

# Digital design and student learning through videoconference collaboration



**Joshua McCarthy**

The School of Architecture, Landscape Architecture and Urban Design  
The University of Adelaide

This paper reports on a pilot study involving a long distance learning experiment between the University of Adelaide and Penn State University through a six-week videoconference program. The program involved staff and students from digital media courses within each University, including Dr Dean Bruton, Senior Lecturer in the School of Architecture, Landscape Architecture and Urban Design at The University of Adelaide, and Associate Professor Madis Pihlak, Director of The Stuckeman Center for Design Computing, School of Architecture and Landscape Architecture, Penn State University.

Using Information and Communications Technologies (ICT) for teaching digital design processes has many advantages and disadvantages. Instant communication between groups and individuals across the world, defies the barrier of distance. Interdisciplinary exploration and collaborative action allow the expansion of design curriculum possibilities and the sharing of information and experience, while technical skills and standards rise as students find new levels of potential in response to more diverse audiences. Disadvantages with such design experiments include time differences between two continents, technical constraints and the availability of technical assistance.

The project was largely successful, evident through positive feedback from staff and students, and the emergent relationship between the two schools. Through this pilot study, and the resulting research, new possibilities are now being explored, including cross-continental design collaboration with design schools in Canada, Malaysia and India. The University of Adelaide, has supported the project by supplying a AU\$48 000 grant to purchase the test equipment, used in the pilot study, and establish a dedicated videoconference facility.

**Keywords:** videoconference collaboration, digital design, student learning

## Introduction

Interdisciplinary collaboration with international design colleagues has been a common goal for many academics since the early 1990s (Bruton and Barnes, 1993). In 1994 Kidwell wrote, “many people in the computer industry hold this vision of networked computing as personal, easy to use, and ubiquitous as the telephone, but it is not clear how, or when, or even if, it will happen” (Kidwell and Ceruzzi, 1994). By the late 1990s however, IP (internet protocol) based videoconferencing became possible, and more efficient video compression technologies were developed, bringing cheap, albeit low quality, VTC (video teleconferencing) to the masses.

This pilot study was conceived in 2006 while Dr Dean Bruton was on a lecture tour of USA, including the Bracken lecture at the Architecture and Landscape Architecture School, Penn State University. The idea was to develop a shared design studio facility that could enhance the educational programs of both partners. Bruton was interested in the ‘Virtual Design Studio’ and had followed the work done by MIT during the 1990s (Wojtowicz, 1995). At the time, William Mitchell wrote, “The new paradigm, the virtual design studio, conceives of designing not simply as a technical process but also fundamentally as a social process” (Wojtowicz, 1995). Bruton and Associate Professor Madis Pihlak proposed a ‘pilot’ virtual design studio, to take place in early 2007, using current technology and low cost software solutions, to determine if it was possible to surpass the technical difficulties and frustrations of other researchers’ former attempts to link international design studios for interdisciplinary collaborative design activities.

## Aims

The aims of this project were to explore the current technology – both hardware and software to assess its effectiveness for supporting the activities of an international interdisciplinary collaborative design studio.

The primary aim was to link students across barriers of national boundaries, time zones and institutional contexts. The objectives of the project were to enhance the educational programs of both Universities by combining classes and sharing information and experiences. It was hoped to expand the social and cultural boundaries of national borders to develop relationships with others with similar interests and goals. Key goals included expanding the use and the sharing of knowledge and experience within the students' learning environment, developing cultural and political dialogue and deeper discourse within the digital design studio, supporting the steep learning curve required for digital media design education by establishing strong student relationships between the two schools, and developing our educational curriculum to include interdisciplinary collaborative projects in virtual environments thus simulating the way industries of design practice work today.

## Method

The project ran for six weeks, with two one-hour sessions per week. The timeline of the project was set out well in advance, as the time-zone differences were considerable – 14.5 hours. The project required a window of opportunity that could allow a common class time so that the video link could be run as a standard part of curriculum activities. The class time for Penn State was 7.30pm Tuesdays and Thursdays, and 9am Wednesdays and Fridays for Adelaide University. Students were asked to give a seven-minute presentation on one aspect of their current projects or give a tutorial on a specific aspect of software used for the production of movies, computer games or web/interactive design. The assessment (15% of their final mark for a six-unit course) was based on their ability to organise the material, present in public using the video link facilities, and simultaneously to the local class. The session was assessed by the lecturer and recorded on a high-definition camera for future reference. Adelaide University sessions included 3D Studio Max demonstrations, such as the modelling and animation of a quadruped, the development of animated characters for an interactive game design, and a bone rigging system. Penn State student presentations included a game designed with the Unity engine and other Maya based projects for games and film. An opportunity for questions and comment was provided after each session. The Adelaide University academic staff delivered three lectures that were shortened versions of their normal two-hour sessions from the course 'Rules and Contingency in Design with Digital Media', a core component of the Masters of Design with Digital Media degree. The first lecture was on 'Grammar in Design', the second 'Contingency in Design' and the third was titled 'Games, Play and Interactivity in Design'. These lectures were prepared as PowerPoint presentations and sent as shared files to USA so that they could be seen simultaneously with the video link display of the speakers in action. The Penn State lecturers did not present any official lecture but were actively engaging students in their desktop critiques.

The technical equipment involved in the set up included 2 Sony EVI-D70 cameras, a tripod and a Sony Bravia X Series 46" LCD Screen mounted to the studio wall. The software used was intended to be simple and low cost. The choice of AIM was based on the successful tests completed between Pihlak and Bruton during late 2006. Bruton tested many software packages to find a satisfactory way of sharing a desktop between the Macintosh computer using their latest operating system (OSX) at Penn State University and the Windows PC using the XP operating system at Adelaide University. The final compromise was the desktop sharing software called TightVNC viewer. The multi-viewer software program called Squidcam was used when it was required to expand the size of the remote camera window.

The evaluation of the videoconference sessions involved two key steps. Firstly, weekly interviews with Dr Dean Bruton were held, discussing the continuing development of the sessions, the positives and negatives of each presentation, and if any major problems occurred. Secondly, the 15 Adelaide University students involved in the project were surveyed at the end of semester to establish their opinions of the studio. The survey was held in week 11 of the semester once the videoconference sessions had been completed. The questionnaire was designed to determine a) students' level of engagement during the sessions; b) whether they found the sessions informative; and c) whether they felt they improved their communication skills. The questionnaire included five questions using a Likert scale with responses ranging from 7 (strongly agree with the question) to 4 (undecided) to 1 (strongly disagree with the question). Students were also allowed to provide open-ended comments for each individual question. Lastly students were asked to discuss the best aspects of the sessions and any aspects that could be improved, thus allowing for any unexpected responses, that hadn't been considered in the five Likert-scale questions.

## Results

During the semester Dr Bruton commented regularly that the students were very positive in terms of the quality of the presentations and their involvement with each other during the sessions.

The positive response from students to the connection with an international group of peers doing similar work was gratifying to see. In the third session we agreed to share each other's email addresses and the official aspects of the connections started to break down into informal communications between interested individuals. The experience led to a more cohesive group spirit and a more collaborative social atmosphere.

School staff and visiting international academics responded well to the event while observing the sessions. Sharing imagery and files of the event as well as the sessions was also a positive aspect of the program. It reinforced the presentations as students could test their colleagues' game design and see their animations in real time. At least three to five files were shared each session and were sent in only a few minutes during the sessions. There were, of course, some drawbacks with the program. Hardware costs was the main negative issue with the project. The computer screen switch panel was valued at AU\$9000, the Sony HD screen cost approx AU\$5000, therefore requiring adequate security within and outside the studio space. While this increased costs, it made the project development and operation far more comfortable. The cameras were high quality, with fire-wire connection, and fixed to a base. This prevented multiple simultaneous screens for different presenters. Dr Bruton attempted to use other software, such as InSORS, for this but the camera type (fire-wire) prevented further development. The Sony HD-LCD screen was purchased to enable the screening of HD movies as the students are now working at this resolution in keeping with industry standards. The delivery of the Mac desktop using TightVNC was excellent in picture quality and resolution, but the refresh rate was slow preventing full real-time animation playback. The use of a screen video capture program such as CamStudio was a failure. There seemed to be too high a demand on the computer to cope with the video link, desktop share and screen capture at the same time. This resulted in a break down of the sound quality. To record the sessions onto disc, still cameras and a DVDCam were used.

The responses from students revealed significant insight into the sessions, and outline the necessary changes required to ensure the success of future videoconference collaborations. In general the responses provided by the students were positive, but most came with constructive criticism. The mean response for the five Likert-scale questions ranged from 3.4 (broad agreement of 17%) for "I developed a strong connection with the Penn State students during the videoconference sessions", to 4.8 (broad agreement of 83%) for "I developed my communication skills during the videoconference sessions" and "the videoconference set up was effective as a presentation tool." Both questions regarding the Penn State presentations – "I learnt new digital skills through the Penn State student presentations" and "the videoconference set up was effective as a learning tool" – received a mean response of 4.5, (broad agreement of 58% and 50% respectively. 12 of the 15 students involved in the course responded to the survey, a response rate of 80%. From the students' perspective it seems the least successful aspects of the sessions were the lack of interaction with Penn State students and the technical difficulties associated with different hardware formats at each end, as one student noted "the benefit of the videoconferencing was shadowed by extremely frustrating technical difficulties that took away some of the spontaneity." Another student remarked, "the major problem was the feeling we weren't actually talking to anyone because we were unable to see their faces and gauge reactions." This is certainly one aspect that must be addressed as a strong connection between the instructor and student in digital learning is vital (McCarthy, 2006). While the technical difficulties hampered the sessions at times, the students saw many benefits with the videoconference technique, such as improving presentation skills and making international contacts, "I recently emailed all of the Penn State students and have been discussing our projects with them. It's great to learn what students in similar courses on the other side of the world are doing."

## Conclusion

This pilot study offers insights into the establishment and management of an international collaborative virtual design studio. Building new approaches to the use of technology is now part of the role of academics in higher education (Coventry 2007). Building on Mitchell's suggested teaching tools, activities and rituals (Wojtowicz 1995) new forms of interaction in the design studio can be brought in, such as the virtual desk critique or virtual pin-up; site models – virtual models (CAD or GIS) may be discussed and developed in real-time; agents, analysts, and consultants – using online networking for product information sharing and management; model making and prototyping –collaborative design using geometric data files for rapid prototyping. Unlike in Mitchell's era, these tools, activities and rituals are

today in place and available. The ability to share and compile resources in a *Wiki* for example uses the patterns set by others to record and develop a discourse internationally and locally within the course intranet. Screen video capture is available to record the dialogue and actions of shared desktops. The cameras are sufficiently high quality to allow live document sharing for real-time discussion of plans in a collaborative design setting. Future courses may incorporate real-time video links as a component part or entire feature for design activity. The development of projects that explore design issues of international significance is more likely once the shared technical fundamentals are in place for collaborative discourse in participating countries. As travel becomes more expensive and time consuming, the sharing of files and use of video links for design seems more attractive. Those that develop easy, efficient systems for this purpose will have the advantages of cost and international significance when tendering for projects and educational custom. Virtual design teams are the way of the future – varying partnerships as the project demands.

This project has strengthened the relationship between Penn State University and the University of Adelaide in several ways. Firstly staff involved in the project have become firm friends and will continue to share their future experience in digital media and design beyond the life of the study. The sharing of technical details and challenges also brought technical staff together from both universities, while many of the students expressed a strong interest in continuing relationships through email contact and potential international visits. These three aspects highlight the importance of further exploration into international interdisciplinary design collaboration. As Dr Bruton notes, “a fascinating paradox emerges – people say that technology impersonalises our world, yet here is an example of how it expands our personal connections.” Future expansion of the project to include other countries seems highly probable after discussions with other academics both in Australia and overseas, and the financial support of The University of Adelaide, in the form of a AUS\$48 000 grant. The videoconference sessions will continue with Penn State University in 2008.

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**Mr Joshua McCarthy**, Lecturer, School of Architecture, Landscape Architecture and Urban Design, University of Adelaide, Adelaide 5005. [joshua.mccarthy@adelaide.edu.au](mailto:joshua.mccarthy@adelaide.edu.au)

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