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Published
2008

Conference Title
TERC 2008 5th Biennial International Conference on Technology Education Research, October 2008, Gold Coast, Australia.

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TECHNOLOGY EDUCATION THROUGH ONLINE VIRTUAL ENVIRONMENTS

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Abstract
Students are engaging with online 3D virtual environments as creative social spaces but virtual environments such as Second Life also provide opportunities to facilitate technology education in a flexible, connected and creative medium. Using a Second Life environment developed for Griffith University this study explored the use of a Second Life virtual environment to support collaborative design and development of virtual objects and found some advantages to the creativity of collaborative designs over designs produced individually within the Second Life virtual environment.

Introduction
Students are engaging with online 3D virtual environments as creative social spaces (Dicky, 2005) but virtual environments are foreign to many educators. Second Life is a popular virtual environment and is being evaluated for its potential in facilitating educational outcomes (Dede et al., 2005). This paper describes the range of educational applications being explored within the Second Life environment and highlights the issues involved in the development and implementation of a virtual environment for Griffith University. The findings of a study into the application of virtual environments to support technology education through collaborative design and development are reported.

Second Life
Second Life is one of several dozen virtual worlds (SLED, 2008a) currently available for use or under development. As a Virtual Learning Environment (VLE), Second Life is being used for a wide variety of educational applications. Current categories include Distance and Flexible Education; Presentations, Panels and Discussions; Training and Skills Development; Self-paced Tutorials; Displays and Exhibits; Immersive Exhibits; Role-plays and Simulations; Data Visualisations and Simulations; Libraries, Art Galleries and Museums; Historical Re-creations and Re-enactments, Living and Immersive Archaeology; Computer Programming; Artificial Intelligence Projects; Artificial Life Projects; Multimedia and Games Design; Art and Music Projects; Literature, Composition and Creative Writing; Theatre and Performance Art; Photo-stories and Photo Scenarios; Machinima; Treasure Hunts and Quests; Virtual Tourism, Cultural Immersion and Cultural Exchange; Language Teaching and Practice, and Language Immersion; Social Science and Anthropological Research; Awareness/Consciousness Raising and Fund Raising; Support and Opportunities for People with Disabilities; Politics, Governance, Civics and Legal Practice; Business, Commerce, Financial Practice and Modelling; Real Estate Practice; Product Design, Prototyping, User-testing and Market Research; Interior Design; Architectural Design and Modelling; and Urban Planning and Design (SLED, 2008b).
GUSL
Development of the Griffith University Second Life (GUSL) environment was focused on supporting a range of educational activities. It was comprised of a virtual island containing lecture facilities and tutorial spaces (Figures 1, 2 and 3). While the Griffith University Second Life (GUSL) environment contained other facilities such as experimental zones, social spaces and a database of links to other Second Life educational locations, this paper focuses on the use of the tutorial spaces in which students completed construction projects. The GUSL environment was developed with the support of an eLearning Fellowship in Semester 1, 2007 and first used for courses in Semester 2, 2007.
Figure 2
GUSL Presentation Space.

Figure 3
GUSL Tutorial Space.
The development of the GUSL environment provided a range of learning and teaching opportunities in a facilitated virtual environment. In order to focus participation within the environment on discussions and learning activities, minimal use was made of traditional building structures beyond that necessary to assist in identifying locations and bounding the purpose of specific locations such as a discussion spaces, presentation spaces, recreation spaces or resource spaces. To provide these boundaries, natural formations such as ridges, plateaus, and canyons were used with bush land foliage providing screens between locations. With the predominant navigation mode within Second Life being to fly between locations, this provided an effective means of participant transition between locations and in establishing the form of interaction that would occur at various locations. It was found however that during initial orientation with the GUSL environment, participants needed additional assistance in learning the location and purpose of each location. This was facilitated by prominent signage and a system of teleportation booths that enabled participants to select from a list of locations and instantaneously move to that location. In addition, participants were provided with Second Life Location Based Links (SLURL) which functioned as a website URL, provided in their course notes they allowed participants to enter the GUSL environment at specified locations.

In order to maximise tutorial time on learning activities directly related to their course, participants were provided with a Second Life account, a pre-generated avatar (3D representation of the participant), and introduced to the basics of movement within the VLE and the mechanics of object construction.

Study
In this study, the Second Life Virtual Learning Environment (VLE) was used to facilitate comparison of individual DDE (Design, Develop, and Evaluate) processes with collaborative DDE processes. The VLE provided a reduced set of variables over a traditional classroom environment in which to explore the processes occurring. Two groups from an undergraduate level course on technology education used the VLE in their studies. One group was tasked with individual DDE projects involving the construction of a virtual chair (Figure 4). The second group was tasked with the same project, but required to work collaboratively (Figure 5) in each stage of the DDE to complete their virtual chair. The participants were randomly selected from within a larger cohort and each group comprised fifteen participants with an equivalent mix of gender, teaching experience, and ICT skill. None of the participants were previously familiar with the Second Life environment.
During a half hour session, participants met synchronously in the VLE and participated in text-based online discussions to support their design process. This proved a challenge for both groups, as it was a requirement that their design was articulated in text before proceeding to development. This was followed by a half hour development session in which participants met synchronously to develop their designs in the VLE. The final half hour session involved showcasing products and completing a process of self and peer evaluation of their products and design and development processes.

Figure 4
Object Construction.

Figure 5
Collaborative Construction.
The Second Life VLE supported recording of textual discussions occurring between group members for the collaborative group and during the evaluative session for both groups. Each contribution was identified by the contributor and time stamped. In addition to a post course survey on perceived effectiveness of the environment to support collaborative DDE, six elements were analysed in the study:

1. Creativity of the final product, as measured by self and peer evaluation;
2. Effectiveness of the DDE process as measured by individual perceptions;
3. Time taken to generate design;
4. Time taken to develop product;
5. Complexity of design (number of primary shapes comprising product); and
6. Similarity of product to design.

Excepting complexity, which was measured in the number of primary shapes comprising the object, and time taken, which was measured in minutes, each measure was against a five-point scale with 5 being the higher response (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>Individuals</th>
<th>Collaborative Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity (1-5)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>DDE Effectiveness (1-5)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Design Time (minutes)</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Development Time (minutes)</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>Complexity (Objects)</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Similarity (1-5)</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Findings
The study suggests that individual participants were able to complete designs and develop products quicker within the VLE than collaborative pairs. This was primarily a result of the difficulties in communicating design concepts and coordinating construction instructions using only text between collaborating pairs. Conversely, the study suggests that collaborative pairs produced more creative designs that had a greater complexity to their structure than individual participants.

The study also found that collaborative pairs were much more likely to follow their design and produce a product similar to that which they had designed. The additional effort involved in producing the design was one factor in which participants reported a greater need to see a return on the time invested in the design phase. In addition, the need to communicate clearly between collaborative pairs in the development phase to coordinate the construction process provided an additional purpose to the design that was not necessarily required from the individual participant. The restricted communication provided by the VLE tended to force participants to make effective use of their designs but also encouraged greater creativity in the need to fully describe their design in text tended to produce more complex and creative designs than the less detailed descriptions developed by individual participants.

Overall, the study found several advantages in the use of a VLE to support understanding of the DDE cycle in technology education. Restrictions in
communication within the VLE provided some advantages in collaborative DDE over individual DDE projects. The VLE provided an effective environment in which participants could quickly produce complex products from primary shapes and do so in a collaborative manner that tended to produce more creative responses than those developed by individuals.

References


