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Sustaining the future through virtual worlds

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Virtual worlds continue to be used in Australia and New Zealand higher education institutions although the hype has settled. Whilst some higher education institutions continue to use virtual worlds as they have done for some time, other institutions are trialing different virtual worlds and some are opting out altogether. An overview of how 46 authors from 28 institutions see virtual worlds as an opportunity to sustain the future of higher education is presented. The positives and negatives of using virtual worlds are discussed.

Keywords: virtual worlds, Virtual Worlds Working Group, VWWG, *Second Life*, *SL*, *OpenSim*

Introduction and background

As we race through the 21st century, education will become even more global and 24/7 (24 hours a day, 7 days a week) than it is currently. Coupling this expansion with educational resources being further stretched by increasing numbers of students, fewer staff and less support, the provision of quality education seems to be becoming unsustainable (Gregory & Gregory, 2011). The pressures on staff are enormous and the workplaces

our graduates are likely to enter are becoming more complex with increasingly advanced technology and processes. Finding new ways for students to engage with and link to a learning community is necessary. As the fidelity of 3D virtual worlds (VWs) increases and more students opt to learn online, VWs can provide rich experiences for learners as places in which students and staff can interact with each other and the wider community (Brenner, 2009). By enabling virtual embodiment, VWs have the capacity to facilitate a sense of belonging that is not always available in other ways for students scattered across diverse geographical locations (Gregory & Tynan, 2009). The social immersion engendered by a sense of community provides the potential to reduce dropout rates so that more students will persevere with their studies. Access to learning that may be too costly or too dangerous in the physical world can be made possible through VWs (Thackray, Good and Howland, 2010; Savin-Baden, 2011). They can enable those activities which can make life and learning meaningful, such as getting together, sharing information, collaborating and celebrating (Gregory & Tynan, 2009). In this paper, the Australian and New Zealand (NZ) Virtual Worlds Working Group (VWWG) members demonstrate how VWs can be used to sustain the future of education.

Figure 1: Virtual Worlds Working Group meeting

In 2010, 21 members of the VWWG published an ASCILITE paper outlining ways in which they were transforming the future through VWs (Gregory et al., 2010). Follow on papers in 2011 saw a total of 69 members of the VWWG continue their story through two ASCILITE publications (Gregory et al., 2011 and Hearns et al., 2011). These papers presented reflections on how Australian and NZ higher education institutions are sustaining the future through the use of VWs. They also focused on how ACCESS (assessment, collaboration, communication, engagement, stepping-stones and simulation) came into play with VWs and these themes are still relevant today. The overall focus of this paper is on sustainability. There have been dramatic changes in the ways in which institutions are using VWs in Australia and NZ, as outlined in their stories here.

How are the VWWG institutions using virtual worlds in education?

Discussed are 28 institutions and how they are using VWs at their institution. This provides a background context to members of the VWWG.

Figure 2: Students gathering for info session

University of New England (UNE)
VWs have been used at UNE since 2008. Over 500 students in the School of Education have used Australis 4 Learning in *Second Life* (*SL)* for virtual tours, role-plays, virtual guests, experimentation, discussions and reflection. *SL* is being used to research assessment strategies to aid in professional experience preparation. Six classrooms were created with a number of child avatars for synchronous classroom role-plays. Machinima (in-world video) has been created for assessment. Given the shortage of professional placements in schools and limits on practice for off-campus students, this mode of preparation will be sustainable for the future and may ultimately provide preliminary placements. Bots (non-player characters) are being created for asynchronous use. The School of Science and Technology and the School of Health use machinima of typical counselling scenarios in social work and pharmacy to develop scenarios with multiple endings for students to critically review examples, stimulate discussion and reflection.

James Cook University (JCU)
An OpenSim tropical setting is in development for teaching public health through an inter-professional group of over 500 students across the health faculty. Interactive posters and bots produced by students will be used in a South Africa based project to provide health information for children and for use in a Public Health Resource Centre. A project in the developmental stages in Information Technology (IT) looks at the use of VW technology, however it has yet to be fully realised and implemented. The Virtual Classroom project uses VWs, combined with screen casting technology to allow students to share their computer screen with their lecturer within a virtual classroom setting, enabling interaction between students from other campuses. This gives the students the feeling of 'presence' within the classroom demonstrating their work to both their lecturer and peers. VWs

Figure 3: JCU & UniSA squatter camps

Figure 4: Virtual Careers Fair

are of special interest at JCU due to the remote locations of some students and placements.

University of Southern Queensland (USQ)
USQ has two islands in *SL*. The first is for activities and events including a virtual careers fair, student interviews for use in teaching the microskills of counselling, social marketing campaigns of Public Relations students, meetings for German language students to practice conversational skills, the Encke Virtual University Collaboration and virtual courtroom trials for criminal law students. Another island, RejuveNation, is used for education students to measure how effectively virtual environments can be restored as compared to natural environments and to trial a bot designed to answer basic questions about their study.

Deakin University (Deakin)
Deakin Island comprises four separate islands in *SL* housing both active and inactive scenarios. These include a crime prevention simulation of a decayed urban environment to provide students with insights into how the design of urban spaces can be used to understand the dynamics of criminal activity. The Arts education centre hosts assessed portfolio exhibitions curated by students in a virtual art gallery. On campus and distance art education students meet regularly in a virtual studio for tutorials and scenario based art learning experiences with Music, Dance and Drama studios used less frequently. Deakin Island also hosts the Physical TV Company production "Thursdays Fictions", a surreal dance fantasy where the user is given the opportunity to become one of the characters in the story. Deakinopolis comprises live sims used in the medical discipline area as a portal to *SL* case studies and scenarios with further development of a virtual suburb set in a low socio economic area to provide context for health sciences students working in communities.


Figure 5: Laneways

The University of Queensland (UQ)
The UQ Religion Bazaar island in *SL* will be de-commissioned in August 2012. It is now used as an orientation area for students in languages and educational technology classes prior to virtual field trips to other islands for the purposes of evaluating the affordances of various technologies for language learning in the context of different pedagogical and second language acquisition theories. Pharmatopia, now moved to *Unity3D*, is hosted by Monash University in which UQ's contribution is a virtual compounding dispensary that was created to help students practise pharmaceutical calculations. The former *SL* version is still available online but is no longer used for teaching. The *SL* component of the Transforming Assessment project (Crisp, Hillier & Joarder, 2010) has been transferred to an off-line *OpenSim* housed at UQ. There are plans to place this online as downloadable *OpenSim* Archive (OAR) files containing e-assessment examples for use in Professional Development (PD) for academics.

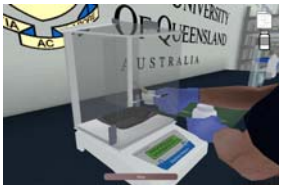

Figure 6: Pharmacy

Canberra Institute of Technology (CIT) and University of Canberra (UC)
CIT have been using VWs since 2007 for students to practise skills including communication and following procedures effectively. CIT and UC set up a Great Health Challenge in *SL* (Private Island) to promote inter-disciplinary learning and skill development via a scenario focused on an elderly lady being admitted to hospital. The challenge supports learning how to develop a sustainable health plan. CIT have been using *Unity3D* for OH &S training. This is an asynchronous single user activity where students have to find and fix 10 hazards in a room designed to simulate their area of training, e.g. gym, hospital room etc. Success now sees CIT working with UC to develop an IV medication scenario to minimise incorrect medications being given to patients.


Figure 7: IV Medication

Macquarie University (Macquarie)
VWs are used to demonstrate the potential for learning and teaching pre-service teachers in Education via visits to sites within *SL* and paired work to create a VW learning design that could be used with their own students. Another group was asked to solve a geometric problem (Soma Cube) within *SL*. These activities are to provide pre-service teachers with an opportunity to acquire technical skills and to inspire design possibilities for enhancing learning. Other projects include an *OpenSim* region for primary and secondary school students and plans to virtualise all Macquarie University museum spaces for enhanced accessibility and interaction.


Figure 8: Omosa field trip

University of Ballarat (UB)

The UB Island in *SL* includes information about the University; a purpose built Emergency Room simulation with six scenarios for the School of Health Sciences to initiate nursing students into the environmental aspects of operating in a team; a Virtual Stuttering Support Centre that provides a variety of simulations and support services to those with speech disorders open to any *SL* user; and a virtual art gallery housing current art works by UB academics. The Island provides a facility for educators to experiment with the use of simulation learning in a virtual environment and is supported by staff and student project groups who build requested simulations. IT students are able to learn about virtual environments from both an education and computing point of view whilst providing services for 'clients' as part of their capstone student project. The UB Island hosted a Virtual Open Day in 2009 and continues to provide learning activities to students in a variety of subject areas whilst enabling academics and others to experience the benefits of simulation learning.

Queensland University of Technology (QUT)
QUT Island is a closed sim in *SL* used by QUT staff and students with few permanent structures other than a community plaza and auditorium. The island is predominantly used as a film set for the creation of machinima used in Law that depict legal practice scenarios (Butler, 2012). Students in the School of Design created a virtual space station and environmental landscape area, while Business conduct virtual field trips to explore consumer psychology and brand return on investment issues. *OpenSim* VWs are used to teach Game AI and a postgraduate nursing course at Austin Hospital in Melbourne, to teach students proper ICU handover processes by simulating physical and informational components of the Austin ICU environment.


Figure 9: Law machinima

Manukau Institute of Technology (Manukau)
The SLENZ Foundation build on the *SL* island of Kowhai (owned by NMIT) is used for interviewing and language studies by students from both institutions. The build includes: holodeck (scene changer) used as a clothing store; runway for modeling outfits for student discussion; demonstration interview room and media room. Interview rooms include a general room; pathway rooms (nursing, policing, teaching); rooms representative of real companies in the Auckland area and a whānau room designed for Māori and Pacific Island cultures. A job board houses advertisements for real jobs and a Stairway of Learning provides information on interviews and interview preparation. Resources developed by other organisations in *SL* are used such as: the Danish Visions area for communications students; the Red Mesa sim for pre-degree Māori nursing students engaged in literacy enhancement; while students investigating water quality can view a presentation by an Earth Sciences teacher and expert in water purification from New York.


Figure 10: SLENZ Project

University of South Australia (UniSA)
UniSA's Career Services is using an *OpenSim* VW to help students identify and articulate the employability skills of communication, teamwork and problem solving via a series of scenarios in which the student's avatar interacts with groups of chatbots (simulating a conversation using audio or text) in panel interview and staff meeting situations. The scenarios are game-like, encouraging students to improve their score each time they re-enter by updating their approach or knowledge via online resources and collaboration with peers. Development of the scenarios has been informed by feedback from students, academics and employers.

University of Western Australia (UWA)
UWA has four sims set up in a cluster. This allows for UWA to use an amphitheatre capable of hosting approximately 200 avatars. Activities carried on the sims are Art, Teaching, Visualisation Research, machinima and Architecture. Teaching and learning activities carried out are primarily focused on Marketing and Business.


Figure 11: Simulation

Southern Cross University (SCU)
SCU Interaction Island in *SL* was launched in 2009 with Commerce Town added in 2010 to support teaching scenarios in Commerce and Management, Law and Justice, Hospitality and Tourism and Education. Realistically constructed buildings represent a range of business premises which facilitates role-playing and teaching scenarios. Pre-service teacher courses in visual art, science and technology and learning technologies also use Commerce Town. The Doctor of Business Administration Program (DBA) developed a third island in 2011 used by students from Australia and overseas. In 2012 the School of Education introduced *SL* within seven subjects,


Figure 12: Creating t-shirts

adding an Early Childhood Centre for role-playing activities, an interactive Maths playground and an Eco space for Science. Education students contribute to sustainability of the virtual learning environment by building objects and spaces that they can potentially use in their own teaching. The stand-alone VW environment *Sim-on-a-stick* has also been used by some Education students who are successfully integrating VWs use into a number of local schools.

Flinders University (Flinders)
Flinders have stopped using *SL* in mental health due to some staff reluctance to use it or undertake training, poor bandwidth and general resistance to change. Flinders have used machinima from *SL* in teaching and will continue to develop materials when the technology and cultures are more conducive.

Curtin University of Technology (Curtin)
The use of VWs at Curtin has vanished in some areas and reemerged in others. The Virtual Wound Clinic project lost impetus caused in part by the loss of the backend *Sloodle* data while the 3D MUVE Special Interest Group has seen a fall in interest. Changes to *SLs* educational licensing fees meant that use in some areas has became financially unviable. Concerns about the inability to own and control the materials built in proprietary environments were raised, while open source alternatives were considered immature and too technologically demanding, leading to a curtailing of activity. While former VW research in the areas of medical training and virtual campus service has fallen away, a refocusing on the needs of oil, gas and mining industry has occurred. This includes Building Information Modelling (BIM) and the potential for 3D graphics and real time social interaction capabilities of VWs to be used for modeling the physical and multi-disciplinary collaborations that occur along the entire life cycle of projects in these industries. Health Sciences and School of Information Systems have started to look again at learning simulations.

Nelson Marlborough Institute of Technology (NMIT)
NMIT continues to use two islands in *SL*, Koru and Kowhai, as well as *OpenSim* islands on JokaydiaGrid and *Kitely*. Koru is an explicitly themed NZ sim which also hosts activity from Wellington Polytechnic (WelTech), the Virtual Life Education NZ Inc group (VLENZ) and a build developed for international students. Kowhai hosts two SLENZ builds, The Birth Centre for midwifery and the Hyperdome for interviewing skills. NMIT also uses Kowhai for a blended mode IT degree course on Multi User Virtual Environments taught in *SL* by a teacher who is geographically remote, in which the potential of VWs and the move towards the 3D Web are explored. Students build, script, create and run an event in *SL*, create machinima, or create and maintain an *SL* focused community. Students can also work in *OpenSim*, *Kitely*, *Sim-on-a-stick* and *Minecraft*. Three final year IT student projects are also based in *SL* (Atkins & Caukill, 2009). *SL* is also used in English Language teaching and for staff PD workshops.

Monash University (Monash)
Chinese Island in *SL* simulates a township containing a restaurant, farmer's market, railway station, medical clinic and transport infrastructure. It is used for beginner level Chinese language courses. The lessons are designed around real world scenarios and require use of the target language to complete tasks and achieve the set goals in which learners must to interact with scripted bots by engaging in text-based conversation in a free-form manner. Arabia is a simulation of university and residential environment in Cairo, Egypt. Lessons are focused on immersing beginner level students in aspects of everyday Arabic culture and family life, using Arabic phrases and vocabulary. Behavioral Studies use virtual facilities that simulate a formal university environment. Students are taught fully online with weekly live sessions in *SL* looking at how identity, privacy, communication, teamwork, commerce and community are affected by digital mediation. Pharmacy started using *SL* in 2007 and moved to *OpenSim* in 2010, however due to the technical complexity and fidelity limitations of *OpenSim*, lead to a further move, to *Unity3D* in 2012. The *Unity3D* problem based learning modules include a tablet manufacturing facility, a compounding dispensary, two biotechnology laboratories and a sterile products manufacturing facility.

Figure 13: Language

University of Technology Sydney (UTS)
The UTS sim in *SL* includes private spaces (the home) and public spaces (retail, administration) which are used in foreign language teaching and in the International Studies program. The project developed course design, delivery modes and learning strategies that linked virtual space activities to other in-class activities which was found to increase students' motivation to exploit learning material more fully.

Victoria University (VU)
VU has stopped using *SL* and *OpenSim* and is now using *Unity3D.* Sims include a construction training game for building site White Card certification; a sustainable building simulator, developed with RMIT and energy calculator specialists, where students can choose different building materials and see their impact on energy consumption and biotechnology simulation of drug creation processes. This is a collaborative project involving VU, CSL and Monash Universities. The advantages of *Unity3D* include; scalability for large user numbers, a higher fidelity 3D experience, no dedicated viewer to access is required, it can be easily distributed via multiple channels (online, download, USB stick and Flash formats) as it requires no virtual server to run and teachers reported being more comfortable working in it from the outset.

University of Tasmania (UTAS)
UTAS uses *SL* for courses including Designing Virtual Worlds, Sociology and Social Work and Education. In Designing Virtual Worlds, students expressed ideas and storylines by creating stand-alone structures and themed 3D environments. In Sociology and Social Work courses, 200 students viewed a lecture focusing on people who make their living in *SL*, with an optional essay on the differences between values in real life and *SL* in relation to work and happiness. In Education a pilot study where pre-service teachers took on the role of teacher and used a selection of seven child avatars with profiles of challenging and inclusive behaviors was found to provide a practical means of preparing pre-service teachers for the challenges of undertaking practicum placements. The project was evaluated with participants and teacher educators indicating *SL* had the potential for use in teaching preparation and could see its immediate application to classroom practice. The *SL* chat facility and machinima contributed greatly to the authenticity of the situation and encouraged reflection on their experiences.

Victoria University of Wellington, NZ (VUNZ)
A trial use of VWs is planned with groups of students from French, Italian and Spanish language classes who will supplement in-class language study and prepare oral presentations using *SL* resources. Students will research a cultural, social, political or historical aspect of one or several virtual locations relevant to their languages. Students will meet in-world with their tutors, virtual speakers and developers in the target language with the aim of acquiring a sense of belonging to an international community of language-users; a greater contextual understanding of the cultural and social dimensions of language-learning and an ability to relate their learning to their specific interests and experiences and provide access to resources that enable them to extend their experience beyond the framework provided by the course itself and technological expertise related to VWs.

Charles Sturt University (CSU)
E-sim environments have been developed to support the teaching of social work, policing and chemistry. The School of Information Studies (SIS) is the only school maintaining an active presence in synchronous VWs. The CSU-SIS Learning Centre on the island of Jokaydia III in *SL* is used to support undergraduate and postgraduate distance education students studying social networking and preservation subjects. Students can attend in-world discussions hosted by lecturers, guest speakers or student presentations, meet their lecturers for individual consultation and use the area as a space for socialising. Academic staff believe the main affordance of *SL* compared to *OpenSim* VWs is the greater breadth and richness of the professional and informational learning experiences gained from the educational, library, art and historical communities residing in *SL* (Hay & Pymm, 2010). However, the future of the CSU-SIS Learning Centre has only been ensured until the end of 2013 at which time the number of professional, educational and cultural communities that decide to remain or withdraw from *SL* will be a deciding factor in the centre's continuance.

University of Newcastle, Australia (UoN)
At the School of Architecture and Built Environment, *SL* is utilised for design learning. A collaborative architectural studio (Gu et al., 2009) has been conducted remotely between UoN and Rangsit University, Thailand. In this virtual design studio, a total of 45 architecture students, geographically separated, collaborated on a joint-design project to explore the design potentials in a VW, the concept of a virtual home, and to implement their collaborative design in *SL*. Students learnt new design protocols and skills associated with collaboration across cultures linking to Graduate Attributes of the architectural profession as well as the internationalisation of the curriculum. *SL* was found to be suitable design platform that enhances collaborative and creative possibilities.

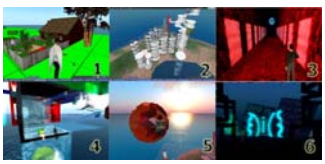

Figure 14: virtual home designs created by students

University of Western Sydney (UWS)
UWS continues to develop VW technology as a research and educational tool for Digital Humanities. Research

has focused on believability simulation technology for cultural studies and health care. The Westopia Island in *SL* continues to be used by the School of Computing, Engineering and Mathematics for teaching in the areas of human-machine interaction, game and simulation technologies, social informatics and cyber-physical systems.

Oztron (Oztron)
Oztron has been creating virtual spaces for higher education institutions, including: Whitecard OH & S training (VU), sustainability (RMIT), Biotechnology (Monash and CSL), Pharmatopia project (Monash, UQ and Glaxosmithkline) and virtual patients (Monash Medicine / CIT - Nursing).

Literature on virtual worlds and sustainability

VWs are "an online electronic presence that imitates real life in the form of a personal presence through someone's avatar (the alter ego which is a graphical representation of themself in the VW)" (Gregory, 2007, online). VWs are a 3D online environment populated by multiple users through their avatars (Girvan & Savage, 2010). Many universities both nationally and internationally have a presence in a VW (Thackray, Good and Howland, 2010). The ability to be "immersed in a synthetic, constructivist environment" as suggested by Dede (1995, p. 46) is a major factor in the perseverance of educators who seek to provide constructivist, complex, higher order thinking learning experiences for their students. Warburton (2009) presented the possibilities and barriers to implementing VWs in higher education including technical, identity, culture, collaboration, economics and creativity. While many of these barriers remain today, the perseverance as demonstrated in this paper and in the literature (Savin-Baden, 2011) shows that educators have a belief in the value of VWs for delivering positive outcomes for their students. While VWs have the potential to answer many of the questions pertaining to sustainability for higher education there is currently scant reference in the literature. The higher education sector can be sustained, as Dede (2005) reminds us that "The evolution of higher education is shaped by changes in the characteristics of entering students, by development of new methods of teaching and learning, and by shifts in the knowledge that society values". Finally, Ondrejka (2008, p. 229) suggested that the "mix of fantastic possibilities and social educational opportunities has VWs poised to transform basic approaches to learning and communication, as well as innovation and entrepreneurship".

Method

A survey was circulated to members of the VWWG seeking their thoughts and opinions on how they perceived trends in VWs were affecting their institution. They were also asked what "sustaining the future through VWs", meant to them and their institution. Authors from the institutions detailed above participated in the survey.

Analysis and discussion

Feedback from VWWG members indicated that, as a group, they are using VWs across a wide range of disciplines including education, early childhood learning, physiotherapy, pharmacy, social work, occupational therapy, public health, nursing, community service, aged care, nutrition, allied health, sports and soft tissue therapies, OH & S, medicine, biotechnology, arts, criminology, languages, ICT, multimedia, business, law, project management, journalism, construction, communications, employability skills development and research. Activities are diverse and include games, interviews, guest lectures, literacy activities, meetings, discussions, reflections, simulations, building, scripting and role-playing. Educators have been working with school students on sculpture and futuristic architecture design tasks, collaborating with other universities, conducting careers days, conferences, workshops, public relations, creating machinima as a teaching resource and providing PD.

Sustainability in virtual worlds – an Australian and New Zealand perspective

Institutions are able to provide engaging learning opportunities for learners through VWs. This is particularly pertinent for those institutions that have substantial distance learning cohorts including Deakin, UNE, CSU and USQ. With the need for learning to be more flexible, activities in VWs help to provide practical procedural based activities that can be delivered online and at a distance. The ability of VWs to be accessed remotely from anywhere at any time ensures the continued provision of practical stimulation scenarios. For many present and future students, the physical and the virtual are becoming somewhat blurred. VWs showcase the possibilities engendered by new models of interaction. The traditional expensive physical environments that were once considered the norm are in essence becoming unsustainable given the increasing student demand for flexibility

and increasing pressure on existing resources. VWs act as a beacon of innovation, providing an environment in which to prototype new ways of learning and teaching and discern the path to the future. They offer access to technologies that can support a more constructivist, problem-based approach to learning and teaching. VWs will also become increasingly important in the current climate of widening participation as we look for more flexible ways to accommodate an increasingly diverse audience.

In preparing students for a knowledge-based society, educators need to shift their focus to enquiry-based education, facilitating the development of creative problem solving skills and increasing opportunities for students to undertake practice-based and service learning. Without the use of technologies such as VWs, educators are ignoring the potential to expand the range of educational activities and resultant positive outcomes for students. To provide students with a comparable learning environment that challenges and extends them in their thinking and creating is only truly possible through VWs. These environments enable students' work to be showcased nationally and internationally, providing them with an expanded network of opportunities. Educators can connect globally in ways that remove barriers to the creation of networks and communities.

Innovative teaching methods
There are a variety of innovative teaching and learning methods used in a VW, including simulations, role-plays, virtual tours, building, scripting and the use of expert guest lectures. All these methods are using VWs as a means for teaching and learning that are not possible by traditional teaching methods either face-to-face or by distance using Learning Management Systems. Machinima enables the development of engaging and challenging learning materials. These materials not only make difficult areas of curriculum accessible, but also facilitate active learning. They allow for flexible learning and the provision of the same asynchronous experiences for students irrespective of study mode. These materials are better suited for modern day learners who are of a generation surrounded by ubiquitous information and merged technology, dealing with competing time commitments. Machinima is also cost effective as it costs a lot less to make a machinima than traditional video productions, it is flexible (different settings appropriate to the content covered in the machinima can be created far more easily than in real world environments) and accessible (there is not the need for professional levels of cinematic expertise to make machinima).

Blended learning
VW technology offers a bridge to a future existence where the real and the virtual can coexist seamlessly. VWs provide a place to learn, engage, experience and experiment and the fusion of augmented reality with VWs and the 3D web will change our 'real' world in ways we can only begin to imagine. Experiencing the power of being globally connected in a 3D environment in real time is what the virtual environment spaces are all about. There are advantages in terms of being able to work in virtual teams or attend conferences, thus reducing the need to travel to establish meaningful learning and networking spaces but the real value of pursuing educational activities in VW environments is that it allows educators to begin to see some of the issues and challenges that they will face in the new real/virtual integrated world and to give them opportunity to experiment with how they as individuals as well as educators and students might start to approach them.

Costs
It can be argued that the cost of maintaining the VW technology itself is incredibly expensive. However, once established, the continuing costs are minimal. This is not always the case though. VWs can be used at minimal costs to the academic and student if they have access to spaces that enable the learning they wish to provide. Unfortunately, many academics are not aware of these spaces and embark on large projects costing substantial amounts of money. VWs enable the cost-effective provision of a range of services to be provided and learning to students in a more engaging and authentic ways compared to traditional modes of delivery. VWs provide sustainability to higher education institutions in the form of costs, but they have not always been adopted at an institutional level. Rather, projects have been implemented and driven at an individual, unit, program or faculty level. Many resources have already been created in VWs that are free to use. Experiments can be conducted cost effectively without harm to others and at minimal costs compared to real life experiments. Simulations are cost effective in a VW. Virtual excursions provide authentic learning without the costs involved transporting students to the location and the time savings are enormous. Virtual conferences are cost effective in terms of money and time. In off-campus teaching, costs can be reduced because VWs enable large numbers of students to come together at the one time in the one space. Residential schools for off-campus students can be minimized as VW can offer the affordances of the face-to-face sessions.

Business Sector - Careers

There is an increasing trend for employers to use VWs as part of their recruitment practices and services delivery (Andersohn, 2009; Klingshrin, 2010; Sullivan 2010) and as evidenced by the appearance of virtual careers fairs. The more learning institutions utilise and thereby expose students to this environment, the better graduates will be positioned for the work world of tomorrow.

International collaboration
The future is driven by international collaboration and VWs make collaboration much easier to accomplish. For example, the meetings of the VWWG are unique in the Australasian context, allowing a widely diverse group of academic staff from many universities to meet regularly. These meetings have enabled the VWWG to remain an influential and potent force in education over three years. The VWWG began in November 2009 with four members. It currently has over 190 members. The first meetings began with a teleconference. Skype was then used for the second meeting as one of the members was located overseas and couldn't teleconference easily. Not everyone could connect when Skype was trialed. By the third meeting, the VWWG decided to only meet in the VW as this enabled many users in the one place at the one time. It also meant that everyone could participate using audio or text depending on the individual requirements.

Professional Development (PD)
If we consider the sustained use of VWs in education in Australia, it is necessary to reflect on the PD of current and future educators. PD of academics within tertiary institutions with respect to VW use is an issue in need of attention if adoption beyond special projects is to take place. The IT and pedagogical support units in institutions will need to gear up to support academics in utilising VWs in teaching. This could be achieved by the creation of ready-made environments; shareable examples and the offering of PD courses which will help stimulate interest and develop a critical mass of knowledge about VWs in the academic community. Secondly, teacher education programs need to familiarise pre-service teachers with VWs by providing them with opportunities that will challenge their ideas on VW pedagogy. The same is true for students across various other disciplines. Thirdly, to meet our environmental obligations, educational programs that can re-create environments can do so retrospectively to demonstrate better and best practice.

Economic constraints
It is inevitable that there will be more economic constraints on higher education institutions in the future. The ability to bring geographically distributed staff and students together in one space, and the ability to create and store resources on an extremely limited budget will be of benefit to all providers. Also, as the body of knowledge in all disciplines continues to grow in leaps and bounds, the only way to educate new students is to teach them how to learn and how to work together in a community of practice, so that ideas can be shared and knowledge built collaboratively. Educators have already identified VWs as a suitable environment for the development of these communities and the sharing of knowledge and resources.

Future of virtual worlds (sustainability)

VWs are continually providing opportunities for the staff and students across universities in Australia and NZ. Many members of the VWWG believe that the future holds a range of possibilities that will help to support the development of VWs in teaching and learning. However, others do not. These are discussed more fully below. Over time, as input devices become more user-friendly and bandwidth issues reduce, VWs will be a standard way of interacting. There are a number of trends in VWs including the development of browser based access to VWs making it easier for staff and students to access VWs directly and create configurable worlds that allow the design of teaching modules not previously possible. This is already starting to broaden the appeal of VWs to staff who held some reservations about their validity initially. In some universities, VWs, 3D virtual environments and simulations are now embedded in a number of formal curricula and while still not widely used throughout all disciplinary areas of the university it is likely that their use will continue to grow and develop overtime, although their growth is more likely to be driven by individuals rather than the collective institution. The need to demonstrate levels of innovation in teaching practice and teaching spaces has helped to sustain the presence of VWs in many universities even if not widely used. In areas such as language, teaching can be offered through a variety of possibilities in speaking, writing and listening enabling innovative educators to think laterally in developing visual and interactive tactile educational learning activities. Developing better educational outcomes is a key driver for many VWWG members.

An important issue that demonstrates the sustainability of VWs is the use of different platforms. In 2009 when the VWWG first paper was published approximately 90% of institutions were using *SL*. Three years later many are using *OpenSim* and other platforms, although the majority has retained an *SL* presence. As staff become

more sophisticated in their skills in building and scripting in VWs the opportunity to develop closed VWs where students can self explore scenarios as many times as they like is increasing the possible uses for many academics. There is a growing movement towards open source and more manageable simulation environments which may be seriously considered in the near future. Intranet versions of VW servers for easy development of internal secure grids and mobile VW clients, to facilitate ad hoc, ubiquitous usages of VWs in educational scenarios will all contribute to a greater uptake of VWs.

Some of the barriers to using VWs continue to be the usability due to bandwidth and hardware however these are generally felt to be less of an issue than in previous years and likely to be resolved with future developments in networks such as the NBN. To increase the use of VWs, especially *SL,* the costs and time needed to develop skills is still mentioned as a barrier. Although a general sense of optimism in the uptake in VWs is being felt.

With a renewed emphasis on research activity, many academics feel they cannot accommodate the time requirements of working in VWs where more teaching responsibilities are falling to sessional staff who are not familiar with many current pedagogical initiatives including the utilisation of VWs. What also seems to be occurring is a shift at some institutions in the overall emphasis of educational technologies with social media appearing to receive a greater focus than VWs. Also, in some areas is a revival of interest in technology via the introduction of tablets, specifically iPads. These devices limit the possibilities of using VW viewers, but they do amplify the possibilities of augmented reality and we are beginning to see projects that tap into these affordances. What seems to be evident is a reapplication of the basic principles of immersion and engagement and repurposing them into other contexts that are more sustainable under prevailing conditions within the university. The more sophisticated 3D VWs will see future application in those areas where their affordances more closely meet pedagogical requirements than do other, less demanding, competing technologies.

VWs are a feature of tertiary (and possibly secondary and primary) education. Key influencing factors for sustainability include: ongoing improvement in the network and computer technology needed to access and develop these environments; greater functionality of VW platforms combined with a commensurate improvement in user-friendliness; ongoing empirically based research into models of learning that incorporate VWs leading to improved pedagogical design of learning activities and demonstrated relevance of these activities to the main curricula; changes in broadly held perceptions of VWs from being associated with leisure-based gaming activities to that of useful tools which can provide learning opportunities not readily available in real world settings; an increase in PD of educators towards improving technical skills and literacy of educators as to the affordances of VWs; and a general increase in online interaction in all aspects of everyday life.

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References

Andersohn, B. (2009). 3D Virtual Real Estate Company. RE Techworld blog, viewed 26th April 2012 at http://retechworld.wordpress.com/2009/12/12/3d-virtual-real-estate-company-realty-or-reality/

Atkins, C. & Caukill, M. (2009): *Serious Fun and Serious Learning: The Challenge of Second Life.* In Judith Molka-Danielsen and Mats Deutschmann (Eds.) Learning and Teaching in the Virtual World of Second Life, Tapir Academic Press, Norway.

Brenner, A. M. (2009). Pre-service Teachers: Recognizing the Value of Second Life in Learning about Teaching. *The Teacher Educators' Journal*, 21-25

Butler, D. (2012). *Second Life* machinima enhancing the learning of law: Lessons from successful endeavours. In M. J. W. Lee, B. Dalgarno & H. Farley (Eds), Virtual worlds in tertiary education: An Australasian perspective. *Australasian Journal of Educational Technology*, 28(Special issue, 3), 383-399.

Crisp, G., Hillier, M., & Joarder, S. (2010). Assessing students in Second Life – some options. In Proceedings of the 26th Annual ASCILITE Conference, Sydney. (pp. 256–261) http://ascilite.org.au/conferences/sydney10/procs/Crisp-concise.pdf

Dede, C. (1995). The Evolution of Constructivist Learning Environments: Immersion in Distributed, Virtual Worlds. *Educational Technology, 35*(5), 46-52.

Girvan, C., & Savage, T. (2010). Identifying an appropriate pedagogy for virtual worlds: A Communal Constructivism case study. *Computers & Education*, 55(1), 342–349. doi:10.1016/j.compedu.2010.01.020

Gregory, B., Gregory, S., Wood, D., Masters, Y., Hillier, M., Stokes-Thompson, F. ... Yusupova, A. (2011). How are Australian higher education institutions contributing to change through innovative teaching and learning in virtual worlds? In Proceedings of the 27th Annual ASCILITE Conference Hobart 2011. (pp. 475-490). http://www.ascilite.org.au/conferences/hobart11/procs/Gregory-full.pdf

Gregory, S. (2007). Virtual Classrooms: Learning in a Virtual Environment. http://www.virtualclassrooms.info

Gregory, S. & Gregory, B. (2011). Do virtual worlds have a role in increasing student engagement as measured by their higher academic grades? In *CreateWorld 2011 Proceedings* (pp. 40–50) Brisbane. http://auc.edu.au/media/cw11/CreateWorld_2011_Proceedings.pdf

Gregory. S., Lee, M.J.W., Ellis, A., Gregory, B., Wood, D., Hillier, M. ... McKeown, L. (2010). Australian higher education institutions transforming the future of teaching and learning through virtual worlds. In Proceedings of the 26th Annual ASCILITE Conference, Sydney 2010 (pp.399-415). http://ascilite.org.au/conferences/sydney10/procs/Gregory-full.pdf

Gregory, S. & Tynan, B. (2009). Introducing Jass Easterman: My *Second Life* learning space. In *Same places, different spaces.* Proceedings of the 25th Annual ASCILITE Conference Auckland 2009 (pp. 377-386) http://www.ascilite.org.au/conferences/auckland09/procs/gregory.pdf

Gu, N., Gul, L., Williams, A. and Nakapan, W. (2009). Second Life - a Context for Design Learning, in Wankel, C. and Kingsley, J. (Eds), *Higher Education in Virtual Worlds: Teaching and Learning in Second Life*, Emerald Books, Bingley, UK, pp. 159-180.

Hay, L. & Pymm, B. (2010/2011). Real learning in a virtual world: A case study of the School of Information Studies' Learning Centre in Second Life. *Education for Information, 28*(2-4), 187-202.

Hearns, M., Diener, S., Honey, M., Cockeram, J., Parsons, D., Champion, E. ... Gregory, S. (2011). He ara hou ka tū mai: NZ institutions of higher learning unpacking demands and facilitating change. In Proceedings of the 26th Annual ASCILITE Conference, Sydney Hobart 2011. (pp.571-579). http://www.ascilite.org.au/conferences/hobart11/procs/Hearns-concise.pdf

Klingshrin, R. (2012). Employee training is the new 'learning' as 3D virtual worlds transform the workplace. Xerox Corporation. Viewed 10th May 2012 at www.asc-inc.com/wp_employee_training.aspx

Ondrejka, C. (2008). Education Unleashed: Participatory Culture, Education, and Innovation in *Second Life*. In K. Salen (Ed.), *The Ecology of Games: Connecting Youth, Games, and Learning* (pp. 229-252). Cambridge: The MIT Press.

Savin-Baden, M. (2011). *A practical guide to using Second Life in higher education*. Berkshire, UK: McGraw-Hill.

Sullivan, J. (2007). Outrageous recruiting using avatars and YouTube. Blog. Viewed 15th June 2010 http://bit.ly/jsullivan

Thackray, L., Good, J., & Howland, K. (2010). Learning and Teaching in Virtual Worlds: Boundaries, Challenges and Opportunities. In A. Peachey, J. Gillen, D. Livingstone, & S. Smith-Robbins (Eds.), *Researching Learning in Virtual Worlds* (pp. 139-158): Springer London. http://dx.doi.org/10.1007/978-1-84996-047-2_8

Warburton, S. (2009). Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British Journal of Educational Technology, 40*(3), 414-426.

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http://www.ascilite.org.au/conferences/wellington12/procs/gregory.pdf