Enriching student experience and inter-professional learning of inclusive design with Second Life

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ABSTRACT: This position paper reflects rapid advances in immersive 2D and 3D eLearning technologies and the expanding pool of ideas and applications in higher education across two professions. Inspiration has been drawn from examples in design learning, and various multidisciplinary collaborative projects through developmental research in Multi-User Virtual Environments (MUVEs). Linden Lab's Second Life (SL) is the most mature and popular of the 'persistent' virtual worlds. The study described in this paper aims to increase the authenticity of student learning through a range of SL simulated 'life experiences' relating to accessibility and mobility in the built environment.

Significantly, the successes of such initiatives lie in several elements: teaching champions with vision and courage; detailed scripting of precise role-play encounters for first-time users to provide supportive 'blended learning' contexts; careful and vigilant strategic management of facilities and resources, and a robust design program. This paper focuses on the crucial alignment of these elements to the specific challenges of designing and navigating conception and development processes, to enable the execution and delivery of a tightly defined script for meaningful and memorable learning outcomes. This innovative pedagogical approach lacks time-tested outcomes, but is recognised equally as opportunity and challenge; risk and reward.

Conference theme: Design Education
Keywords: Student learning experience, Second Life, Design education, Inclusive design

INTRODUCTION

2D and 3D eLearning technologies are increasingly prevalent in educational settings, and the most commonly encountered is Second Life (SL) (New Media Consortium, 2009). Launched in 2003, access continues to be freely available to all web users once the free client software (3D Viewer) is installed and a personalised avatar is registered (selected from a range of names and possible embodiments). An often quoted statistic was that 80% of active internet users and Fortune 500 enterprises would have a presence in some form of virtual world by the end of 2011 (Gartner 2007). Gartner cautions about 'hype', and note that not all of those will access SL, however it is a relatively cost effective platform for entry to 3D virtual experiences by educators. Recognising its potential to offer unique research and teaching opportunities, the creators of SL have specifically invited and encouraged educational institutions to colonise their world (O'Connor & Sakshaug 2008-2009). As a general purpose, 'user-created' virtual world (VW), rather than a game, SL is considered more suitable for education than those set up for gaming and predominantly social networking, as the educators are not required to overlay their own objectives onto existing VW rules (Wagner 2008). Many contend that technology has always influenced teaching and learning, and so this new direction in education is just another stage in the ongoing process of innovative technology enabling greater variety and richness in virtual learning environments (VLEs) (Chang, et al. 2009; Kluge & Riley 2008).

The research informing this paper is funded at Deakin University through an annual competitive funding program: Strategic Teaching and Learning Grants Scheme (STALGS). Current work is being undertaken by a recent strongly forged collaborative alliance with a team of academic staff with expertise in architecture, occupational therapy, equity and diversity, and learning design at Deakin University. The twelve month project titled 'Design 4 Diversity: Enhancing inter-professional learning and the student experience in a cross-faculty setting' involves participation by architecture and occupational therapy students, as well as representatives from relevant national professional bodies and key stake holder groups. The project looks to identify opportunities and learning resources to support the infusion of inter-professional pedagogies for the creation of new models for collaborative learning. The aims include to develop and trial flexible, blended teaching and learning resources, designed to provide rich experiences in inclusive design practice; to explore and identify sustainable opportunities for architecture and occupational therapy students to enhance learning with a framework on inter-professional education and to initiate stakeholder partnerships for the support of ongoing research and work integrated learning opportunities in the area of inclusive design practice.

In focussing on inclusive design, the project team used SL to create two specific virtual learning environment scenarios to offer confronting accessibility challenges for people with specific mobility issues. The provision of virtual and authentic experiences is expected to enhance and enrich the development of well integrated professional skills, in the area of socially inclusiveness and equity of access that we refer to as 'Design for Diversity'. This paper will briefly examine SL in education, precedents in architecture/design education and multidisciplinary collaborative projects, along with research and development in virtual worlds. The reasons for focussing on the universally
relevant topic of inclusive design and the rationale for the constructivist approach in design education are explained within the context of this examination. Accounts detailing the experiences and research intentions for multidisciplinary use of SL in higher education from precedence are particularly illuminative of its rarity and developmental status. A description of the process of scripting two specific learning scenarios for use in the Design for Diversity inter-professional learning project is provided along with the challenges experienced. The paper will conclude with a discussion of the opportunities, challenges, risks and rewards of this technology in the service of architecture / design education, and potential for future developments.

1. SL IN EDUCATION AND PRECEDENTS IN ARCHITECTURE/DESIGN EDUCATION

Research and published accounts of SL in education have grown exponentially over the past two years. Linden Lab directed extensive assistance to the education community, providing resources and reduced fees for land (often island) purchase and maintenance to ensure that the education market was central to its business. This included efforts via the teen grid to attract elementary and secondary education providers. The kind and number of educational institutions active ‘in world’ can only be estimated, because identifiable client information is not available. However, Linden Lab’s list serv for the SL educational community includes hundreds of educational institutions. A wiki also lists a number of identified users from education sectors (Second Life Education Wiki, 2010), as does the New Media Consortium (NMC) who estimated that more than 1,200 educational islands were created in the year 2007 (NMC Virtual Worlds Announces, 2008). The medium has now reached a stage of development that supports detailed and sustainable activities, including serious research. At Deakin University, four islands have been purchased and merged as a single land mass, beginning with one piloted for Collaborative Arts Education in 2007. Other investigations and discipline curriculum developments have been conducted by Criminology and Nursing.

Gu, et.al (2009) have rationalised how constructivist learning approaches are essential to design education. They present compelling evidence drawn from combined educational theories derived from ongoing technology and applied sciences, that served the various design disciplines since the early 20th century. In design education students essentially learn to construct their own understanding and knowledge through experiential learning, problem solving and reflection. 21st century has shown how 3D innovative technology facilitates these learning activities and also creates the constructivist learning environment. The historical reliance of the constructivist approach and precedent examples suggests SL to be a challenging yet ideal context for design learning.

A collaborative design studio involving architecture students in University of Newcastle, Australia and Rangsit University, Thailand utilised SL to explore the concept of virtual homes and the space for the implementation of a design outcome (Gu et al. 2009). Advantages identified included the ability to view objects in multiple perspectives, the ability to personalise environments and the possibility of giving studio access to students disadvantaged by distance or mobility issues. The exploration of 3D worlds as a newly emerged design discipline, with students participating in the design process from a very early stage due to SL’s modelling interface provided many opportunities for collaboration. The authors found monitoring this work could be challenging and students found the lack of face to face meetings a challenge. They recommend the formulation of clear goals and objectives, and an awareness of the challenge of learning both new skills and a new technology at the same time.

A survey report by Kirriemuir (2009) made reference to a unit called ‘Virtual Worlds for Design’ offered at the University of Strathclyde in the United Kingdom. Using SL as a design environment, students collaborated on group projects, which have included virtual student unions, studio spaces and exhibition buildings. This subject appears to be the culmination of a long period of development and investment by this institution, beginning with the construction of the Clyde Virtual Design Studio in the late 1990s (Whittington 2000). The University of Strathclyde have also explored virtual environments as collaborative environments for design in partnership with industry (Ehsani and Chase 2009), finding that SL gives the opportunity for enhanced testing by and feedback from users. Four models of architectural collaboration are proposed, highlighting the mediums ability to facilitate this aspect of the design process. This approach to the use of SL in architecture / design education also highlights the need for it to be relevant to and integrated with the workplace in which the students will eventually practice.

2. MULTIDISCIPLINARY COLLABORATIVE PROJECTS AND DEVELOPMENTAL RESEARCH IN IMMERSIVE VIRTUAL WORLDS (IVWS)

This multidisciplinary team delivering the project on which this paper is based provides multiple perspectives to compliment the inter-professional learning intent of the study. The experiences and research intentions of multidisciplinary uses of SL in higher education and their particular challenges demonstrate the developmental status of such collaborations. Notably, evidence around inter-professional collaboration in health, far outweighed that involving architecture / design learning explorations.

Jarmon et al. (2009) evaluated the use of SL in multidisciplinary education involving communication and architecture students working on a social housing project. This project used the experiential learning theory of Kolb to frame their research and mixed methods of data collection and analysis. It was found that the affordances offered by SL in providing opportunity for real life applications, in a manner which encouraged active participation in learning promoted a real sense of presence, yet highlighted the need for relevance to real life to promote meaningfulness and transferability.
Dong (2010) described a series of three pilot studies, initiated by informal discussions amongst educators about some of the challenges of teaching inclusive design in the undergraduate settings. The second pilot study is particularly relevant to the current project as it involved collaboration with occupational therapy students. Project DOT (Design + OT) was rolled out in 2009 using 110 first year design students and 8 first year occupational therapy students. The occupational therapy students were attached to design groups, and their role appears to have been to fill the gap in the design student’s knowledge on disability and functional performance. Recommendations from this project include careful planning and coordination of interdisciplinary collaboration, development of case studies describing successful projects, working directly with users, using real-life design briefs and the integration of inclusive design throughout a course instead of as a stand alone unit.

3. BRINGING UNIVERSAL/INCLUSIVE DESIGN TO THE FOREFRONT

Inclusive design (also known as universal design) is a multidisciplinary concept which alludes to designs which cater for specific populations, but also be of benefit to all in the community (Keates and Clarkson 2003). It has come to prominence in recent decades across a number of fields, in response to a number of drivers and motivators. The aging of the Australian population (Australian Bureau of Statistics 2009) and the increased presence of people with disabilities in the community following deinstitutionalisation (Australian Institute of Health and Welfare 2008) have led to the Federal Government’s launch of National Disability Strategy, which aims to address barriers to participation for people with disability and promote social inclusion. The aspirational target for all new homes to be built to disability-friendly Liveable Housing Design standards by 2020 (Shorten 2010) remains a voluntary initiative, yet is the next step in codifying inclusive design in built environment practice. In addition, the Australian Government has committed to the introduction of Disability Access to Premises - Buildings Standards designed to codify the rights to access protected by the Disability Discrimination Act (Commonwealth of Australia 1992, 2010).

Given these drivers, inclusive design is a key philosophy to instil in the future generation of architects. It is a practice which will become increasingly prevalent, even if they do not specialise in ‘disability’ design. There is a clear need to incorporate some ‘lived experience’ into their learning around inclusive design, to ensure both its relevance and transferability to practice.

4. INTER-PROFESSIONAL LEARNING: ARCHITECTURE AND OCCUPATIONAL THERAPY

Inclusive design is an area of commonality between occupational therapy and architecture, as the needs of individuals with disabilities must integrate with the needs of the built environment. There is a perception that inclusive design is simply ‘good’ design, but the notion of designs which cater for specific populations suggests a need to know the user group for whom you are designing.

Occupational therapy (OT) is a client-centred health profession, whose primary goal is to enable people to fully participate in the activities of daily living (WFOT 2010). Deakin University OT students learn about architectural drawing and environmental design in the third year of their course, to assist in making recommendations around primarily home modifications. When considering the potential negative impact of the built environment on participation for people with a range of conditions (temporary and permanent), many students commented that there should be greater collaboration with architects as part of the multidisciplinary approach. Both Architecture and OT have both been located at the Waterfront Campus of Deakin University for some years, but there was no history of shared projects or programs between the departments. A shared interest in optimal environmental design is at the basis of the current project, along with developing knowledge of each professions unique perspective on this topic.

Both departments have strong cultures supporting high quality teaching and learning, with a concurrent commitment to innovation in this area. In addition, Deakin University specifies a series of graduate attributes, which it expects from all its students regardless of their studies. These include contributing and formulating new knowledge, understanding a variety of contexts and awareness of social responsibilities. The most relevant skills which will be developed include creative thinking, effective communication, working effectively as part of a team and applying existing knowledge to new situations. Support for this inter-professional initiative therefore comes from philosophical, practice and organisational sources.

4.1 Enhancement of intended learning outcomes from the use of SL in inter-professional setting

Whilst the overall project adopted a total of six shared intended learning outcomes across both professions, those around the use of SL in the inter-professional setting was regarded to primarily enhance the constructivist learning approach and the inter-professional aspect through “in world” collaborative interaction of a first year architecture student partnered with a third year OT students. The shared intended learning outcomes for the Design for Diversity project included:

- Describe the Principles of Universal Design
- Describe the factors that influence individuals’ participation within the community from the perspective of the ICF
- Demonstrate evidence of universal / inclusive design thinking in a design solution in the built environment
- Critique a design solution from the perspective of universal / inclusive design
- Communicate professional expertise / role within an inter-professional environment
- Demonstrate basic architectural drawing skills

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5. CREATION OF SL LEARNING SCENARIOS: OPPORTUNITY AND CHALLENGE - RISK AND REWARD.

The four Deakin islands are managed as a single ‘estate’ under one avatar account with Linden Lab (as shown in Fig. 1). The estate/island owner variously manages access/building and other rights on the islands, with the land on islands ‘parcelled’ to control scripting behaviours and avatar access. Avatars join ‘groups’ and groups are managed for access and rights. At various levels access is managed, including switching on/off public access to any or all islands. Deakin’s Islands operate in private access mode at most times.

Figure 1 – Deakin University Presence in SL

These factors provide the confidence required by Information Technology and other central groups in the university context, however funding and staffing for the smooth management of an estate is not yet established. These purchases enabled an opportunity to construct a ‘purpose built’ environment, but (as with many other resources in SL) require financial resources. While the possibilities of education in SL are endless, the realities are largely influenced by the budgetary and staffing allocations of the institution.

5.1 Scripting of Two Simulated Navigation Scenarios: Urban setting (Deakin Laneways) and internal building setting (Conference Centre)

Two main environments were designed for the students to explore. The first (on existing land) was Deakin Laneways – a simulated urban setting. This environment derives from an existing pilot project developed for avatar orientation and familiarity. While this enabled its rapid development, the original purpose of the space was different and this made some aspects of this scenario challenging. Some of the effects used to achieve the look and feel of the environment were found to detract from the architectural and physical realism of the space. The students’ task in this environment was to locate a coffee shop and buy something to eat and drink while using a mobility scooter. The second (on new land) was a conference centre. This was also ‘pre-built’ to an extent, as it began as a ‘themed island’ offered by Linden Lab in 2009 to rapidly deploy usable space in SL. However, in this case it was a real advantage for the project team who had a 12 month timeline which included piloting and evaluation. The team found that the ‘contemporary theme’ of the architecture associated with this pre-built island provided exactly what was required to illustrate examples of poorly designed buildings from a universal design perspective (i.e. steep ramps, no lifts etc). The students’ task in this environment was to enter one building to attend a meeting, and then adjourn to another (on the roof-top garden) for lunch using a powered wheelchair. Participants in other aspects of this project had commented that inclusive design is currently best represented in environments where people with disabilities are ‘expected’ (i.e. hospitals), so this second scenario challenges this.

Both the environments and the tasks within them have to be ‘scripted’ – written in a way which the computer understands and can translate to actions in SL. The ‘behaviours’ of objects and processes, including the interactive objects such as an automatic door, lift, or vehicle, require the programming language ‘Linden Scripting Language’ (LSL). For example, scripting enables virtual screens to play PowerPoint presentations, virtual radios to play music, doors to open when you click them, a lift arrive when you ‘call it’ and street lights to switch on automatically at night. Being able to write scripts provides the means to deliver the immersive experiences that simulate a range of real-world behaviour and events. A range of simple scripts may be available for copying or can be easily learned, however design tasks, such as creating powered wheelchairs with reasonably realistic motion, controls and sound, require the skills of an expert developer. For this project, these skills were provided by SL builders based in Europe contracted to the project by an Australian production company that specialises in interactive content.
5.2 Support and resources
The three main areas of support / resources required for this project have been computer technology, education / learning design and interaction and graphic design. The computer technology was provided locally in the school or centrally by the university. The main tasks were to 1) install and maintain the current SL client viewer on the staff and student computers, 2) provide university computers which are at or above the minimum specifications for SL, 3) provide secure access to the external SL servers through the university firewall without reducing its functionality 4) potentially fund the purchase and maintenance of SL islands on Linden Lab servers and 5) providing service agreements guaranteeing the continuing of service and support for the required computing environment.

Education / learning design support was provided locally in the school or faculty and centrally by the university. The main tasks were to 1) advise on the current theory and models of simulation design, 2) advise on the current features and applications of 3D and how it works to achieve educational goals, 3) provide demonstrations and prototypes of possible design solutions, 4) assist in creating blended learning environments employing 3D worlds for pedagogically well grounded purposes and 5) liaise between the academic teachers and 3D builders or project managers who work directly with the technical developers of graphics, AV media and game-like interactivity.

Some Deakin Branding via graphic design support was provided centrally by the university, but most building tasks have been carried out by the commercial service provider. The main tasks were 1) terrafort ‘virgin’ islands (four types of a standard size) which are available from Linden Lab, 2) construct buildings, 3) render surface textures, 4) create 3D objects found in the natural and built environment, 5) create communication media and script textural communications in-world, 6) create interactivity and 7) create navigation aids.

5.3 Champions
The breaking of new ground can be exhilarating, but the multiple (often unforeseen) challenges which arise where experience cannot lead the way can seem insurmountable. The need for ‘champions’ has been identified in research around inter-professional education (Pirrie et al. 1999) and inclusive design education (Tahkokallio & Koivusilta 2004). A strong commitment to the underlying philosophy of the project along with enthusiasm and motivation are crucial elements for the success of innovations. This project has been fortunate to have collected a research team full of such characters, committed, dedicated and passionate about the use of SL in design education, and prepared to take it where it needs to go.

5.4 Set up and Development
Specifications were communicated to the project manager and not to the builders directly, so rather than working interactively ‘in world’ requirements were conveyed in word .docs, Power point sequences, and photo galleries as the build progressed. The visual and interactive nature of the project leads to particular requirements in the technical communications (about visualization, behavior and educational intent) to the project manager and builders. An important factor concerning specifically the creation and ownership of builds in Second Life, is the management of IP and the transfer of IP to individuals and SL groups. While many everyday objects such as clothing, furniture, vehicles and even whole buildings with sophisticated scripting may be purchased or made available freely, the ownership, access and modification of such things needs to be carefully considered. The structure of permissions to build things and their location in-world must be carefully considered.

5.5 Challenges

5.5.1 Building issues
- Selecting 2 representative mobility vehicles (the 4 wheeled scooter and the 2+4 wheeled powered wheelchair);
- Creating these with adequate identifiable features (to scale) to be associated with the real thing;
- Creating plausible realistic motion and sound associated with the vehicles;
- Creating plausible realistic interactions between the avatar in a mobility vehicle and with the landscape and the built environment;
- modifying the existing environment within the time and budget, rather than building from scratch.

5.5.2 Lack of familiarity and lead time issues
Sufficient time in the project is required for the project team to become familiar and confident with the scenarios and their scripted behaviour, and for pilot testing by students, before conducting the learning event. It is important to note that for this project, the inadequacy of a range of supports and the newness of the experience for teaching staff in part led to our approach with the two role-play scenarios. For architecture students in a range of circumstances, it would be appropriate for them to experience richly diverse SL environments before being charged with the task of designing, if not building, their own environments and simulations. A rich variety of built environments exist in SL, but the lead time was not available to prepare students for accessing these to achieve the project goals. The decision was taken to ensure students were able to experience the two scripted scenarios.

As SL is a persistent (365 day and night) real-time MUVE environment, there are great benefits associated with national and international collaboration to maximise the ‘occupancy rates’ of sophisticated and at this stage expensive builds for tertiary education. Large universities and organisations are able to create and share their environments and already in the cases or islands for disability, help, orientation etc. there are excellent examples of collaboration and sharing. The challenges encountered by the team were largely attributed to lack of previous evidence on which to base their program, difficulties finding common times and venues to meet in amongst their
other duties, different ‘professional languages’ which were mutually difficult to decipher at times and general lack of familiarity with virtual worlds in general and SL in particular.

5.5.3 Communication issues
Trial test drives were scheduled to align to the various stages of the scenario builds. With each test drive session, a list of amendments and changes were compiled to then be sent back to the project manager and then on to the builders to comply or respond to. Despite the frequent meetings in-world, conversations about the build and reiterations of the teaching and learning project aims of achieving a realistic simulated learning environment that could offer students the opportunity of an experiential learning to do with human mobility and accessibility, there were times when the lack of educational insight on the behalf of the project managers and the builders presented challenges.

5.5.4 Known SL design flaws
A known SL 1.0 design flaw is that a visual object size does not match physical size. When two physical objects are stacked in Second Life 1.x, they do not stack edge-to-edge as in the real world. Instead there is a wide empty gap between them of about 0.100 munges. This is a result of the physical size of an object (its “collision volume”) being larger than its actual visual appearance. Often this sizing error is not immediately obvious. Most users of the virtual environment have poor depth perception due to lack of common use of 3D stereoscopic displays. Consequently when a physical cube is resting on the ground is viewed at an angle from above, it looks more or less correct. It is only when the camera is moved close to the ground to see the bottom edge of the cube at ground height that the sizing error becomes directly visible. The avatar is also a physical object and consequently does not actually stand on the ground but stands about 0.100 munges above it. A number of hacks have been implemented in the client so that a sizing error becomes directly visible. The avatar is also a physical object and consequently does not actually stand on the ground but stands about 0.100 munges above it. A number of hacks have been implemented in the client so that the avatar’s feet will seem to be firmly on the ground even if they really are not. Correction of this flaw is expected.

Thus issues with scale and ramp gradients within the scenarios have provided cause for reflection on the fidelity of the simulation, particularly regarding the relative scales and the aspect of reality via this mode. Whilst a policy summary exists on street furniture and footpaths, the crux of the constellation is the integration of the new elements conceived and created for the purpose of this inter-professional project into the existing shells or buildings that provide the wider built environment. In this situation, the original specifications regarding the two built settings which formed the environment were not fully known.

5.6 Delivery, implementation and execution
Delivery of the SL component of the project is through a one day intensive interactive workshop scheduled in Week 9 of the teaching trimester. This workshop involves 25 students from each discipline, and includes elements of face to face teaching supported and complemented by the scenarios created in the Deakin University SL precinct. It involves a first year architecture design unit and a third year OT unit. While the architecture students are therefore at a ‘novice’ stage of development, the occupational therapy students are on the brink of commencement in practice. Students from each cohort are to be partnered with a peer from the other. Precise instructions and explanations of the aims and outcomes towards the SL navigation of the two scripted scenarios will be contained in a D4D SL workshop brief, and made available to students one week in advance. Basic technological information including self help guides and hands on tutor help as well as technical staff assistance will be provided.

As demonstrated in Fig. 2, there are a number of methods being implemented concurrently in this project to promote collaborative learning on this topic between the two cohorts of students including shared teaching, shared learning resources and shared interactive engagement through formal curriculum activities integrated within their coursework throughout the entire trimester (12 weeks duration).

**Figure 2 – Teaching and Learning Structure**

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5.7 Evaluation and discussion
SL can be used for many conceivable purposes related to reality or unreality, so when designing to meet specific educational goals specifically through role-play simulation, the interactive scenarios must be tested. A goal of the D4D project is to evaluate the technical and educational potential of SL to deliver authentic (not necessarily with high fidelity realism), valid and reliable experiences to meet learning objectives dealing with changing not only the knowledge and skills of students, but their lasting levels of values in relation to the ethical and legal design for diversity. The opportunities afforded by using SL in this manner are many and varied. Advantages which are also shared with other e-learning technologies include reducing the impact of geographical distance (Salmon 2009) and convenience in scheduling (Savin-Baden 2008). It also provides an opportunity to simulate activities and locations which would be too expensive or too risky to re-create in real life (Chittaro & Ranon 2007). However, there are also a number of challenges which need to be considered and overcome for SL to be successfully applied to design education.

Some students who are used to gaming will view it as a similar experience and expect it to behave as such, while others who are new to 3D environments may become overwhelmed. The potentially rich and complex features in the 3D environment such as synchronous conversations and sounds, media streamed to screens and objects and simulated working models can also overload the user and/or the technical capabilities of their computer or internet connection. Due to the open nature of SL, unsupervised/unregulated environments being used for valid and authentic learning may be disrupted by the general public if they occur in public spaces.

The SL environment also gives students instant feedback on their performance (Jarmon, et al. 2009), enhancing their ability to learn from experience. It enables rich communication and interaction, which is experienced as authentic and relatively natural. This feature links both individuals and a range of resources, and can promote a sense of community and shared presence, in this case a common experience of problem solving in an unfamiliar situation. However, SL can be very seductive in its immersive qualities, and there is always the risk that students may become distracted from their learning tasks. If insufficient boundaries and security are instituted, there is also the possibility of the learning experience being ‘gatecrashed’ by other unwanted visitors with resulting unintended consequences.

Dreher et al. (2009) refers to Generation Y as ‘digital natives’ as the first generation to have been exposed to these technologies in childhood. Their while contested, it is claimed that their learning style is characterised as neo-millennial which features fluency in multiple media, communal learning, balance between experience / mentoring / reflection and personalisation to individual needs and preferences. All of these features could be said to reside in the current programs scripted experiences, making it particularly suited to the current generation of undergraduate students. This promotes student engagement, but the teaching staffs are of a different generation and potentially have to negotiate much steeper learning curves. There is a danger the teaching staff may express their apprehension by over simplifying and regulating the environment, thereby reducing the very benefits it was designed to provide. This factor has to be considered when designing learning opportunities in SL, as the teachers need to be relatively comfortable with the medium before being able to successfully utilise it.

CONCLUSION
As highlighted by the experience of this study team and supported by examination of existing research, we can assert that SL has clear demonstrable value as a medium for inter-professional design education. There are few precedents for its use to date, so this project is sited right on the cutting edge of developments in this field. By providing OT and architecture students with collaborative experiential learning opportunities in a rich, immersive environment, they can be expected to develop deeper and lasting levels of inclusive design learning which are sustained into multidisciplinary practice. While not available at the time of writing, preliminary evaluative results will be presented at the conference demonstrating the outcomes of this project. Though the challenges highlighted are many and confronting in nature, there is a lot to like about these exciting technological innovations in learning environments, methods and deliveries.

From this study, it is intended that SL will continue to form a component of inclusive design teaching in the architecture curriculum going forward. At some point it will be good to invite other schools, divisions and programs in Deakin to use the D4D scenarios for the goals of education in diversity, inclusivity and universal design. Collaboration externally will benefit all. Staff will need to become familiar with what is already freely available in-world and consider its educational potential. While we currently rely on commercial building services, we must build capacity in house and collectively across the sector. It naturally follows that courses in multimedia, graphic design, interaction design, game design, architecture and computing have reasons to involve their advanced students in the creation of participative design projects. The experience has further created far reaching flow on opportunities and potential reward for both students and professional academic staff. One immediate outcome is the attraction of interest from postgraduate students to pursue research in this area. There are several avenues with which to grow education and professional knowledge along with understanding, experience and expertise. OT and architecture teaching staff are now collaborating at many levels to enrich curricula and share teaching practise where there was previously little contact and non-existent dialogue.

Lofty and mighty are the aspirations to advance the social sustainability agenda of a fragile world through the concept of a virtual parallel universe, yet the endeavour, aimed at improving quality and sustaining human life, remains a totally human one.
ACKNOWLEDGEMENT

This paper acknowledges the current research of a 2010 Deakin University Strategic Teaching and Learning Grant Scheme (STALGS) titled “Design 4 Diversity: Enhancing inter-professional learning for architecture and occupational therapy students. The authors acknowledge the input of the Deakin University D4D research team, participants and technical and administrative support of the School of Architecture and Building, the School of Health and Social Development, Knowledge Media Division, Institute of Teaching and Learning, the Division of Equity and Diversity and the contribution of Mr. Terry Osborn, Architect/Access Consultant, Facilities Management Services Division.

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