Gregory, Sue, Gregory, Brent, Hillier, Mathew, Jacka, Lisa, Schutt, Stefan, Ellis, David, Stokes-Thompson, Frederick, Wood, Denise, Masters, Yvonne, Farley, Helen, Orwin, Lindy, Stupans, Ieva, Scutter, Sheila, Warren, Ian, Steel, Caroline, Neuendorf, Penelope, Bower, Matt, Miller, Charlynn, Mathews, Shane, Butler, Des, Hearns, Merle, Garcia, Jaime, Jegathesan, Jay Jay, Brown, Ross, Meredith, Grant, Muir-Cochran, Eimear, Flintoff, Kim, Grant, Scott, Atkins, Clare, Gaukrodger, Belma, Giovanangeli, Angela, Le Rossignol, Karen, Larson, Ian, Cram, Andrew, Linegar, Dale, Wang, Xiangyu, Muir, Tracey, Grenfell, Jenny, Cleland, Ben, Piallat, Edith, Williams, Anthony, Hay, Lyn, Gu, Ning, McCarthy, Angela, Simoff, Simeon and Bogdanovych, Anton 2012, Sustaining the future through virtual worlds, *in ascilite 2012 : Future Challenges, Sustainable Futures : proceedings of the 2012 Australian Society for Computers in Learning in Tertiary Education conference*, Massey University and ascilite, Wellington, N. Z., pp. 361-368.

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25 - 28 November 2012 | Wellington | New Zealand

Sustaining the future through virtual worlds

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Virtual worlds (VWs) continue to be used extensively in Australia and New Zealand higher education institutions although the tendency towards making unrealistic claims of efficacy and popularity appears to be over. Some educators at higher education institutions continue to use VWs in the same way as they have done in the past; others are exploring a range of different VWs or using them in new ways; whilst some are opting out altogether. This paper presents an overview of how 46 educators from some 26 institutions see VWs as an opportunity to sustain higher education. The positives and negatives of using VWs are discussed.

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

Introduction and background

As we race through the 21st century, the demand to make education globally accessible and always available is increasing exponentially. This demand for increased accessibility exacerbates the deficiencies already experienced in higher education with educational resources being stretched by increasing numbers of students, fewer staff and less support. Given traditional delivery models, under these circumstances the provision of quality education is unsustainable (Gregory & Gregory, 2011). The pressures on staff are enormous and the workplaces that our graduates are likely to enter are becoming more complex with increasing reliance on advanced technologies and associated processes. Finding new ways for students to engage with and link to a learning community is crucial. As the fidelity of 3D virtual worlds (VWs) increases and more students opt to learn online, VWs are increasingly providing rich experiences for learners as places where students and staff can interact with each other and the wider community (Brenner, 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 (Karsenti & Collin, 2012). 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). VWs enable activities that make life and learning meaningful, such as getting together, sharing information, collaborating and celebrating (Gregory & Tynan, 2009). Herewith, members of the Australian and New Zealand (NZ) Virtual Worlds Working Group (VWWG) demonstrate how VWs can be used to sustain the future of education.

In 2010, 21 members of the VWWG outlined ways in which they were transforming the future through VWs (see Gregory et al., 2010) and by 2011 69 members reflected on how Australian and NZ higher education institutions are sustaining the future through the use of VWs (see Gregory et al., 2011, and Hearns et al., 2011). There have been dramatic changes in the ways in which institutions are using VWs and these changes are reflected in the brief overview of the use of VWs in teaching and learning by the 26 institutions represented in this paper. The focus of their combined comments is sustainability and learning for the future.

Virtual worlds and sustainability

VWs are 3D online environments populated by multiple users through their avatars (Girvan & Savage, 2010). Across the world, many universities have a VW presence (Thackray, Good & Howland, 2010). The ability to be "immersed in a synthetic, constructivist environment" as suggested by Dede (1995, p. 46) is a major factor in educators persevering with VWs to provide complex learning experiences that promote higher order cognitive skills in their students. The popularity of VWs in higher education remains undiminished in defiance of a range of barriers including technical, identity-based, cultural, collaborative, economic and creative issues (Warburton, 2009) and accessibility (Wood & Willems, 2012). Although these barriers remain today, educators' perseverance, as demonstrated in this paper and in the literature (Savin-Baden, 2011), reveals their belief that VWs can deliver positive student outcomes. Although we propose that VWs have the potential to address issues of sustainability in higher education, there is currently scant reference in the literature. As Dede (2005, p. 226) reminds us, "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". We believe that VWs have a part to play in this evolution, as suggested by Ondrejka (2008, p. 229), who states 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 VWWG members seeking their thoughts and opinions on how trends in VWs were affecting their institution. They were also asked what "sustaining the future through VWs", meant to them and their institution. Forty-six authors from 26 institutions participated, consisting of experts, champions or regular users of VWs with in-depth knowledge of the challenges facing the longer term viability of VWs in education.

Analysis and discussion

The following information is a collation of the survey data. VWWG members indicated that they use VWs across a wide range of disciplines for a myriad of purposes including education, early childhood learning, physiotherapy, pharmacy, social work, occupational therapy, health, nursing, community service, aged care, nutrition, sports and soft tissue therapies, OH&S, arts, medicine, biotechnology, criminology, languages, ICT, multimedia, business, law, project management, journalism, construction, communications, employability skills development and research. Educators reported on a diverse range of activities including games, interviews, lectures, literacy activities, discussions, reflections, simulations, building, scripting and role-playing. Educators work with school students, collaborate with other universities, conduct careers days, conferences, workshops, public relations activities and create machinima (in-world video) as a teaching resource. Table 1 provides a summary of the findings indicating how 26 institutions are using VWs in teaching, learning and research.

Table 1: Institutional opt in year, discipline(s) and how virtual worlds are being used

Year	***Institution,*** *Discipline(s),* How the virtual world is being used
1997	***Charles Sturt University***, *social work, policing and chemistry, information studies* - social networking and preservation, online conferencing, student presentations, group discussions, meetings, socialising.
1998	***University of Western Sydney***, *digital humanities, cultural studies, health care, computing, engineering, mathematics* - research, human-machine interaction, games, simulation, social informatics, cyber-physical systems.
2005	***University of Southern Queensland***, *counselling, public relations, language, law, education* - meetings, conversation, courtroom trials, attentional restoration, trial bots, the Encke Virtual University Collaboration.
2006	***Victoria University***, *White Card certification, biotechnology* - construction training game, simulations
2006	***Nelson Marlborough Institute of Technology***, *midwifery, interviewing, IT, English as a Second* Language - build, script, events, machinima, staff workshops.
2007	***University of New England***, *education, pharmacy* - tours, role-plays, guests, experimentation, discussions, reflection, web quests, machinima
2007	***Queensland University of Technology***, *law, business, nursing* - community plaza and auditorium, machinima, field trips, games, AI, simulations, learning design.
2007	***University of South Australia***, *career services* - communication, teamwork, problem solving, interviews, meetings.
2007	***Monash University***, *languages, behavioral studies, pharmacy* - simulations, bots, identity, privacy, communication, teamwork, commerce and community, problem based learning.
2008	***Deakin University***, *crime, arts education, medical discipline, health sciences* - tutorials, scenario based learning, Physical TV Company production "Thursdays Fictions", case studies, scenarios.
2008	***The University of Queensland***, *languages, educational technology, pharmacy, assessment* - orientation, field trips
2008	***Curtin University of Technology***, *physical and multi-disciplinary, health sciences and information systems* - oil, gas and mining industry, modelling, 3D graphics, social interaction, collaboration, learning, simulations.
2008	***University of Technology Sydney***, *retail, administration, international studies* - language teaching, course design, delivery modes, learning strategies.
2008	***Canberra Institute of Technology*** and ***University of Canberra***, *health* - communication, inter-disciplinary learning, skill development.
2008	***University of Newcastle***, *architecture* - design learning, collaboration, creative possibilities.
2009	***Manukau Institute of Technology***, *interviewing, language studies, nursing, policing, teaching* - holodeck (scene changer), discussions, interview and media room, advertisements, literacy enhancement, presentations.
2009	***University of Ballarat***, *Emergency room, stuttering support, art, variety of subject areas* - simulations
2009	***University of Western Australia***, *art, teaching, visualisation research, architecture marketing, business, teaching and learning* - amphitheatre for large numbers, machinima.
2009	***Southern Cross University***, *commerce, management, law, justice, hospitality, tourism, education* - role-play, maths, science, sustainability.
2009	***Victoria University of Wellington, NZ***, *language* - oral presentations, research, meetings, speakers, developers, PD, contacts, learning, field trips, interviews with native speakers
2010	***Macquarie University***, *education* – learning, teaching, site visits, geometric problem, accessibility, interaction.
2010	***Flinders University***, *mental health* - machinima, otherwise have discontinued using VWs.
2010	***University of Tasmania***, *designing virtual worlds, sociology, social work, education* - creation of stand-alone structures, themed 3D environments, view lectures, role-play, chat, machinima.
2012	***Canberra Institute of Technology, University of Canberra with Oztron***, *OH&S, health* - create spaces for higher education institutions including skill development e.g. IV medication scenario
2012	***James Cook University,*** *public health, Information Technology - posters, bots* - screen casting to share computer screen, interaction.

Sustainability in virtual worlds – an Australian and New Zealand perspective

VWs offer engaging learning opportunities for students, particularly those at institutions that have a strong focus on distance learning. VWs can help to meet the need for more flexible learning through practical procedural based activities that can be delivered online and at a distance and can be accessed remotely from anywhere at any time. Traditional expensive physical settings are under pressure from both increasing student demand for flexibility and restraints on resources. VWs provide a proving ground for prototyping new methods of learning and teaching, especially constructivist, problem-based approaches. They also offer a way of meeting current demands for 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 limiting options for expanding their range of educational activities and resultant positive outcomes for students. VWs enable student 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. The following outlines a number of themes in relation to the sustainability of higher education provision via the use of VWs that emerged from the analysis of survey responses.

Innovative teaching methods
VWs can facilitate an expansive range of innovative teaching and learning methods (see Table 1), which include simulations, role-plays, virtual tours, building, scripting, and the inclusion of geographically distant experts within courses. All these methods can utilise VWs to teach and learn in ways that are not possible or viable by traditional face-to-face teaching or distance learning using Learning Management Systems. VWs allows for the synchronous provision of the same experiences for students irrespective of study mode or location.

Multimedia production
VWs enable the development of engaging and challenging learning materials including 3D models, data visualisation and machinima, contextualising otherwise abstract principles and making difficult areas of curriculum accessible. Such materials suit modern day learners who are surrounded by ubiquitous information and merged technology and who deal with competing time commitments. Machinima is also cost-effective as it is cheaper to make than traditional video productions. It is also flexible, since specific content can be created far more easily than in real world environments, and accessible, since professional cinematic expertise is not required.

Blended learning
VW technology offers a bridge to future educational environments where the real and the virtual can coexist seamlessly and where on-campus and distance education cohorts can be bought together. VWs provide a place to learn, engage, experience and experiment and are fundamentally about experiencing global connection in a 3D environment in real time. This can include working in virtual teams or attending conferences, but their real value is in allowing educators to grasp some of the issues and challenges that they will face in the new real/virtual integrated world, and to giving them opportunities to experiment with how they, as individuals as well as educators and students, might start to approach these challenges.

Economic constraints
It is inevitable that there will be more economic constraints on higher education institutions in the future and while it can be argued that VW technology is expensive to establish, the continuing costs are minimal in comparison. The costs of establishing virtual facilities are many times less than building similarly innovative physical spaces on-campus. VW simulations, particularly of complex, dangerous or rarely encountered situations are also cost-effective when compared to running simulated events on campus. Experiments can be conducted cost-effectively without harm to others and at minimal costs compared to real life experiments. The costs and time associated with transport and accommodation related to conferences, field trips and off-campus students attending residential schools could be minimised or eliminated. Virtual excursions can provide authentic learning; virtual conferences allow distant colleagues to gather easily, and off-campus students can come together for a virtual residential school that can offer many of the affordances of face-to-face sessions. Unfortunately, academics are sometimes not aware of existing virtual spaces and may embark on large projects costing substantial amounts of money. With a little planning and savvy, VWs can enable the cost-effective provision of a range of services and student learning, particularly if the free resources that have already been created in VWs are utilised. However, VWs have not always been adopted at an institutional level. Rather, projects have been implemented and driven at an individual, unit, program or faculty level, therefore there is greater need for coordination, particularly within institutions, to realise improved cost savings.

Careers
There is an increasing trend for employers to use VWs as part of their recruitment practice and service delivery (Andersohn, 2009; Klingshrin, 2010; Sullivan 2010), 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.

Collaboration
VWs make the increasing focus on national and international educational collaboration easier to accomplish, with the ability to bring geographically distributed staff and students together in one virtual space. For example, VWWG meetings are unique in the Australasian context, allowing a diverse group of academic staff from many universities to meet regularly. These meetings have enabled the VWWG to retain its membership and activities over three years. The VWWG began in November 2009 with ten members from four institutions. The current membership is now over 190. The first meeting began by teleconferencing. Skype was then used. By the third

meeting, the VWWG decided to only meet in the VW with communication via in-world audio and/or chat. The ability to create and store resources on an extremely limited budget will be of benefit to all providers particularly as the body of knowledge in all disciplines continues to grow in leaps and bounds. Given the need to make sense of this explosion in the availability of information, we need to educate new students in how to learn and how to work together in a community of practice so that ideas can be shared and knowledge built collaboratively. It has been demonstrated that VWs are a suitable environment for the development of these communities and the sharing of knowledge and resources (Molka-Danielsen, Mundy, Hadjistassou, & Stefanelli, 2012).

Professional Development (PD)
If we consider the sustained use of VWs in Australian and NZ education, it is necessary to reflect on the PD of current and future educators if adoption beyond special projects is to take place. The IT and pedagogical support units in institutions will need to gear up to support academic's use of VWs. 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. Teacher education programs would need to familiarise pre-service teachers with VWs by providing them with opportunities that will challenge their ideas on pedagogy.

Future of learning using virtual worlds (sustainability)

In the pursuit of better educational outcomes, many members of the VWWG in Australia and NZ, believe that the future will see VWs playing a greater role in teaching and learning. Those proposing an increase in VW use see the development of more user-friendly input devices, browser based access and an increase in bandwidth reducing any impediments and encouraging the creation of configurable worlds that that were not previously possible. 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, they are driven by individuals rather than at an institutional level. The need to demonstrate levels of innovation in both teaching practice and teaching spaces has helped to sustain the presence of VWs in many universities. Examples such as language learning offer new possibilities in speaking, writing and listening through the development of innovative visual and interactive learning activities.

An important issue that demonstrates the sustainability of VWs is the emergent use of different VW platforms. In 2010, when the first VWWGs paper was published, approximately 90% of institutions were using Second Life (SL). Now two years later, many are using OpenSim and other platforms, even though the majority has retained a SL presence. As staff become more sophisticated in their skills in building and scripting, the opportunity to develop closed VWs where students can self explore scenarios as many times as they like is increasing the possible uses for academics. One reason for the movement away from SL is the growing movement towards more manageable simulation environments and intranet versions of VW servers for easy development of internal secure grids and mobile VW clients. This will facilitate ad hoc and ubiquitous usages of VWs in educational scenarios to contribute to a greater uptake of VWs. Some of the barriers to using VWs continue to be the usability due to bandwidth and hardware quality, but 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 Australian National Broadband Network (NBN). To increase the use of VWs, especially SL, the costs and time needed to develop skills is still mentioned as a barrier. A general sense of optimism in the uptake in VWs is expressed through the survey responses.

Two VWWG members who are not as optimistic about the future growth of VWs reported that they cannot accommodate the time requirements of working in VWs where more teaching responsibilities are falling to sessional staff, some of whom may not be familiar with many current pedagogical initiatives including the utilisation of VWs. A growing emphasis on educational technologies such as social media and mobile computing technology such as smartphones and tablets appear to be currently receiving a greater focus than that of VWs. Even though these devices limit the possibilities of using VW viewers, 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 VWs will see future application in those areas where their affordances more closely meet pedagogical requirements than do other, less demanding, competing technologies.

The findings reported in this paper represent a limited number of academics from a self-selecting group of virtual world advocates (members of the VWWG), and so care must be taken to avoid generalising the

implications beyond this population. Furthermore, limitations on space do not provide scope for a more detailed critical analysis of the data. Despite these limitations, the snap shot of the use of VWs by members of the VWWG suggest a few interesting trends and the implications for the long-term sustainability of these environments for teaching and learning in higher education.

While VWs are gradually becoming a feature of tertiary 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 and accessibility features; 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.

Further research should extend studies such as this to a wider, more representative population, including academics that are not currently using VWs in higher education to begin to build a more comprehensive picture of the future sustainability of these environments. Such a study should be conducted longitudinally to track changes in technology, pedagogical approaches as well as changing teacher and student attitudes toward the use of VWs in the curriculum.

Acknowledgements

The authors would like to acknowledge members of the Australia and New Zealand Virtual Worlds Working Group (VWWG) who have made it possible for this collaboration to take place.

References

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

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

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., Bogdanovych, A., Butler, D., Hay, L., Jegathesan, J.J., Flintoff, K., Schutt, S., Linegar, D., Alderton, R., Cram, A., Stupans, I., McKeown Orwin, L., Meredith, G., McCormick, D., Collins, F., Grenfell, J., Zagami, J., Ellis, A., Jacka, L., Campbell, J., Larson, I., Fluck, A., Thomas, A., Farley, H., Muldoon, N., Abbas, A., Sinnappan, S., Neville, K., Burnett, I., Aitken, A., Simoff , S., Scutter, S., Wang, X., Souter, K., Ellis, D., Salomon, M.,Wadley, G., Jacobson, M., Newstead, A., Hayes, G., Grant, S., Yusupova, A. (2011). How are Australian higher education institutions contributing to change through innovative teaching and learning in virtual worlds? In G. Williams, P. Statham, N. Brown, & B. Cleland (Eds.), *Changing Demands, Changing Directions*. Proceedings ascilite Hobart 2011 (pp. 475-590). http://www.leishman-associates.com.au/ascilite2011/downloads/papers/Gregory-full.pdf

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., Campbell, M., Grenfell, J., Pace, S., Farley, H., Thomas, A., Cram, A., Sinnappan, S., Smith, K., Hay, L., Kennedy-Clark, S., Warren, I., Grant, S., Craven, D., Dreher, H., Matthews, C., Murdoch, D., McKeown, L. (2010). Australian higher education institutions transforming the future of teaching and learning through virtual worlds. In C. Steel, M.J. Keppell & P. Gerbic (Eds), *Curriculum, technology & transformation for an unknown future*. Proceedings ascilite Sydney 2010 (pp. 399-415). http://www.ascilite.org.au/conferences/sydney10/Ascilite%20conference%20proceedings%202010/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

Hearns, M., Diener, S., Honey, M., Cockeram, J., Parsons, D., Champion, E., Schott, G., Falloon, G., Thompson, D., Bell, T., Grimley, M., Green, R., Cochrane, T., Davis, N., Morrow, D., Corder, D., U-Makey, A., Clear, T., Pilpott, A., Davies, R., Loke, S.K., Atkins, C., Gregory, S. (2011). He ara hou ka tu mai: NZ institutions of higher learning unpacking demands and facilitating change. In G. Williams, P. Statham, N. Brown, & B. Cleland (Eds.), *Changing Demands, Changing Directions*. Proceedings ascilite Hobart 2011 (pp. 571-579). http://www.leishman-associates.com.au/ascilite2011/downloads/papers/Hearns-concise.pdf

Karsenti, T., & Collin, S. (2012). Can ICT reduce drop-out rates among new teachers? A qualitative study in Canadian student teachers. In A. Jimoyiannis (Ed.), *Research on e-Learning and ICT in Education*. 95-108: Springer.

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

Molka-Danielsen, J., Mundy, D., Hadjistassou, S., & Stefanelli, C. (2012). Working Towards Good Practice in Virtual Worlds Teaching: Developing a Framework through the Euroversity Project. *Designing the interactive society*. Presented at the Third Scandinavian Conference on is & the 35th IRIS Seminar, Stockholm, Sweden. http://iris.im.uu.se/

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. 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.

Wood, D. and Willems, J. (2012). Responding to the widening participation agenda through improved access to and within 3D virtual learning environments. 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), pp. 459-479.

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Please cite as: Gregory, S., Gregory, B., Hillier, M., Jacka, L., Schutt, S., Ellis, D., Stokes-Thompson, F., Wood, D., Masters, Y., Farley, F., Orwin, L., Stupans, I., Scutter, S., Warren, I., Steel, C., Neuendorf, P., Bower, M., Miller, C., Mathews, S., Butler, D., Hearns, M., Garcia, J., Jegathesan, J.J., Brown, R., Meredith, G., Muir-Cochran, E., Flintoff, K., Grant, S., Atkins, C., Gaukrodger, B., Giovanangeli, A., Le Rossignol, K., Larson, I., Cram, A., Linegar, D., Wang, X., Muir, T., Cleland, B., Paillat, E., Grenfell, J., Hay, L., Gu, N., Anthony Williams, A., Simoff, S., Bogdanovych, A. & McCarthy, A. (2012). Sustaining the future through virtual worlds. In M. Brown, M. Hartnett & T. Stewart (Eds.), Future challenges, sustainable futures. Proceedings ascilite Wellington 2012. (pp.361-368).