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# Design Collaboration using a 3D Virtual Environment: a Pedagogic Case Study

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## Abstract

Researchers are beginning to explore the role of digital design collaboration within multi-user 3D virtual environments. In the latest installment of an ongoing remote digital design collaboration project with the Sydney University Key Centre of Design Computing and Cognition (KCDC), the University of Queensland Information Environments Program (IEP) co-coordinated an online production of T. S. Eliot's *The Cocktail Party* in a 3D virtual world environment. This paper describes the process and pedagogical outcomes of early learners collaborating remotely in digital 3D media.

## Introduction

Designing is an iterative process. In a traditional design practice – such as architecture, engineering, industrial design, and so on – it relies on the formation of collaborations with colleagues from within and external to the firm (consultants, clients, and service providers; involving video, audio, telephonics and the transfer of files such as email, text, CAD, animation, VRML, among others). As design firms are globalising, potential design collaborators increasingly consist of local and geographically remote partners. Traditionally, design collaboration includes informal and formal meetings. Informal meetings may take the form of chatting about problems (via telephone, email, or IRC), while formal meetings occur when most partners gather in the same physical location including: colleagues, clients, and consultants, although often a phone or even video link-up to remote partners is used [4]. Of importance to this study is the way inclusion of a 3D visualisation component usually comes at the end of this process. It is largely seen as simply a tool and not part of a social process. Its tool-like use is also emphasised over the social in the approach taken by many researchers in the field of design collaboration [1, 2, 3, 5, 6, 8].

On the other hand, collaboration is a process of socializing [7, 11, 12, 20] – an opportunity for collaborating partners to: get to know each other; learn how to work together; and, discover what sort of support one can garner from the other. This occurs with long term as well as short term goals in mind: will the firm continue to work with these people in the future? Good social relations often lead to future client referrals in both directions [4, 12]. Despite this, most of the literature about 3D Collaborative Virtual Environments (CVE's) talk not in terms of its potential outcomes in the design practice, rather they discuss: visualisation issues; real-time, multi-user, 3D interactive virtual environments (VE's) providing a natural, more 'intuitive', user interface – more closely aligned with natural perception; perspectively corrected displays; visual acuity; hardware/software configurations; the difficulty in recognising and manipulating virtual 'objects'; whether to use VR glasses (HMD), a cave, or a desktop PC, and so on [15].

What a CVE offers is the opportunity for participants to enter into a simulated workplace, interact, and collaborate directly on a design project. Despite this, 3D VE's are still largely seen as rapid prototyping tools. VE immersion tools such as: head-mounted display helmets (HMD's); Computer Assisted Virtual Environment (CAVE) typically incorporating a large, back-lit, screen, LCD shutter glasses with position tracker, and a data wand or glove allowing for interaction with the environment; 'Round Table' [17] object substitution using optical projection glasses providing a stereo view of virtual objects overlaid on physical objects; and the more specific CVE devices such as Jung et al's [14] VR Sketchpad and Gross' [13] pattern-recognition software, and so on. Few, if any, of these installations would be found in a typical design practice. However, desktop PC's are common. Hence, rudimentary 3D VE's are accessible.

While many claim that 3D VE's are a key technology in enhancing the real world by providing the tools for its virtual exploration [17], few address the potential transformative outcomes of actively working in and with them. Worldwide, the number of key centres for collaborative research which actively investigate this emerging field is expanding (see Chalmers' MediaLab, Sweden [21]; MIT media lab, USA [22]; CASA, UCL, UK [23]; MiraLab, Switzerland [24]; HitLab, USA [25]; Martin Centre CADLAB, UK [26]; Key Centre for Design Computing and Cognition, Australia [27]; Information Environments Program, Australia [28], among others). To test the efficacy of the various systems developed, ongoing remote collaboration between and within design schools has proven to be an invaluable data source [5, 8, 9].

As part of ongoing research into the efficacy of 3D VE's to provide for collaborative socialization this paper reports on its latest installment. The remote digital design collaboration project described here was

conducted with the Sydney University Key Centre of Design Computing and Cognition (KCDC) and the University of Queensland Information Environments Program (IEP) (Brisbane). Together we collaborated on an online performance of T. S. Eliot's [10] *The Cocktail Party* in a 3D virtual world environment (Active Worlds). Students of design from both Sydney and Brisbane were engaged in a self-directed learning exercise which focussed on using digital media to transform prior understandings about what a 3D virtual environment (VE) can be used for. This paper discusses the pedagogical outcomes of this process for the students from the Brisbane campus. It adopts Guba and Lincoln's [11] constructivist methodology to support its participant-observer reflections. It extends earlier work done from the University of Adelaide Digital Media Masters program that involved a similar remote design collaboration exercise where students showcased their digital animations in the 3D VE. In that project they embedded rich media in deep media in a process of both working in and with the media [see 9].

## The Project

The remote design collaboration project fits within the broader curriculum themes of an introduction to digital technology and a design studio as part of the first year of an undergraduate Multi-Media degree in the school of Information Technology and Electronic Engineering, University of Queensland, Australia. The technological issues revolved around constructing, hosting, and acting in a 3D VE. The studio issues addressed the narratological themes of 1st, 2nd, and 3rd-person narratives and their applicability within an online 3D VE. Eliot's *The Cocktail Party* was chosen because it presents complex yet accessible social interactions in a series of short acts and small spaces which were considered easy to reconstruct within the VE.

77 first-year Bachelor of Multi-Media students in 5 groups of 15-16 members participated at the Brisbane campus with 30 second-year Design Computing students in groups of 6 participating at the Sydney campus. The play was divided into 5 acts which coincided with Eliot's original combination of acts and scenes. Each student brought their own skills and abilities to the group collaboration where the various tasks and roles were negotiated.

## Participant Background

Students came from diverse backgrounds – international students, interstate students, and a range of ages 17-43. For many, English was a second language. Their acculturation to digital media was equally diverse – from extensive 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. Teams in Sydney and Brisbane were able to communicate only via email, chat, and within the Active Worlds (AWs) environment. The reflections expressed in this paper were drawn from my teaching journal, conversations with students, email correspondence between collaborators, chat logs from the AWs environment, and the students' final project reports.

## The Process

First, each group analysed the play. From this they were able to identify all the props, stage settings, actors, roles, interactions, actions and so on for the whole play and for their particular act. Second, tasks and roles were negotiated within the local group and with their remote collaborators. This involved email at first, followed by the transfer of prototype props for insertion into the AWs environment.

Little collaboration takes place without the motive of a deadline, however. Hence, most activity occurred towards the end of the project rather than with early negotiation. Consistent across all groups also was the complaint that communicating via email or chat was inferior to face-to-face or telephone exchange. The fragmented nature of the medium means little detail is included in communiqués, leading to further confusion. (Often detail is left out of communiqués in the vain hope that this would speed the process along. But, as communicating via email – the most extensively used media – is asynchronous, replies are invariably executed in between unrelated tasks which introduce delays of hours or even days). In response to the perceived 'unacceptable' variability and arbitrariness of email communication, remote partners tended instead to work alone – only updating information as a courtesy, if at all.

Despite this apparent *lack* of collaboration, 'formal rehearsals' (when I was present) and the final performance demonstrated a concise level of collaborative understanding of the overall process. The 'phantom' audience in Sydney contributed beforehand by applying their knowledge and skills with the AW's environment and during the performance by adopting an ancillary narrative role – they relayed their visual and textual interpretation of the various acts as they were being performed (see figure 1). (Phantom in the sense that their ghostly presence gave few clues about their 'real' identities. Brisbane participants were reliant on their Sydney partners to upload props onto the AWs server). The pedagogical benefits of this process for the actors and their entourage was immediate and tangible feedback in a rich learning environment, which was also of their own making.



Figure 1. View from the stage. Note the phantom audience in the background.

## The Play

Groups used their interpretations of the play's script to re-construct it [11] in a collaborative VE. Their interpreted re-constructions tended to include elaborate imaginary spaces which borrowed heavily from pre-conceptions about computer game settings. Scripts were prepared in advance in Word, Excel, and Notepad text etc. These 'texts' were then simply cut and pasted into the chat text field of the AWA's interface at the appropriate times (see figure 2).

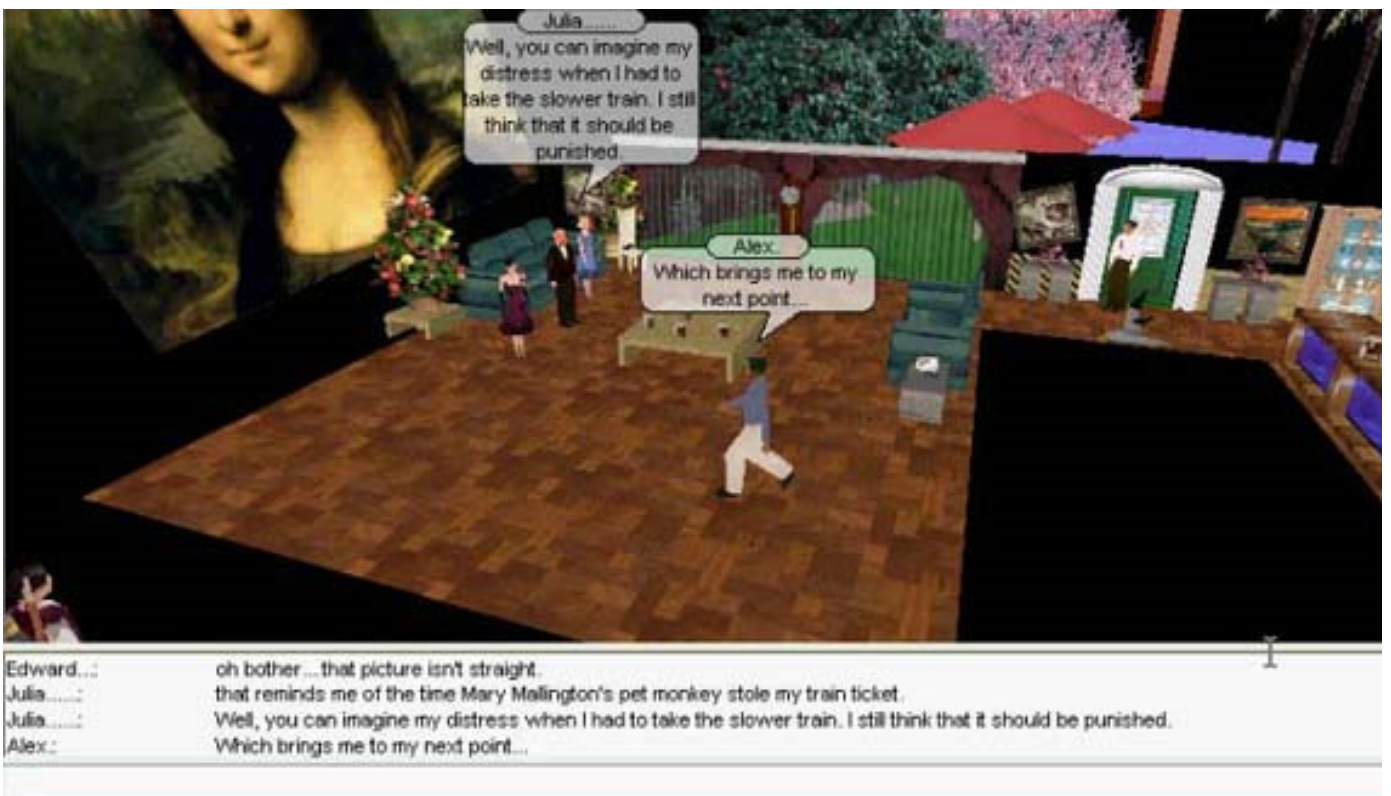


Figure 2. Screen grab from Act 3 T. S. Eliot's *The Cocktail Party* online.

To appeal to a modern audience, contemporisation of the script was used extensively. This included SMS-style text (txt) messaging, chat jargon, and emoticons (see figure 3). This 'txting' was further accentuated by movement about the virtual 'stage' generating a dynamism not ordinarily experienced in a less 'structured' VE encounter. (A less structured VE is one where users interact without purpose, pedagogical or game-play motive – simply navigating an interesting 3D virtual world). At times their recently acquired facility with the technology saw them 'working the audience'. In this way they were

identifying the various 'layers' of reality between: each other in the lab; their agents in the VW; and, the phantom audience in Sydney, who's only identification came via chat messages. Oversized props were used to exaggerate the spatial characteristics of the AWs forum – typical of computer game scaling.

Celia: y do u think u n Lavvy will get back??  
Eddy: \*shrugs\*... i dunno  
Celia: ahhh.. you don't know?  
Eddy: i saw some guy at the party... he told me  
Celia: who?  
Eddy: I don't no who he is. Just some random  
Celia: what!! what did he say?  
Eddy: dunno... stuff I guess. But after talking 2 him I rekon me n lavinia still gotta  
Eddy: chance  
Julia.: Hey u 2. This is all I can do. Anyway lets make a toast.  
Celia: well, what did he say?  
Eddy: ok... to who?  
Julia.: Your aunt of cause! Lol ;-)  
Celia: hmmm.....  
Eddy: uhhh.... sure..o\_0  
Julia.: Well anyway, let's all go out and eat.  
Eddy: \*toasts to fake aunt\*  
Eddy: thanx... but no thanx  
Celia: sure.. i'll meet up with you in a minute  
Julia.: Okies!! Buh bye  
Eddy: ta taa  
Celia: cya

Figure 3. Chat showing contemporisation of play using SMS-style 'txting'.

## Evaluation

According to Bruckman [16] when using digital collaborative software, cultural differences in perception of the technology used and the social and institutional context within which the technology is situated should be foreground. The co-evolution of technology and pedagogy within a CVE should emphasise the social and cultural influences on and of technology. Hence, adopting Guba and Lincoln's [11] constructivist methodology, a series of short questions was asked of each group following their final performances. Their responses were then negotiated as a class in an iterative process until consensus was achieved on agreed meanings. The outcomes of this process indicated that:

- despite the system's fallibility, the opportunity to design virtual spaces, to communicate through text, and motion, to a captive audience, was empowering in ways traditional CAD, video, or animation does not allow. The real-time collaborative interactivity provided for instantaneous (or almost instantaneous) feedback on design moves, in Schon's sense [12] – in this case 'moves' were of a performative/gestural nature (see figure 4). According to Guye-Vuilleme et al [18], gesturing provides for what psychologists [19] call 'non-verbal communication' – tacit communication that occurs without the use of voice, text or signs, such as facial expressions, posture and so on;
- the notion of collaboration, remote or otherwise, was not something that had been broached seriously in their prior education experiences. This exercise was instrumental in transforming the students' ideas about the need for, and potential rewards from, collaborating both within a team and across a time zone;
- through this process students were able to reflect on the transformative outcomes of deconstructing their prior concepts about what a VE could be used for. From this they also constructed a new reality whereby the accepted realisms of a computer game are not necessary to communicate performative design concepts. (Students felt that the AWs environment offered an impoverished, abstract realism when compared to the realisms of high-end computer games such as Quake, Doom, Final Fantasy and so on. But that this did not impede their ability to 'tell their story').

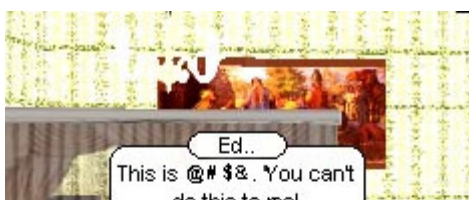




Figure 4. 'Virtual actors' using non-verbal gesturing to compliment the accompanying textual communication.

## Conclusion

Through the vicarious experiences of the students engaged in this exercise we can construct a pedagogy that recognises the need for collaboration (both local and remote). To this end the 3D VE described here provided a vehicle for its exploration.

In broad terms, we can speculate that such a system could be used in a design practice to facilitate remote design collaboration. However, it is not clear that it would support, let alone enhance, the socialization which is a key component of any collaboration. Nevertheless, it could be used as an adjunct to other methods of communication to at least provide for an environment where direct, interactive, and shared, design actions can take place.

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