION SYSTEMS

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## Abstract

*This paper summarises four concurrent trials using synchronous, voice-based communication systems at the University of South Australia in the Divisions of Education, Arts and Social Sciences, Health Sciences and Business and Enterprise. The benefits of synchronous communication as well as the challenges associated with the use of these technologies in an online learning environment are discussed, and the strategies that can be employed to meet these challenges described. The purpose of the trial was to utilise voice-based, synchronous chat systems that would assist in explaining technical concepts to students; help to address the written language problems experienced by NESB students; allow external students to deliver oral presentations to the class and lecturer, discuss assignment development and obtain group feedback; reduce the volume of listserv postings during learning community formation; facilitate supervision of postgraduate students and allow student located in rural and remote locations to present annual review seminars; allow external students to present a simulated external client presentation to student peers and lecturer and engage in post-presentation discussion; record/edit classes for students who missed class and archived for future use, and allow external students to view the work of others and make comment on it in a synchronous environment.*

## Keywords
*synchronous, voice-based, online, webcam, interactivity*

## Project background

The shift in the teaching paradigm from one that is instructivist to a more constructivist approach has resulted in an increased demand for online collaborative tools that "...facilitate group work, discovery learning, mentoring, and foster continuous life-long learning' (Montgomery and Little, 1997). The

benefits of asynchronous communication systems, such as online discussion forums, bulletin boards and listservs, in a constructivist learning environment, are already well recognised. The features of such asynchronous communication systems that support a constructivist approach include: facilitating reflection through discussion (Prestera and Moller, 2001), providing opportunities for learner collaboration (Berry and Carlson, 1999), supporting the creation of learning communities (Montgomery and Little, 1997) and enabling students to communicate at their own convenience (Tu, 2002).

In recent years, synchronised (real-time) communication technologies such as Internet Relay Chat (IRC), Multiuser Object Oriented (MOO) environments, voice enabled browser-based chat systems and video-conferencing have attracted the attention of academics interested in the immediacy of feedback and the intimacy that such technologies provide. According to Spencer and Hiltz (2003), establishing a social presence early in a course using synchronous communication technologies can "...draw in potential nonparticipants and better prepare the class to participate in collaborative and constructivist learning online". Real-time communication systems are said to bridge "transactional distance", the physical separation and communication gap, experienced by learners when studying at a distance (Murphy and Collins, 1997). As Uys explains, "'Distance' is no longer defined in terms of physical proximity but in response time!" (1998). Spencer and Hiltz (2003) explain this need for immediacy in feedback in terms of media synchronicity; that is "...the extent to which the medium is synchronized with the recipient's communication needs". Activities requiring convergence of shared ideas are said to require high media synchronicity, whereas the conveyance of information requires a lower level of synchronicity such as that provided through asynchronous communication systems. Synchronous communication systems are therefore most effective in establishing a rapport between students early in the course (Buys, Coombs and Coombs, 2003), creating social presence amongst group members (Spencer and Hiltz, 2003), overcoming the sense of isolation experienced by distance learners (Duemer *et al*, 2002), providing opportunities for "brainstorming" and problem-solving in a collaborative environment (Murphy and Collins, 1998), and facilitating active didactic conversation in a non-threatening and egalitarian environment (Ziman, 2002).

Most proponents of synchronous technologies also acknowledge the important role that asynchronous communication plays in the learning process. Spencer and Hiltz (2003) argue that a combination of both synchronous and asynchronous communication supports both the conveyance of information and the convergence of ideas in group sessions. Such a combined approach ensures that learners engage in activities that provide immediacy of feedback and provide high levels of symbol variety (i.e. provides opportunity for the sender to use more than one representation of the information), while also providing opportunities for multiple conversations (e.g. bulleting boards), "rehearsability" and "reprocessability". The Rensselaer 80/20 model of interactive distance learning in which students spend 80% of their online time in asynchronous activities and 20% in synchronous activities is an example of this combined approach. Lister *et al* report that this model enables students to work at their own pace, while also helping to keep students on track with course deadlines, facilitating the creation of teams and community, and providing learners with immediate feedback.

## Features of synchronous communication technologies

The early adopters of synchronous communication technologies had a limited suite of tools available. Most of these early systems were text-based and relied on the ability of users to type quickly to maintain the flow of real-time conversation. Murphy and Collins (1998), citing the work of Aoki (1995), argue that such systems require substantial typing skills to communicate effectively, and as a result, participants (particularly those of non-English speaking background) "...have no time to reflect, frame questions and compose responses as the text incessantly scrolls up the screen". Similarly, Tu's (2002) study of the impact of text-based computer mediated communication on social presence, highlighted the importance of keyboarding speed and accuracy of typing in determining the effectiveness of interactive communication. Tu also observed that students' thinking did not synchronise with their typing which also impacted on the immediacy of the interactions. The other major limitation of text-based chat systems includes the lack of "kinaesthetic" and "paralanguage" cues to enable participants to determine when other participants in the group are ready to enter into the conversation (Murphy and Collins, 1998).

Advances in technology and improved bandwidth have spawned a new generation of synchronous technologies that provide both voice and video options to overcome the limitations of text only communication systems. The features of the more sophisticated forms of these browser-based, voice-enabled systems include live streaming audio, streaming video using WebCam, collaborative application sharing, electronic whiteboard, synchronised web browsing (Web safari), on-line testing or survey tools, text chat and the ability to show PowerPoint presentations, ability to upload images. Jackson (2002) in his review of synchronous (real-time) Web based training solutions, identified five products incorporating all or most of these features: *CentraOne, HorizonLive, Lotus LearningSpace, Learnlinc* and *Interwise*. The CentraOne system incorporates *CentraOne Symposium* (designed for small group sessions involving up to 50 participants) and *CentraOne Conference* (designed to accommodate large seminar meetings via the Web). The system includes most of the features identified by Jackson as characterising the more advanced real-time Web based synchronous communication systems. *CentraOne* is also optimised for 28K dial-up making this the ideal choice for trials involving students studying both on and off-campus.

## The trials

Fourteen students from three Divisions in the University, undertook to trial *CentraOne*. The study areas represent the disciplinary and pedagogic diversity that it was felt was necessary in order to establish the viability, functionality and capacity to enhance learning outcomes in a range of settings. These were:

- *Electronic Publishing on the Internet*: a compulsory course for students enrolled in the Bachelor of Arts (Multimedia Studies) program, the Bachelor of Computer and Information Science and Multimedia p, the Bachelor of Computer and Information Science and Bachelor of Arts (Multimedia Studies) double degree, and the Bachelor of Communication, Media and Management degree offered in Singapore.
- *Networked Learning*: an elective, fully online postgraduate course available to students enrolled in *Internet Communication Strategies* and to students studying as virtual exchange students in the School of Communication, Information and New Media.
- *Health Sciences*: supervision of research students located in rural and remote areas, and use of the system by students located in rural and remote locations to present the annual review seminar required of research degree students.
- *Small Business Accounting*: a print-based external course in the School of Accounting in the Division of Business and Enterprise.

Student evaluations of the software and the learning experience were invited by the lecturers, and the feedback received is included in each individual trial report.

### Trial One
*Electronic Publishing on the Internet* aims for students to develop an understanding of the nature, effects and future of electronic publishing, as well as the skills necessary for the creation of online multimedia Web pages. Students undertaking the course develop the knowledge and applied skills required to be able to design and develop compliant, professional standard Web sites as well as an understanding of the ethical considerations relating to the profession. Students are encouraged to communicate with and engage in collaborative activities with their local and off-shore peers to facilitate problem-solving in an inter-cultural context. The online course materials include a course outline, details of assessment requirements (including assignment details, criteria for marking and copies of the marking sheets used by assessors), detailed study notes with embedded activities, suggested online references, information about academic policies relating to plagiarism and links to support services. Students are provided with individual electronic workbooks within which they record their online activities, a Web server share with FTP access enabling them to build Web pages locally and then transfer to the host server, and access to a communal knowledgebase. Asynchronous collaboration is achieved through the use of a listserv which helps to build social community, provides a means for students to discuss topics covered in the modules, and enables students to engage in peer review of each other's Web sites as they are developed. The listserv was selected as the main form of asynchronous interactive communication because experience

had also shown that even with regular monitoring and active facilitation by the coordinator of the course, students quickly lost interest in contributing to asynchronous discussion boards. Students undertaking other online courses conducted by the coordinator had also complained about the use of asynchronous discussion boards which, they argued, did not provide a convenient means for threading discussions and editing their postings. Students also expressed concern that social messages were interspersed with other postings not directly related to the topics of study and postings by the coordinator about critical information relating to the course (changes in assignment dates etc) were lost in the volume of unthreaded postings. Attempts to address this concern by creating separate forums were also unsuccessful, as students quickly tired of checking more than one forum. When the listserv was introduced, students responded positively; acknowledging the value of postings, the opportunities provided to engage in peer review online and the technical support provided through this medium. Despite the obvious benefits of the listserv, however, students expressed frustration at the volume of emails received, particularly early in the course when students were forming their initial personal presence and forming learning communities online. Many NESB students also found difficulty in expressing their technical queries in writing. It was against this background that the decision was taken to trial voice-based, synchronous chat systems that would address: (1) the volume of listserv postings during the learning community formation period by providing an alternative means for students to introduce themselves in real-time; (2) the complexities of trying to explain technical concepts to students via course notes and email correspondence and (3) the written language problems experienced by several NESB students that may have impacted on the quality and quantity of their listserv postings.

Four students participated in the trial. The first session focused on familiarising students with the *CentraOne* environment, while subsequent sessions were devoted to application sharing using *FrontPage*. The two students who attended these real-time tutorials on a regular basis reported a high level of satisfaction with both the quality of transmission and the benefits they gained from demonstration of techniques in real time and from the critiquing of their own sites. One of the students was from a non-English speaking background and previous attempts to explain *FrontPage* features via online notes and email correspondence had been unsuccessful due to the difficulties this student experienced with written communication. The real-time voice tutorials achieved more in two or three sessions than had been possible over several weeks of text based online communication. While there were some initial "teething" problems, all four participants in the trials found the *CentraOne* environment "user" friendly and required only minimal technical support once they had successfully logged in for the first session.

### *Trial Two*

The four students enrolled in *Networked Learning*, from Germany, the United Kingdom and Australia, were required to complete two of the three specified assessment items using *CentraOne*. They were aware of this requirement prior to enrolment. They were required to have access to a microphone and advised that a webcam was optional. One student elected to use a webcam, all others used a microphone only. The course was particularly suited to the trial as students were required to research and apply emerging and innovative educational technologies as part of their course objectives which were to understand sound, web-based pedagogical practices, be competent in developing and implementing a web-based unit of study, be aware of a range of assessment potentials for web based teaching and learning, be familiar with the collaborative and global potentials of web-based teaching and with the limitations and possibilities of the medium in an educational environment, and to recognise the cross-disciplinary potential for web-based approaches to teaching and learning.

Students were required to deliver a PowerPoint presentation describing and illustrating the educational websites they had developed for their major assignment. They were also required to present a draft of their assignment, using *CentraOne*, to the lecturer prior to the whole-class presentation. Each student was required to lead an oral discussion after their presentation and to respond to questions from fellow students. The lecturer conducted a peer evaluation of each student presentation at the end of each presentation, utilising the *CentraOne* survey tool. Each presentation was recorded.

The students were very positive about the *CentraOne* technology. They were relaxed about using program and appeared to be quite comfortable when presenting their assignments and communicating in the

*CentraOne* environment. Their ease with and willingness to adopt the technology is perhaps, at least in part, attributable to the nature of the course and the profile of students likely to enrol. Of particular note was the minimal requirement for induction to the technology. Once logged on, students found the environment highly intuitive and easy to navigate and use. The assignment presentations and the subsequent dialogue replicated the face to face classroom experience very closely.

Of particular note in this trial was the ability for students from dispersed geographic locations to interact and to present and discuss their work. Time-zone issues were accommodated relatively easily by holding presentation meetings in early evening (Australia) and early morning (Germany/UK). For the preliminary one-to-one meetings with the lecturer, a schedule of lecturer availability was posted and students nominated which time best suited them.

Undoubtedly the opportunity to discuss, orally, the development of assignments was regarded by students as a significant aid to their learning. The microphones were integral to the assignment tasks. The visual component (webcam) used by the lecturer and one student, was tangential to the core task, and in fact the images were stilled quite rapidly as the moving image of the presenter in the screen corner tended to distract from the demonstration of work on the major part of the screen. The stilled image of the presenter in the corner of the screen was an effective way of personalising the presentation; the animated image diverted attention from the key purpose of the meeting which was to demonstrate and discuss the student projects.

### Trial Three

The system was also used successfully to supervise research students from the Division of Health Sciences located in rural and remote areas. This occurred firstly through direct supervision of students, including discussion of progress, use of the whiteboard to discuss papers and documents in preparation, use of webcam to demonstrate experimental techniques and use of PowerPoint to discuss conference presentations. On several occasions, three participants (principal and associate supervisors and student) worked together using these modalities. The student also worked with a statistician discussing data analysis. The student could application share their excel spreadsheet and discuss the statistical analysis of their data with the statistician. The system was very effective when used in this way. Use of the webcams purchased added significantly to the functionality of the system.

The second application used the system for students located in rural and remote locations to present the annual review seminar required of research degree students. Students located at rural locations (Mildura and Cobar) presented their annual review seminar using a PowerPoint presentation to an audience of supervisors and other students located in a lecture theatre in Adelaide. The students presented their progress seminar and the audience was able to ask questions of the student.

### Trial Four

Part of the assessment *Small Business Accounting* involves a group presentation which simulates a presentation to a small business client of an accounting practice. External mode students had previously submitted their presentations with either audio or video accompaniment to PowerPoint files. This method of presentation is a useful alternative given the circumstances of distance students, but does not allow such students to experience being 'on show', to experience visual input from other presenters, nor participate in the discussion and feedback that ensues for those who present personally in real time. The main objective of the exercise is to give students the opportunity to contextualise the material learned to that point. The objective of the software trial was to allow the distance students to access the perceived educational and other benefits of the synchronous audio visual presentation that is available to internal and locally based external students. The nature of the presentation task steeps it in the realms of role-play. As a result, having someone to present to, and from whom one can be asked questions, appears to improve the quality of the presentations. It also provides an opportunity for distance students to view the work of others and make comment on it. This basically put the experience on par with that experienced by internal and local external students who present this task in person to others.

During the trial there were 46 students enrolled externally in 'Small Business Accounting' located as far north as Jabiru in the Northern Territory, as far west as Wudina and Whyalla in South Australia, and as far east as Leichhardt in New South Wales. All external students were invited by email to nominate their preferred choice of presentation mode. They could choose from either an in-person presentation at an organised presentation session at City West Campus, an online meeting, or an alternative electronic submission medium (such as video, or audio accompanying a MS PowerPoint file, followed by email Q&A).

Students were informed that the default method of preparation was by group, unless personal geographical or other circumstances made such pre-presentation collaboration unreasonably difficult. Students were also advised that the default presentation mode for locally based students would be in-person, and the default for distance students would be an on-line meeting. Requests for individual (as opposed to group) presentations, or changes to the default mode of presentation, were adjudicated by the lecturer.

Of the six distance students, only three were initially accepting of the default method of presentation i.e. online meeting. The others wished to be considered for an alternative electronic presentation medium. Since this was effectively a test run of the technology as applied to this course, it was decided to be encouraging of student participation in this mode of presentation. For the same reason, however, where students seemed to be strongly resistant and/or seemingly presented cogent reasons why an alternative would be better, it was decided not to compel them to use the technology so as not to cause unnecessary anxiety about the learning process.

Once participants were identified an electronic meeting was called. Students sent in MS PowerPoint files to the Coordinator for uploading prior to the meeting to improve speed and minimise the chance of problems in the uploading process. At the commencement of the meeting, a ten minute introduction to the web interface was held. There were three presentations of approximately twenty minutes duration, plus in-session Q&A. Two of the presentations were from individuals, and one from the pair in Whyalla. After the presentation, the session was evaluated both with the "voting" tools that are part of the interface and through audio discussion.

Due to the small number of students involved, no statistical inference can be made in comparing the results of distance students who chose to present on a medium other than online, however all students were extremely positive about the experience. All students agreed to the proposition that they had a better and more enjoyable learning experience doing their presentations interactively online than would have otherwise been the case. All said that they would be keen to use it again in their studies. Collaboration was improved relative to the previous modes available to distance students for this task. Though it is sometimes difficult to bring students together to prepare such a task on video etc. due to large distances between them, judicious splitting of the task can make it possible for some students. What is far more difficult is to have students learn from each other's presentations. The online synchronous tool allowed this to occur. The positive reaction from students, along with their willingness to interact in questioning and discussion, was compelling evidence of this.

Students commented that outside of its role in their learning, they appreciated the opportunity of using online presentation software such as that provided by the *CentraOne* system. Being in remote locations students commented that they could see applications for communication with and presentations to their future clients. The quality of presentations was quite high, and students commented on the value to them of having experienced the presentations of other students both orally and visually. The benefits in relation to the learning of collaboration and presentation skills are evident from the discussion of the previous two outcomes. It was also noted that after the interactive experience, two of the students who were rarely heard from by the coordinator began to make semi-regular contact by email and telephone, suggesting that the positive experience improved some student confidence. From a teaching perspective, the online meeting was no more difficult to coordinate than other modes appropriate to this task.

In running the meeting, the teacher has the control to assist in the flow of the event through the various tools (eg hands up and voting) and through control of the microphone function. This is especially

useful in quietening down "dominators" and giving quieter students their turn. As the presentation is synchronous the teacher has the opportunity, through immediate feedback, to elicit responses from presenters and have them clarify or change tack if necessary. This is not possible with asynchronous presentation media.

## The challenges

Challenges identified in the trials include:

- *familiarisation with the environment* - while the students participating in the trials did not report any major concerns accessing the *CentraOne* user interface, considerable time was spent in the first session helping students to adjust their viewer window size and position to ensure they could see all of the screen during application sharing
- *facilitation of sessions* - the number of participants involved in the initial trials was limited to four students and it was obvious even from those sessions that the instructor needs to be skilled in facilitating sessions to ensure all participants have the opportunity to engage in discussions
- *technical issues* - the initial download of the client and the *Java Virtual Machine* (if not already installed) presents a major obstacle for many students - particularly if they have a poor Internet connection.

## Conclusions

The features on *CentraOne* that have direct applicability include:
- *application sharing* - instructor can demonstrate techniques in Web design and students can try out these techniques in real-time
- *'Web safari'*- students can search for factors affecting the electronic publishing industry by researching sites and sharing relevant sites with their peers while engaging in voice-based discussion about the issues identified
- *application sharing and 'Web safari'* - students can critically analyse Web sites and engage in peer review of each other's sites as they are developed
- *real-time, voice-based discussion* - students can engage in online voice-based discussion and debates about the social, ethical and legal issues relating to electronic publishing.
- *PowerPoint* - which would enable the instructor to conduct a real-time lecture for students unable to attend face-to-face lectures
- *electronic whiteboard* - enabling the instructor to illustrate concepts and students to explain technical points via diagrams
- *recording and archiving sessions* - enable students who are unable to attend to catch-up on missed material at a more convenient time.

The outcomes from these preliminary trials provide evidence of the value of voice-based discussion and application sharing in courses that demands mastery of specific technical skills.

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