O (Big) Brother, Where Art Thou?: Exploring the capabilities of synchronous online communication while supervising experiential learning from a distance

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Abstract: Good teaching has been described as a 'conversation' or as an 'interactive engagement' that mandates collaboration between all the participants. The applied communication technologies, broadly classified as synchronous or asynchronous, specifically constrain the available environment for the practiced pedagogy in distance education. In the research reported here the capabilities of a commercially available classroom management tool with built-in bi-directional audio communication and a range of computer application-sharing services were explored. This software was used to supervise online students who were performing computer-based experiential learning. Post-event survey and focus groups returned a majority of favourable participant responses. While the described case study was conducted over a local-area network of computers, the on-going developments in technology ensure that the eventual porting of this concept onto a wide-area network, such as the Internet, will be equally beneficial to the distance education delivery of science-based curricula; for example course work in engineering.

Introduction

Toohey (1999), with help from his colleagues, developed a simple model of the learning process. The resultant five stages and their relationship to each other are shown in **Figure 1**. Both in the '*Try it out*' stage, where students frequently identify the gaps in their knowledge, and in the '*Reflect and adjust*' stage, where students consider the feedback they have received in order to decide how to adapt their understanding, students need a lot of interaction with teachers and other students. In fact, the collaborative active involvement of both student and academic staff is mandatory to achieving the higher levels of learning (Centra, 1993).
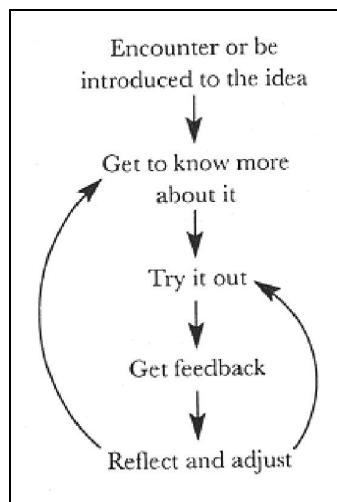
Figure 1: A simple model of the learning process (Toohey, 1999: 154)

Other researchers have described good teaching as a conversation (Laurillard, 1993; Ramsden, 2003) or as an interactive engagement with the students (Chickering & Gamson, 1987; Lizzio, Wilson, & Simons, 2002; Newlin & Wang, 2002). Laurillard (2002) re-interpreted her original concept, commonly known as the Conversational Framework, for educational scenarios that employed a variety of recent technologies, such as video, DVD, web resources, simulations, etc.

The facilitation of such conversations for off-campus students, who are participating in learning-by-doing within science-based curricula, has been identified as one of the distance education providers' greatest challenges (Arbaugh & Benbunan-Fich, 2005; Sivakumar, Robertson, Artimy, & Aslam, 2005). During the supervision of laboratory experimentation or problem-solving tutorials extensive participant interactions must occur. As shown in **Figure 2**, Laurillard's (2002) Conversational Framework has been adapted by Ling (2006) in order to illustrate this style of teaching/learning.
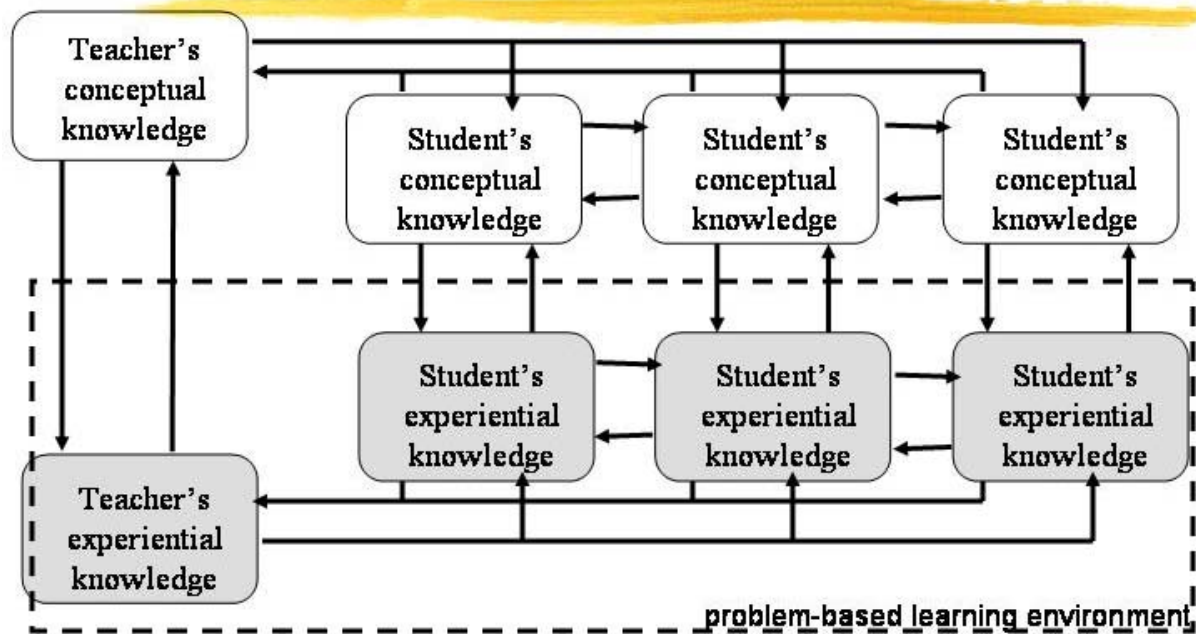
Figure 2: Laurillard's Conversational Framework adapted for experiential learning (Ling, 2006)

In the context of distance education the quality of the practiced pedagogy is purely a function of the applied communication technologies. While, 'synchronous' and 'asynchronous' are two mutually-exclusive industry-wide telecommunication descriptors, they have also found usage in other fields, as illustrated by the following definition which has a distance education focus (Ginsberg & Foster, 1998: 48):

> *Distance learning is the exchange of curricular materials between a teacher and students located at distant sites, with some form of two-way communication between them. The learning can be synchronous - in real time, with simultaneous participation by students and teachers - or asynchronous, with the students choosing when they will participate. Correspondence courses are an early example of asynchronous distance learning.*

Asynchronous communication is primarily "in a narrow bandwidth … called writing" (Feenberg, 1999: online) that inherently affords students with ample time for reflection before having to respond or contribute (Berge, 2000; Hmelo-Silver, Derry, Woods, DelMarcelle, & Chernobilsky, 2005; Larreamendy-Joerns & Leinhardt, 2006). Since this form of communication has an inherent democratic nature, the students tend to complete all their set tasks and subsequently make the resultant contributions permanently accessible to all participants (Kuriloff, 2005). On the other hand, the delays within asynchronous systems inhibit spontaneity, potentially allowing the student to significantly progress down the 'wrong path' before being corrected by colleagues and/or an academic (Cheaney & Ingebritsen, 2005).

Investigations into the application of interactive electronic media have shown that synchronous rather than asynchronous communication resembles face-to-face environments (Walther, 1993). The importance of audio bandwidth was highlighted by Martarazzo and Sellen (2000) who found that speed rather than quality of synchronous communication resulted in more efficiency and satisfaction with non-proximal collaborators. Additionally, in academia higher interaction levels have been perceived when instructors responded faster with feedback to any student-initiated questions. (Roblyer & Wiencke, 2003). While the transmission of facial expressions and body language require a video link, any thumbnail-sized 'talking head', occupying potentially valuable computer-screen real estate, has been found to be of little ultimate benefit, since the image size of the participants, as well as the possible delays in any accompanying audio has a strong effect on the naturalness of the resultant conversation (Tang & Isaacs, 1993). Early research has also confirmed that shared computer desktops have been extremely valuable for distributed online collaboration (Tang & Isaacs, 1993).

In telecommunication terminology the face-to-face or 'in-class' model has been described as a 'synchronous learning network' (Latchman, Salzmann, Gillet, & Bouzekri, 1999), perhaps providing a hint on how such a learning environment could be successfully re-created online for distance students.

Details of the case study

In 2007 a case study was mounted to investigate the application of online synchronous communication for the supervision of students who were performing computer-screen-based tutorial exercises in an introductory subject dealing with electronic circuit behaviour that was taught into all engineering degree courses offered at Swinburne University of Technology. At the start of that academic year, without being aware of this research project, all prospective students were instructed through an online portal to register their selection for attending one of seventeen timetabled tutorial groups for this subject. At the beginning of the second teaching semester the researcher selected two of these groups to tutor. This selection was based only on the availability, at the already-scheduled tutorial timeslots, of both the researcher and a specific computer laboratory on whose desktop computers copies of the software required for the research were installed. In this way, the student participants were selected in a pseudo-random fashion.

In each of the tutorial sessions, the students were scheduled to complete a number of problem-solving exercises. In order to ensure that student use the laboratory computers, the researcher integrated the electronics circuit simulation software, *Electronics Workbench*ᵀᴹ *Multisim 2001 Text Book Edition*, into his delivery of the curriculum. Consequently, in these two tutorial classes, the students were required to initially simulate electronic circuits on a computer screen, take appropriate measurements of voltages, currents, waveforms, etc., and then mathematically verify their results; or once their calculations were complete verify these with appropriate simulations. Earlier research has found that student use of this software in the study of electronic circuit theorems encourages deeper levels of learning (Banky & Wong, 2007) – making the introduction of this tutoring approach an ethically acceptable alternative.

Consultation with Swinburne University of Technology IT Support staff resulted in them assigning, for this research, a computer laboratory that was divided by a glass wall into two physically separated but neighbouring areas. There were 12 networked desktop personal computers in each part of this laboratory. As shown in **Figure 3** a commercially available classroom management tool, *NetSupport School*, via its built-in audio communication and a range of application-sharing services, facilitated the synchronous remote supervision of the students' on-screen activities over the University's local-area network (LAN).

During the semester a total of sixteen tutorial sessions were delivered by the researcher - nine supervised face-to-face and seven online. The last tutorial session for each participating group was devoted to a post-event survey, and a focus group that was led by two colleagues of the researcher, both of whom were not directly involved in this research activity. In this way the students were canvassed for their perceptions on the availability of help if and when needed and feeling isolated during the online supervised activities.
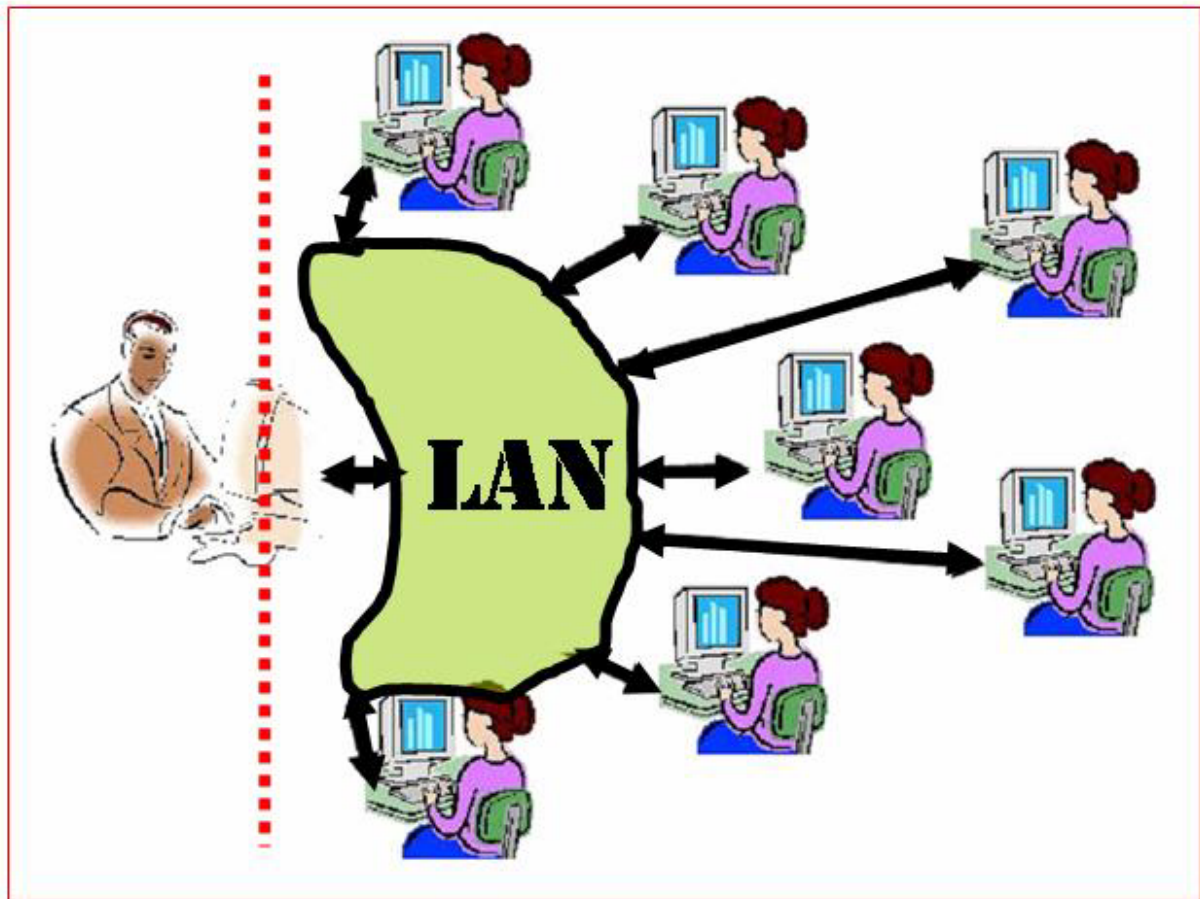
Figure 3: Network topology for online supervision

Results and Analysis

The post-event survey asked the student participants to complete four Likert-scaled questions. The concept of the five response-alternatives is based on the scaling proposal by Likert (1932) which he did not intend to be a summated one. However, there is an underlying assumption of a variable, the value of which represents attitudes and opinions (Clason & Dormody, 1994). In order to acknowledge this discrete nature, the analysis compared the proportions of the responses in each category rather than consider the means and standard deviations of the ensuing distributions. **Table 1** summarises the Likert-scaled responses of the participating students, which were 'binomialised' by obtaining the percentage of the 'disagreed' and consequentially the 'not disagreed' replies.

Table 1: "Disagreed" responses to Q1 – Q4 of post-event questionnaire

Survey questions	Disagree
Q1: While doing the simulation exercises I was helped by my tutor in person	31.3 %
Q2: While doing the simulation exercises I was helped by my tutor through the LAN	31.3 %
Q3: I did not feel isolated while my tutor was monitoring my progress over the LAN	31.2 %
Q4: I did not feel isolated while my tutor was helping me over the LAN	37.5 %

As reflected in their responses to questions **Q1** and **Q2, t**he supervisor's ability to help the students in real-time during both styles of supervision was clearly confirmed by the students' perception of what occurred. As shown in **Table 1** analysis determined that 31.3% of the responding students disagreed with receiving tutor help during the sessions irrespective of the supervisory mode practiced by the academic.

In the post-event survey questions, **Q3** and **Q4, t**he issue of feeling isolated while being supervised over the LAN was canvassed directly from the students. Analysis of the responses indicated that just under two-thirds of the cohort did not feel isolated while completing their tasks and being monitored and/or helped by the tutor online during the case study (refer **Table 1**).

The post-event focus group comments highlighted some students' discomfort with the case study implementation in statements such as: *"(feeling uncomfortable) when I didn't request any help and my mouse was grabbed. You think: what's going on? What am I doing? I didn't do that. And then he started talking to me. And then you say: Ahh!"* and *"I could imagine looking at a website and somebody is looking (at what I was doing)"*. Another student was more accepting of the research with the statement: *"I quite like the idea of (my) mouse being controlled by somebody in another room"*.

Additionally a perceived reduction in the participants' feelings of isolation from their supervisor was confirmed in this remark: *"it's easier to ask a question. If you e-mail (a) question he may never get around to it and it's harder to explain. When someone is there, you know, and you start explaining it and you say: do you understand? Then they say: no I don't. You can try to (have it) explain(ed) again"*.

Conclusions

This research has confirmed that an academic using synchronous bi-directional audio communication and computer desktop sharing, that is commercially available in software such as *NetSupport School*, has the ability to remotely supervise a range of computer-screen based student activities with the level of help that compared favourably to what is available in face-to-face environments. Furthermore, about two-thirds of the participating students perceived not being isolated while receiving assistance during this delivery of online supervision.

While the case study was conducted over a LAN, there is every reason to expect that in the long term the results obtained will be the same for a wide-area network (WAN) implementation, such as the Internet. Currently, two limitations exist for achieving this - namely the availability of a single commercial software with the features of *NetSupport School* that is designed for use over the Internet, and the current bandwidth of most Internet connections. Fortunately, due to the worldwide requirement for collaboration software and high-speed communication, technology providers are endeavouring to resolve both these issues as quickly as possible.

The implementation of systems, like the one used for this study, that facilitate the practice of some face-to-face pedagogy during the online supervision of experiential learning, as well as reduce the participants' feelings of isolation, is simply a recognition of the fact that distance education is just education at a distance (Zhao, Lei, Yan, Lai, & Tan, 2005) - particularly in engineering education.

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