What about the firewall? Creating virtual worlds in a public primary school using Sim-on-a-Stick

Abstract

Virtual worlds are highly immersive, engaging and popular computer mediated environments being explored by children and adults. Why then aren't more teachers using virtual worlds in the classroom with primary and secondary school students? Reasons often cited are the learning required to master the technology, low-end graphics cards, poor connectivity and the firewall. A solution to one of these barriers is to use a virtual world that can operate inside the firewall locally on school computers. The virtual world Sim-on-a-Stick provides a four region virtual world on a USB flash drive that is free and fully functional without accessing a network. Sim-on-a-Stick was used in a public primary school in regional Australia during term one 2012. This paper presents a case study outlining the implementation and integration of virtual worlds by a pre-service teacher, classroom teacher and her class.

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INTRODUCTION

Virtual worlds are computer mediated 3D immersive environments in which participants can interact with objects, their surroundings and each other using both asynchronous and synchronous communication media through the use of an avatar. Educational institutions internationally (Kirriemuir, 2010; Warburton, 2009) and nationally (Albion, 2008; Dalgarno, Lee, Carlson, Gregory, & Tynan, 2010; Gregory et al., 2011) have introduced virtual worlds into their courses in a bid to cater for the shift in student demographics and demands. Savin-Baden (2011, p. 7) provides some reasons why virtual worlds are useful in higher education:

- experimentation can occur in ways that are not possible in real life;
- opportunities to develop communities, create trust and increase the sense of 'presence' in learning (especially in relation to distance education);
- opportunities to play with roles and identity; and
- activities tend not to have real life consequences.

These reasons are equally applicable to the use of virtual worlds in K-12 education. Importantly for educators in K-12 is the increasing use of virtual worlds by children outside of the classroom. There are currently over 200 virtual worlds (KZero, 2012) that can be accessed either through a web browser or a dedicated application with 1.7 billion users worldwide; the largest growing sector of users are 10-15 year olds. Virtual worlds that are user content created such as Second Life are made up of a collection of sims (also known as regions or islands) which in the case of Second Life number over 30,000. It is in these user content creation virtual worlds (Second Life, Reaction Grid and OpenSimulator) that many educational institutions have developed their own virtual world sims. Higher education institutions have primarily used the virtual world Second Life because it provides a mature, stable platform with many ready made objects available on the SL marketplace. K-12 educators are more limited in their choice of virtual world platforms due to age restrictions in worlds such as Second Life and tightly controlled Internet access put in place by School Departments of Education. The alternative for K-12 educators is to either create a virtual world using OpenSimulator software and host it on their own school server or to use a stand alone application such as Sim-on-a-Stick.

NSW Department of Education schools, like many state run schools in Australia, have a firewall to protect the children from "..people and bots trying to infect or get unauthorised access to [their] computer" (NSW Department of Education and Communities, 2012). In trying to protect children the firewall also restricts a number of applications from being able to run effectively or at all. Due to the restricted access to virtual worlds Sim-on-a-Stick was trialled at a regional public primary school in term one, 2012. This paper discusses the process and reflections of a pre-service teacher and her university mentor as they promote, develop and support the use of Sim-on-a-Stick.

Background

At Southern Cross University (http://www.scu.edu.au) pre-service teachers have been introduced to virtual worlds as an emerging technology with the capacity to provide creative and engaging experiences for students across all age groups. The virtual world of Second Life was first introduced in 2010 as part of the curriculum specialisation subject for visual arts teachers, a subject undertaken by students in the Graduate Diploma of Education (Secondary). In 2011, Second Life was offered as a learning site to students across a further seven subjects. In the science and technology subject 16 students elected to create a sustainable design project in Second Life (Jacka, Logan and Ellis, 2011). One of the 16 students continued to use virtual worlds in her other subjects throughout 2011. In 2012 the same student worked voluntarily at a local public primary school with children in a year 5 class (11 year olds). She introduced virtual worlds to the children and the classroom teacher through the use of Sim-on-a-Stick

Sim-on-a-Stick is a virtual world that can be run from a USB thumb drive. The virtual world is based on the OpenSimulator platform which is "an open source multi-platform, multi-user 3D application server" (OpenSimulator Wiki, 2012). The capacity to run OpenSimulator from a USB stick has been developed by a group of people dedicated to providing access to open source virtual worlds. OpenSimulator virtual worlds have similar characteristics to other content creation virtual worlds such as Second Life. One of the main differences is that they can be hosted on local servers making them ideal environments for schools. Sim-on-a-Stick goes one step further in that it works without needing a hosted server because the database technology resides on the USB stick and uses MySQL. When the user first enters Sim-on-a-Stick they are provided with 4 flat regions on which they can build. If the user requires a ready-made environment they can load OAR files (OpenSim Archives) that are available freely from a number of OpenSim creators. When a teacher or student has built an environment or objects that they wish to share they can export their builds to be imported into other users sims. All of the importing and exporting features of Sim-on-a-Stick are free.

A significant reason for choosing to use Sim-on-a-Stick in schools, particularly those with a low socio-economic profile (eg: State run and funded schools in Australia) is the ability to run the virtual world without requiring skills, funds or access to set up a school dedicated server for

OpenSimulator. Furthermore Sim-on-a-Stick can be used inside the school firewall.

Virtual Worlds for learning

The use of virtual worlds in education has increased since the launch of the commercially available virtual world Second Life in 2003. This is evident in the scoping studies conducted in the UK (Kirriemuir, 2010), Australia (Gregory et al., 2011) and the US (Kelton, 2008). These studies have concentrated on higher education however there is evidence to suggest that K-12 teachers are implementing virtual worlds as part of their teaching. The interest and use by K-12 educators is reflected in educators' websites, blogs and contributions to virtual world conferences such as Virtual World Best Practice in Education. Unfortunately very few reports have been made in the academic literature (Dickey, 2011). Virtual worlds that have set scenarios for children to interact with such as Quest Atlantis and River City have proved popular with K-12 teachers as they are relatively easy to implement with ready made links to syllabi. However, most content creation virtual worlds such as OpenSimulator and Second Life require a higher level of commitment from the teacher. Prensky's (2010, p. 149) findings that "… students are incredibly eager to create, and don't get nearly enough opportunities to do so" reminds us of the importance of implementing ways to provide content creation opportunities for students such that virtual worlds facilitate.

The virtual world that was used for this project is a content creation virtual world that can be run from a USB stick – Sim-on-a-Stick. While it appears to be gaining in popularity through the dedicated online community there is very little literature about its use in education. There are a few people who are driving the dissemination of the Sim-on-a-Stick software mainly through the iliveisl blog (http://iliveisl.com) and the Sim-on-a-Stick website (http://www.simonastick.com). Sim-on-a-Stick is based on OpenSimulator and there are some references to OpenSimulator being used in the K-12 classroom (Cram, Hedberg, Lumkin, & Eade, 2010) however the main literature in relation to content creation virtual worlds in K-12 education is in the use of Second Life (Johnson & Levine, 2008) and Teen Second Life (Twining, 2009). Schutt, Martino and Linegar at al (2009) documented their struggle to implement virtual worlds in a government secondary school starting with Teen Second Life and eventually teaming up with a private school through the Skoolaborate project on the main Second Life grid. He goes on to describe how they began to develop their own OpenSim environment due to the barriers accessing a proprietary controlled virtual world. Schools currently using OpenSimulator who are documenting their activities on school websites and blogs include these Independent schools: Northern Beaches Christian College (Sydney, Australia), China International Schools (Beijing, China), Gaelscoil Eoghain uí Thuairisc (Carlow, Ireland) and the Elizabeth Morrow School (New Jersey, USA). A small number of NSW Department of Education schools have had access to OpenSimulator virtual worlds through collaboration with Macquarie University (Cram et al., 2010).

Methodology

Over the 11 weeks of term one 2012, 22 students aged between 10-12 used Sim-on-a-Stick as part of their regular school work at a regional public school in Northern NSW. A pre-service teacher who had volunteered to work at the school one day a week supported the classroom teacher. The pre-service teacher had 12 months experience using virtual worlds, primarily Second Life, but she had not utilised virtual worlds in a K-12 classroom. The classroom teacher agreed to use Sim-on-a-Stick as part of the projects the class were doing in the Key Learning Areas (KLAs) of Human Society and its Environments (HSIE) and Science and Technology. Throughout the term the pre-service teacher maintained a blog (http://coffsharbourpublicschool.edublogs.org/virtual-worlds/) to record the virtual world activities and the students' reactions to working in Sim-on-a-Stick.

The data for this paper has been collected from the blog entries, personal correspondence between the pre-service teacher and her university mentor as well as personal conversations with both the principal and the classroom teacher. A case study approach has been adopted that records and reflects upon the interaction between students, teachers and a new technology. The reflections made by the classroom teacher, students, university mentor and pre-service teacher will be used to inform the use of virtual worlds that will continue throughout 2012.

Implementing the use of Sim-on-a-Stick

At the beginning of 2012 before the start of term one of the NSW school year the pre-service teacher and her university mentor worked together to test Sim-on-a-Stick in a variety of situations. The initial download and set up worked on the Windows platform of their personal computers. The pre-service teacher proceeded to test it on the computer in the university computer labs and finally in the NSW Department of Education school. During one of the planning days at the school the pre-service teacher tried Sim-on-a-Stick on one of the school computers. Fortunately a number of teachers witnessed the virtual world set up and immediately asked the pre-service teacher if she would come and work with their classes. Both the pre-service teacher and university mentor were surprised by the excitement that Sim-on-a-Stick immediately generated.

The pre-service teacher agreed to work with one class of year 5 students and the first 2 weeks of the term were spent introducing the children and the classroom teacher to Sim-on-a-Stick from the set up to the possibilities for creating their own environments. Before the children could work on their own virtual world sim the pre-service teacher had to load the Sim-on-a-Stick application onto each of their USB sticks (22 in total). She also put information on the school blog to inform the parents about virtual worlds, an introduction to how she became involved and how the parents could do their own set up at home if they wanted to.

During the very first lesson with the children she talked to them about building. She showed them the use of tension, gravity, wind, 3D geometric solids, coordinates, textures, movement and terraforming. The children were then given the opportunity to explore and experiment with the building tools. She chose not to give them direct "how to" instructions instead she allowed them to learn experientially. Her blog entry for this first experience shows the depth at which the children were immediately immersed and learning in a variety of ways.

> *"It was amazing to watch the depth of engagement, learning, problem solving and collaboration that the students displayed. It was even more incredible to discover how quickly they picked up the skills using the complex bank of building tools connected to this program. One child was creating buildings, lining up objects (prims) and creating a sewerage system. Another child immediately edited his avatar and worked out how to twist and apply textures. One girl thoughtfully selected her shapes and manipulated them by hollowing and shearing; she also chose to build underwater. Another girl had created trees, grasslands and changed her avatars hair colour to black and commenced building and terraforming the land. One child was building a walkway around one island. He had to work out how he could connect his prims and ensure they were all the same height so that he did not have to fly from one level to another. He also colour coded each prim so he could see that the edges connected and there were no gaps to fall into. Another child was determined to build underwater and very quickly was able to pick up on the programs applications. She stretched and made her prims*

'phantom' which meant you could walk, run or fly through them. She was also able to make them flexible so that they moved according to the settings she had programmed into them. Wow! The principal dropped in to see what they had been doing and loved all the work they had completed…somehow the children didn't realise that they had been working!" (Booth, 2012a)

Supporting the projects

The pre-service teacher spent one day a week with the children. Depending on how motivated the children were they spent approximately 1 to 4 hours a week working in their virtual world. To support the children's' building in the virtual world the pre-service teacher showed them builds from the virtual world of Second Life. She was unable to take them directly into Second Life instead she took screen shots and displayed them on the interactive white board. She observed that the children were able to translate the 2D screen shot from Second Life into the 3D worlds that they were creating. After showing the children an image of the Eye of the Storm created in Second Life by an experienced builder the children created their own storm tunnels as can be seen in Figure 1.

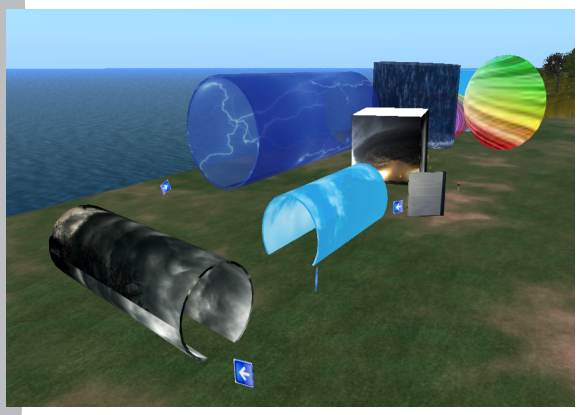

Figure 1: The 'Storm' build inspired by Douglas Story & Desdemona Enfield's immersive art experience 'StormEye'.

The pre-service teacher found examples for the children and provided them with support as they needed it. Her blog entries kept the children and the school community in touch with other users of virtual worlds and a community of interested education users of virtual worlds developed, all closely following what the children at the school were doing. The children knew that they could use the school blog to ask the pre-service teacher for help when she wasn't at school and that the university mentor was also available to support them and the pre-service teacher. As the term progressed the children became the experts and were helping each other. In response to one particular student taking on an expert role the pre-service teacher commented on the blog " … you are a star as you are always there magically assisting anyone who needs help and I have never asked you to do this." (Booth, 2012b)

On the one day of the week that the pre-service teacher was at the school she facilitated a lunchtime library club for virtual worlds. The intention was to give children not in the designated virtual world class an opportunity to participate and to increase the time she was able to spend with the children. A comment from the blog about the lunchtime club reveals the enthusiasm that the students had about Sim-on-a-Stick:

"Every computer was being used by students who were exploring and problem solving as they worked through the application. I am always amazed at how engaged the students are and this is their lunchtime…awesome! I can see the potential of this program and what is great about Thursdays Library Club is that everyone can get a chance to use it." (Booth, 2012b)

Supporting the projects

Once the children had mastered some basic skills and the principal and classroom teacher had committed to the potential of the virtual world it was time to explicitly link the use of the technology to the activities in the classroom. The classroom teacher and the pre-service teacher decided to use the virtual world in the KLAs of Science and Technology and HSIE. The children were put into 5 groups chosen by the classroom teacher. Two of the groups worked on a Science project about weather and the other 3 worked on a Global Connections project for HSIE. The children worked in groups of about 4 but they worked on individual USB sticks so much of the collaboration occurred in discussion outside of the virtual world. At the end of the term a multi-user Sim-on-a-Stick was implemented as a place that all of the created builds could be put together. The pre-service teacher was able to export all of the objects that the children had built in their own worlds and import them into one collective multi-user world.

Two of the groups built huts and a mosque representing a Nairobi village where some of the children are from (Figure 2). The children from Nairobi were able to include many aspects of their own culture and became the experts as they helped other children. Subsequently these builds were used by the pre-service teacher as part of an assignment she completed for her university degree. She uploaded the children's builds into Second Life. In doing this, an audience that includes pre-service teachers, lecturers and students from other countries have been able to view the children's builds. The children have been able to see, through a screen recording of the space in Second Life, that their work has value outside of their own classroom as the education community has appreciated it.

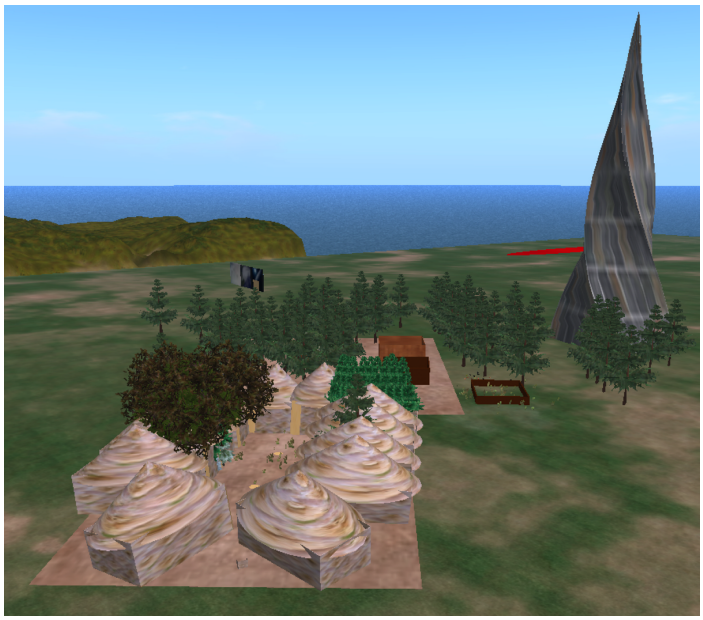

Figure 2: The Nairobi village showing the huts in the foreground and the mosque spiraling to the sky in the background.

The other three groups were focusing on weather as part of the Science subject. They designed a tsunami, earthquake and a storm. The children who modeled their storm on the 'eye of the storm' project were unable to animate in the way that the more technically advanced builders in Second Life had instead they used their problem solving skills and designed a series of 5 tunnels each becoming increasingly stormy in the imagery. They also considered the users and added arrows to point the way around the tunnels (Figure 3). One of the children scanned a piece of written

work from her workbook and placed it on a board next to the entrance of the tunnel to tell the user what the build was about. Similarly the tsunami was created using a cylinder placed next to a beach (Figure 4). While not an active animated tsunami (as is possible with more advanced building and scripting skills) the intention is quite clear and provided a representation that the children were intensely proud of. One child from the tsunami group commented, "I love [Sim-on-a-Stick] because there are endless possibilities to what you can do. You can defy the laws of physics."

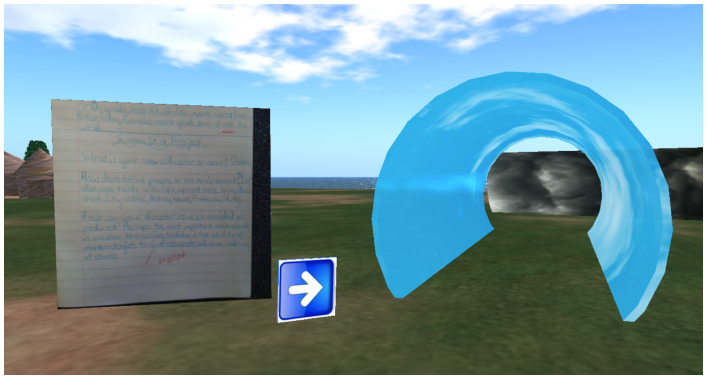

Figure 3: One of the Storm tunnels with an information board on the left and an arrow to indicate correct navigation.

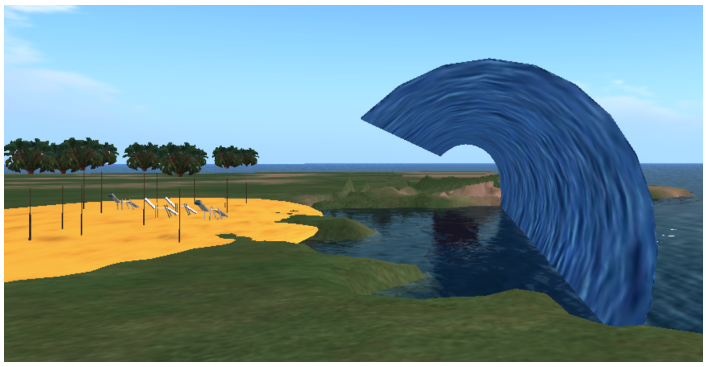

Figure 4: The tsunami wave threatens the peaceful beach.

Links to the syllabus

Importantly for the introduction of any new technology is the capacity for the projects in which the technology is being integrated to link to the syllabus. Without clear connections to the outcomes that the teachers are required to report on to the principal, parents and state education department many teachers are reluctant to integrate new technology. At the end of the term the classroom teacher observed and identified a number of syllabus outcomes in the work that the children had created in Sim-on-a-Stick and during the process of creation. These are outlined in table one and two.

Observations

Prensky (2010, p. 45) suggests that the skills of "thinking critically, presenting logically, communicating, making decisions, being rigorous, understanding content and context and persuading" are essential skills that we want our students to learn, practice and master and are not reliant on a particular content area. Importantly he recommends that these skills don't change but rather the tools change from books and essays to powerpoint and youtube. Many of these skills were observed in the children using Sim-on-a-Stick. These are skills that weren't so easily observed before the children were engaged in the virtual world activities. Children who had been struggling with class work eagerly spent lunch and recess working on their buildings in the virtual world. In a very short period of time they developed skills to help them build and navigate the virtual world and to become experts in something that was valued by their peers, their teacher and their principal. Noteworthy was the confidence that the non English speaking background children developed as they became the experts about the content and design for the Nairobi village. They advised the other children on what was authentic in terms of creating a Nairobi village

Table 1: Links to NSW HSIE syllabus

NSW Syllabus Area: Human Society and its Environment Stage 3 **Theme:** Global Connections
Virtual World artefacts: 2 Groups - A variety of huts based on their home village in Nairobi
Syllabus Outcomes: SSS3.7 Describes how Australian people, systems and communities are globally interconnected and recognises global responsibilities.
Indicators: ~ Describes how, and gives reasons why, Australia is interdependent with other nations. ~ Explains the ways in which technologies and systems assist global interconnections, including global communication systems. ~ Identifies human rights and how these are respected, and situations when they are not respected, in Australia and the world. ~ Describes universal human needs and the efforts of organisations in meeting these needs, eg United Nations, Red Cross. ~ Makes statements about global responsibilities
Links to other Key Learning Areas: **English:** The structure and language features of the text types students create and interpret. **Science and Technology:** Content from the Information and Communications strand.

Table 2: Links to NSW Science and Technology syllabus

NSW Syllabus Area: Science and Technology Stage 3 **Theme:** Weather
Virtual World artefacts: 3 Groups - Tsunami, Storm and Hurrican
Syllabus Outcomes: INV S3.7: Conducts their own investigations and makes judgments based on the results of observing, questioning, planning, predicting, testing, collecting, recording and analysing data, and drawing conclusions. DM S3.8: Develops and resolves a design task by planning, implementing, managing and evaluating design processes. UT S3.9: Evaluates, selects and uses a range of equipment, computer-based technology, materials and other resources to meet the requirements and constraints of investigating and designing tasks. ES S3.6: Recognises that the Earth is the source of most materials and resources, and describes phenomena and processes, both natural and human, that form and change the Earth over time.
Indicators: ~ Researches information on the causes and effects of catastrophic events such as earthquakes and cyclones. ~ Devises a VW to simulate the effects of significant events. ~ Works collaboratively to design and produce a VW based on factual knowledge of catastrophic events.
Links to other Key Learning Areas: **English:** Demonstrating ways of taking notes from an address by guest speaker or during an excursion. Exploring the purpose and features of written explanations. Jointly constructing explanations of natural phenomena. **Mathematics:** Exploring aspects of position, focusing on mapping. Measuring temperature, volume and wind speed using both formal and informal units. **Human Society and its Environment:** Investigating the influences of natural phenomena on lifestyles and environments as part of cultural study on a current affairs issue.

as they replicated aspects of their own culture. The sense of pride they were able to display to the rest of the class permeated the transference of acceptance and understanding throughout the class and truly exemplified the theme of Global Connections.

Conclusion

What was undertaken with this project is similar to other projects that have implemented virtual worlds in education. One of the main differences is that this project occurred in a regional public primary school using a content creation virtual world that could run on a network protected by a firewall. Using Sim-on-a-Stick gave this group of children the opportunity to discover ways to communicate ideas and be engaged in learning that they previously had not encountered. In term one 2012 it was a proof of concept in terms of the ease of use and the engagement of the children and the school community. As a result Sim-on-a-Stick will continue to be used in 2012 by this class and a number of other classes. The university has also started to implement the use of Sim-on-a-Stick with more of the pre-service teachers in a bid to introduce virtual worlds into all schools. A comment on the pre-service teacher's blog sums up the experience "Sim-on-a-stick isn't perfect but for now it is the only way we can access this type of technology at the school and we are having a brilliant time being innovative with its applications." (Booth, 2012c)

Addendum

Since the writing of this paper in early 2012 the pre-service teacher has used sim-on-a-stick with 5 more classes at Coffs Harbour Public School. She has also introduced it at another 2 local public schools. The university mentor has implemented the use of sim-on-a-stick with 2 classes at her local public school including students in kindergarten aged 5. Two more pre-service teachers from SCU have worked with classes in their local public schools using sim-on-a-stick. A website has been developed to curate sim-on-a-stick examples and resources for education at http://simonastickedu.com.

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References

Albion, P. (2008). *3D online spaces for teacher education: Mapping the territory*. Paper presented at the Society for Information Technology & Teacher Education International Conference 2008, Las Vegas, Nevada, USA. Retrieved from http://www.editlib.org/p/27423

Booth, K. (2012a) [blog] 5M discover a virtual world simonastick retrieved from (http://coffsharbourpublicschool.edublogs.org/2012/02/09/5m-discover-a-virtual-world-simonastick/)

Booth, K. (2012b) [blog] Virtual world library club is crazy retrieved from http://coffsharbourpublicschool.edublogs.org/2012/03/09/virtual-world-library-club-is-crazy/

Booth, K. (2012c) [blog] HSIE and Science projects using sim-on-a-stick: Virtual world technology retrieved from http://coffsharbourpublicschool.edublogs.org/2012/03/23/hsie-and-science-projects-using-sim-on-a-stick/

Cram, A., Hedberg, J., Lumkin, K., & Eade, J. (2010). *Learning through design and construction in multi-user virtual environments: Opportunities, challenges and an emerging project*. Paper presented at the Global Learn Asia Pacific 2010, Penang, Malaysia. Retrieved from http://www.editlib.org/p/34325

Dalgarno, B., Lee, M. J. W., Carlson, L., Gregory, S., & Tynan, B. (2010). 3D immersive virtual worlds in higher education: An Australian and New Zealand scoping study. In C. H. Steel, M. J. Keppell, P. Gerbic, & S. Housego (Eds.), *Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010* (pp. 269-280). Brisbane, Qld.: The University of Queensland.

Dickey, M. D. (2011). The pragmatics of virtual worlds for K-12 educators: investigating the affordances and constraints of ActiveWorlds and SecondLife with K-12 in-service teachers. *Educational technology research and development*, 59(1), 1-20.

Gregory, B., Gregory, S., Wood, D., Masters, Y., Hillier, M., Stokes-Thompson, F., et al. (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. 475-490). Hobart, Tasmania: University of Tasmania.

Holmes, J. (2007). Designing agents to support learning by explaining. *Computers & Education, 48*(4), 523-547.

Jacka, L., Logan, M., & Elllis, A. (2011). *Facilitating creativity in pre-service teacher education courses through their engagement in virtual worlds*. Middlesbrough, UK.

Johnson, L. F., & Levine, A. H. (2008). Virtual Worlds: Inherently Immersive, Highly Social Learning Spaces. *Theory Into Practice, 47*(2), 161 - 170.

Kelton, A. (2008). Virtual Worlds?" Outlook Good". *Educause Review, 43*(5), 15-22.

Kirriemuir, J. (2010). UK university and college technical support for "Second Life" developers and users. *Educational Research, 52*(2), 215 - 227.

KZero. (2012). *Virtual World registered accounts reach 1.7bn in Q4 2011*. Retrieved from http://www.kzero.co.uk/blog/

NSW Department of Education and Communities (2012). *School a to z - Practical help for parents*. Retrieved April 22, 2012 from http://www.schoolatoz.nsw.edu.au/technology/technology-az/-/technology_glossary/7w0F/4584/Firewall

OpenSimulator Wiki (2012). *What is OpenSimulator?* Retrieved April 4, 2012 from http://opensimulator.org/wiki/Main_Page

Prensky, M. (2010). *Teaching digital natives: Partnering for real learning:* Corwin Press.

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

Schutt, S., Martino, J., & Linegar, D. (2009). *Navigating the labyrinth: the technical trials and misadventures of bringing virtual worlds into a government secondary school*. ACM.

Twining, P. (2009). Exploring the educational potential of virtual worlds - Some reflections from the SPP. *British Journal of Educational Technology, 40*(3), 496-514.

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.

Authors Note

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Lisa is a passionate advocate for integrating new technologies in all curriculum areas for K-12 and higher education. She has a background in visual arts and has worked in media organisations as well as the education sector. Her current role is in the school of education at Southern Cross University, Lismore, NSW where she lectures across a range of subject areas including new media, emerging pedagogies, instructional design and educational technologies. Her current research includes investigating teaching and learning in virtual worlds for pre-service teacher education. Lisa hosts the higher degree by research virtual worlds working group on SCU Education Research Island in Second Life.

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Kate is in her final year of a Bachelor Education (Primary) degree at Southern Cross University, Coffs Harbour, NSW. Previously she worked in early childhood which included 8 years at the Casuarina Steiner School in Coffs Harbour. In 2011 Kate enthusiastically embraced the use of virtual worlds in education. With the support of her mentor, Lisa Jacka, she has implemented innovative ICT experiences for students at three NSW Department of Education schools in Coffs Harbour, NSW. Kate was the only pre-service teacher to be accepted as a highly accomplished ICT educator with the education network and professional development program PLANE. Her knowledge about the use of virtual worlds in the classroom is much sought after worldwide.