

3D Remote Design Collaboration: A Pedagogical Case Study of the Cross-Cultural Issues Raised

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Abstract

Much architectural design work increasingly addresses an international audience. But many designers continue to work in isolation. In practice, however, their work includes international collaboration. This requires cross-cultural understandings with their co-collaborators. There are few opportunities for this to occur in a pedagogical setting. The 3D co-located laboratory (3DCollab) described in this paper was used as a cross-cultural exchange platform to address the need for design students to practice collaborating remotely. What the 3DCollab did was to facilitate cross-cultural exchange in a fun and informative environment where learning was constructed and played out in a 3D virtual environment (3DVE). The project involved students across three cooperating institutions: The University of Queensland (Australia); the National Yunlin University of Science and Technology (Taiwan); and, the Norwegian University of Science and Technology Trondheim (Norway). It builds on previous exercises conducted by the authors. As far as the authors of this paper are aware this is the first e-learning application to focus on cross-cultural understanding in a 3DVE.

Keywords: Qualitative, 3D, Cross-Cultural, Design Collaboration, Pedagogy.

1. Introduction

The project described in this paper makes a significant contribution to the ongoing need for design professionals to work in diverse cultural environments at an international scale. The need for cross-cultural understandings in groupwork is well documented [3,

13, 14, 15, 16, 12]. The establishment of remote collaboration as an essential component of the teaching programme formalizes the need to address cross-cultural encounters in the design professions. A number of different remote design collaboration systems have been used to date [2, 9, 10, 11, 18, 17, 6, 7]. The system described here has been developed over a number of years of previous use of remote collaboration 3DVEs by the authors [19, 1, 20, 4, 6]. An important component of this latest iteration was the use of video-conferencing in conjunction with the 3DVE. The video conference was introduced as a social 'ice-breaker' to overcome the initial hesitance by students to begin communicating with their remote counterpart with whom they had had no prior contact. The suite of collaboration tools used feature synchronous and asynchronous information exchange. The students who participated in this exercise study multimedia design, design computing, and computer science. As such, they were open to engagement in computer-supported collaborative work (CSCW) and the creative design process. The 3D co-located laboratory project (3DCollab) gave them the opportunity to do this. It gave them content to discuss, and it is in their discussions that new understandings about alternate cultural approaches to the tasks emerged. This paper reports on the latest iteration of ongoing remote collaboration research in pedagogy.

2. The 3DCollab Interface

Three primary groupware applications were chosen: Yahoo (video and chat), Active Worlds (3DVE and chat), and Email (text and file transfer). The interrelationships between these tools were, at times, direct (see figure 1).

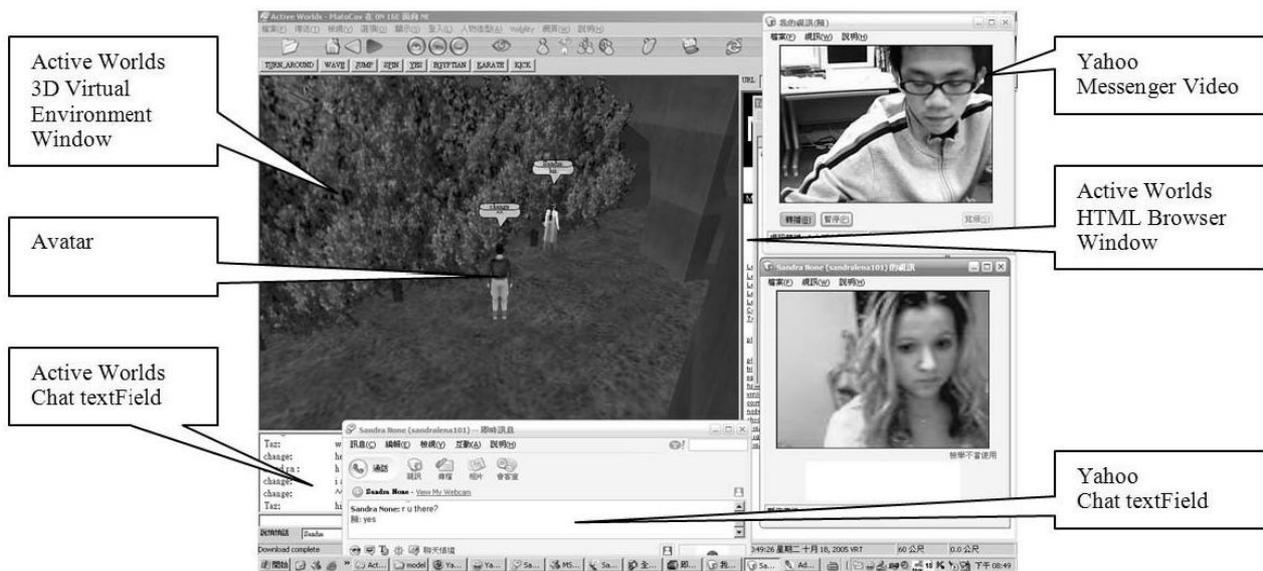


Figure 1. Direct interrelationships between the 3DCollab suit of tools.

Students could converse with each other using video, voice, and chat to get instructions on how and what to build in the AWs 3DVE. Prepared instructions, images, and models could be emailed between them. At times, the students were instructed remotely by the teachers directly within the AWs 3DVE moving from the Yahoo video and chat screen to the 3DVE environment and back. This approach proved to be very effective. For example, students could take the teacher to an object in the scene in the 3D virtual world and describe the problem they were having. The teacher could then walk them through the process on how to fix it. For example, how to add an image texture, access the library of objects, insert code for externally referencing files hosted on another server, and so on.

The typical distribution of applications necessary to facilitate the 3DCollab includes:

- an ActiveWorlds G1000 Galaxy Server, running on a Dell PowerEdge 1750 2.8GHz Xeon, with 2GBs of RAM, and 3x72GB SCSI Drive RAID-5 Windows Server 2003;
- the Yahoo messenger video conferencing group of tools, chosen because they tended to be robust and easy to install. As a video-conferencing tool, the quality of imagery and frame rate varied depending on bandwidth availability. But, this did not seem to adversely affect the efficiency of the system to mediate social interaction. The Yahoo chat field supported textual communication and graphical emoticons;
- Various email systems were used. As a core asynchronous text and file transfer system they proved faultless.

Combined, this group of tools were used as a teaching tool. This was demonstrated on a number of occasions when the teachers used them in conjunction to tutor their students on how to build in the AWs 3DVE.

3. The Project

In the remote design collaboration exercise described here three institutions cooperated on a single project: the University of Queensland (UQ, Brisbane, Australia); the National Yunlin University of Science and Technology (NYUST, Douliou, Taiwan); and, the Norwegian University of Science and Technology (NTNU, Trondheim, Norway). Students from each institution collaborated on the script writing, construction, and performance of Plato's Allegory of the Cave.

Initial collaboration was in the form of a fun video-conference and chat that mediated the icebreaking communication part of the exercise. As a formal, structured activity it was crucial to the overall success of the project. This was followed by the group decision-making process and consensus relating to the other design tasks. Members of the various groups needed to decide what roles each of the members would play in the collective collaborative effort. At the end of the collaboration, students were interviewed about their experiences as a way to evaluate the processes within the project. They were also required to submit a reflective report which was assessed.

Plato's parable was chosen because, in philosophic terms, he describes the process of getting educated in the affairs of the world. As such it was deemed an appropriate vehicle for design students to learn about

the value of collaboration as an educationally transformative ideal. It also served as a motive for engaging in the technology and as a theoretical framework for investigating notions of cross-cultural understandings using information technology.

Plato's parable was divided into 5 acts. The Australian team converted the parable into short play scripts; constructed a virtual version of the cave as described in the parable; and, produced a performance in their virtual stage sets. The Taiwanese team

developed an alternative virtual space focusing more on the notions of virtualities than any direct reference to a stage set for a performance of Plato's parable. The Norwegian team evaluated and interacted with the combined Australian-Taiwanese final performance (see figure 2). All teams had access to the same material: Jowett's [8] translation of Plato's Allegory of the Cave; the Active Worlds 3D virtual world environment and tutorials for building in it; Yahoo messenger; and, various email applications.



Figure 2. Plato's Allegory of the Cave reconstructed as a stage set in the AWs 3DCVE.

3.1 The Australian Setting

The Australia team comprised 67 first-year Bachelor of Multi-Media Design students in 5 groups of 12-14 members participating. Students came from diverse backgrounds – international students, interstate students, and a range of ages 17-25. For some, English was a second language. Their acculturation to digital media was equally diverse – from ostensibly self-taught students, some already working in the multi-media industry coming back to 'upgrade' their qualifications, to those with little exposure to digital technology.

Two courses were incorporated into the Brisbane remote collaboration experience. A technology-oriented course and a design studio-based course. The technology course introduced the students to a broad range of digital media of which the 3DCollab constituted 25% of the course content. The design studio course focussed on narratives in digital media.

The remote collaboration exercise also constituted 25% of this course. In the technology course students cycled through the iterations of prototyping the virtual world in VRML and in the Active Worlds environment. The Active Worlds constructions formed the stage set for their narratological investigations and final performance in the studio course. There were two online preliminary rehearsals before the final performance.

Students could work from home, access the school's webcam setup, and use the facilities provide by a PC lab. The final performance was conducted in the evening in the school's PC lab. It took five hours to complete. The typical workstation specification varied between Dell GX260s to Dell GX280s. Generally they had 512MB RAM, a 2.8GHz P4 and a 40GB hard drive installed.

3.2 The Taiwanese Setting

The Taiwanese team comprised eight participating Masters students from a interaction design course in the first year of a Computational Design degree. The student backgrounds vary from computer science to interior design. The main purpose of the 3DCollab exercise to this course was to explore the notion of virtualities. The eight students were organised into four groups of two. They reviewed the three knowledge domains of virtual communities, media spaces, and virtual narratives. The Plato's Allegory of the Cave performance in the 3DCollab was analysed in relation to each of these domains. Each group developed a theoretical and interactive analysis of the theme. Cooperation and negotiation was achieved through video conferencing, emails, and in the 3DVE. How to build was negotiated with the Australian team in the 3DVE.

Students worked in the media lab at NYUST or from home. Lab computers were equipped with a WebCam and the necessary software to participate in the project. Each computer had dual systems including Windows and Linux with a 3D graphics card, 512Mb ram, ASUS P4 2.8GHz, and 80/160 Gb HD installed. There were two projectors and a digital sound system in the lab. A Sony DV camera was used to record the proceedings.

3.3 The Norwegian Setting

The Norwegian team comprised 13 groups of 4-5 students each fourth-year Computer Science students participating as part of a course on computer-supported collaborative work (CSCW). Most students were ethnical Norwegians. Their primary task was to evaluate the final performance. Notes from their evaluations were used in this report. They explored the virtual stages created by the Australian and Taiwanese students and, whenever possible, communicated with them online in the world or via the provided e-mail addresses. On the day of the final performance, the Norwegian students followed the performance online for five hours, (08:00-13:00 Central European time). They logged in through the AWs 3DVE application either from private computers or from the general student computer lab, where it was installed. During the performance the Norwegian students adopted the role of the audience, but participated actively in discussions initiated by the performing teams. The typical machine they had access to included a HP PC Intel P4 3GHz, with 512 RAM, and a 40GB hard drive installed.

For the Australian, Taiwanese, and Norwegian students, the 3DCollab capitalized on their prior awareness of the technologies used: 3D computer games, 3D modelling, graphics programs, email, chat, video conferencing and so on. In this manner the focus was less on skills acquisition and more about addressing

the core task at hand – remote collaboration for constructing a place of learning in a 3DVE.

4. Analyses Of Chat Logs

Following a qualitative rather than quantitative methodology the nuances of the participants' interactions is critical to a thorough understanding of the project. Hence, the analysis of the chat logs that come from Yahoo chats and the 3DVE final performance chats. Despite the central role of the 3DVE, which included spatial and visual communication, it was noticed that textual communication dominated. Once navigation of the 3D world had been completed attention tended to be primarily focussed on textual communication. In these cases the 3DVE tended to be simply a distraction. Hence, the role of the 3DVE emerges as a secondary function for brokering social interaction. Therefore, much of the analysis of this report is derived from the saved chat logs. A number of issues were raised. The three that we discuss in this paper refer to: the cross-cultural issues raised; overcoming cultural difference; and socialization.

4.1 Cross-Cultural Issues Raised

Interacting in the AWs 3DVE, students found they could not assume that their remote counterpart would understand how to use the spaces they had constructed or interpret their actions. Methods needed to be developed that offered 'universal' communication metaphors. For example, the 'wave' function in the AWs 3DVE was used as a method for attracting the attention of others and 'getting in their face'. This was particularly important during the final performance where one group of avatars led another through a spatial and textual narrative.

4.2 Overcoming Cultural Difference

If we compare the video conference tool to interaction in the 3DVE a number of interesting issues are raised. These include personal preferences for different types of communication media, and visual versus verbal learning styles. In turn, these tended to hinge on the nature of the task to be mediated: Yahoo was better for discussions, and 3D for direct building. Having access to both indicated the need for the integration of several supplementing tools. Combined, they provided a vehicle for overcoming cultural differences.

For example, we found that when we analysed the chats from the ice-breaking exercises mediated in the Yahoo messenger environment, a cultural shift occurred during the conversations. We noticed that the Australian students seemed open and consistent in their inquiry and

expression. On the other hand, the Taiwanese students were more guarded in their responses to probing questions. At first, they never gave a direct answer. They seemed to be looking for the other's opinion first to gauge their own response before answering. However, once they found terms they were both familiar with they had a common understanding to the parameters of the question. This helped them build a rapport and intimacy, until the normally reserved Taiwanese student offered his opinion freely and the first stages of a 'virtual' friendship was established.

When asked why Taiwanese students take this course of action it was revealed that early year students tend to be too reserved to talk about their ideas openly. The video conference had helped them to socialize, and they recognised the importance of participating in the chats. In fact, many expressed eagerness to participate for the very reason that it was perceived as a non-threatening environment where they could ask "stupid" questions without fear or ridicule. Although, it still took them some time to come to terms with conversing with a non-Taiwanese person. This was due to their reluctance to show their less than "native-speaker" English.

4.3 Socialization

When we move to the AWA's 3D virtual environment we find that the shift from socially reserved to openly inquisitive was most pronounced in those students who had engaged in the earlier Yahoo-mediated ice-breaking exercises. They seemed to have a greater natural rapport with the same participants when in the 3DVE towards the end of the project. We saw instant joyous recognition and bonding carried over from their video-conferencing and email communications.

This suggests that the collection of tools used in the 3DCollab project were supplemented by each other, with some tools more appropriate for different phases of the cooperation. Together they were the glue for creating the virtual community that came together in the final performance.

5. Conclusion

In this paper, we have reported our experiences with a 3D co-located laboratory (3DCollab) that was used as a cross-cultural exchange platform to address the need for design students to practice collaborating remotely. The reported study allowed the exploration of a number of issues related to supporting cross-cultural interaction with groupware tools. This study also highlights the value of the 3DCVE as a platform for cross-cultural encounters across significant geographical distances. It allowed a quick and informal 'acquaintance' between people from different cultural backgrounds. As opposed

to alternative tools such as 2D chats and forums, the 3D aspect allowed a more active social involvement and the visualization and concretization of the performed activities central to the project. Such cross-cultural interaction and subsequent understandings is crucial for the graduate attributes of students entering the design professions in the twenty-first century.

From this we can speculate that future iterations of groupware configurations could be used not just for collaborative design and role-play but also other activities such as social events and other types of discussions between students from different regions. The results also revealed some weaknesses of the proposed system for supporting cross-cultural interaction, thus highlighting possible future research directions. For example, the overall evaluation of the system tends to suggest it has some scalability but is still open to the vagaries of connectivity and equipment and application failures. Another issue is the need to extend the existing 3D object libraries to support greater cultural diversity and thus better inter-cultural collaboration. An important future research direction is the exploration of possibilities for using the 3DCollab in other educational contexts, including different types of role-play and theatrical performances.

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