Using virtual worlds in rural and regional educational institutions

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Abstract

Four academics from two regional and two metropolitan Australian universities present how they have used local and internationally based virtual worlds in rural and remote locations to engage and motivate their students. Outlined are ideas that can assist rural educators to utilise virtual worlds in teaching and learning along with some solutions to difficulties they may encounter. The discussion will include several virtual world implementation models and how to become globally connected in their teaching practice via this medium.

Introduction

Three dimension (3D) virtual worlds have been used as an educational tool in universities for over a decade, with one of the most popular, Second Life, having been opened to the public in 2003 (Linden Research, 2008). The four academics who have outlined how they use virtual worlds in their teaching and learning use a variety of virtual worlds, all began their teaching using Second Life. In 2010 Second Life removed educational discounts to universities (Nelson, 2010) and therefore many universities began exploring other options. Two of the authors of this article still use Second Life and two use other virtual worlds, such as Sim-on-a-Stick (SOAS), Minecraft and OpenSim. How these institutions have overcome the hurdles of using virtual worlds as a teaching and learning tool, particularly to remote and rural students are discussed and ideas on how to use a virtual world to provide a globally connected community are addressed.

Background and context

The authors are academics at Australian universities, two regional, the University of New England (UNE) in Armidale and Southern Cross University (SCU) in Lismore and two metropolitan, University of Queensland (USQ) in Brisbane and Monash University (Monash) in Melbourne. All authors have been teaching in virtual worlds for a number of years and have developed their own spaces for their students in which to learn. All authors have come together as part of the Australian and New Zealand Virtual Worlds Working Group where they regularly discuss ways of teaching and learning in virtual worlds and share ideas and resources.

Review of the literature

Inequities exist between the types of educational experiences available to students in rural, regional and remote areas compared to students in urban and metropolitan areas (Lyons, Cooksey, Panizzon, Parnell, & Pegg, 2006). The recurrent issues effecting rural students are access to educational institutions and curriculum options, financial constraints (higher rate of low socio-economic groups) and attitudes about the importance of education (Alloway, Gilbert, Gilbert, & Muspratt, 2004; Drummond, Halsey, & van Breda, 2011; O Riordan, Adam, & O'Reilly, 2009). Alloway et al. (2004) noted that these differences can significantly impact on the types of aspirations and expectations that rural students have in relation to what they can achieve post-secondary school. From their research they found that Information Communication Technologies (ICTs) had the capacity to change the outcomes for students as while they were "physically and geographically isolated, the introduction of ICTs meant

that students in rural and remote areas shared many experiences with their metropolitan counterparts; they were more connected than they had been in the past" (p. 241). However, the ability to provide ICTs that connect students means the appropriate infrastructure must be in place (Bell, 2010; Drummond et al., 2011). Bell (2010) noted from her study of rural, indigenous, urban and metropolitan communities in South Australia that the high level of use of the Internet "requires downloads and uploads which quickly eat into service plans and contracts. The slowness of connection affects people in rural, regional and remote communities as does operating behind various kinds of firewalls, including those provided to schools (p. 17)."

One of the ways to begin to reduce these inequities is to facilitate immersive ICTs such as virtual worlds that create the same affordance as face-to-face learning experiences. New virtual worlds are appearing daily and it is difficult to keep up with the technology of the 'latest and greatest'. Second Life is still the most popular of virtual worlds (Dalgarno, Gregory, Carlson, Lee & Tynan, 2013). All four institutions reported in this article have used, or are still using, Second Life as a teaching and learning tool. However, exploration has begun to find other virtual worlds that are a better fit for the different institutions. With the emergence of tools such as the Oculus Rift, immersion in learning is taking on a whole new meaning. The Oculus Rift, a head mounted display, can provide "very real, almost perfect" virtual world experiences (Reiners, Wood, Gregory, Petter, Teräs, Chang, Gütl, Herrington, 2013, p. 740). Educational institutions are only just beginning to explore the use of this type of technology with their students. However, virtual worlds, with addition of head mounted displays and other wearable technology, are providing authentic learning experiences for students.

Use of virtual worlds at the University of New England

The University of New England is a regional university in Australia offering courses in face-to-face (on-campus), external (online) and blended delivery modes. UNE is located in Armidale, NSW. It currently has around 22,000 students, on-campus and online. The student cohort is approximately 80% online and 20% on-campus (UNE, 2013). The majority, 71%, of students at UNE reside in rural and regional locations, with 22% from metropolitan locations and 6% from overseas.

Within the School of Education, the number of online students is higher, with 88% of students opting to learn by accessing materials through Moodle, an online Learning Management System (LMS) (McGarry, 2014). On-campus students attend lectures, workshops and tutorials but also access their learning materials online through a blended approach to learning.

A virtual space in Second Life was created in 2007 for education students at UNE to use as a teaching and learning tool so that students could participate in virtual world activities. Since 2008, 691 students (312 voluntary and 379 compulsory) have participated in these activities. All students were enrolled in an education course at UNE. The voluntary students were those students who were studying online and living off-campus. They were enrolled in a variety of ICT units (subjects) and courses at UNE, participating in virtual world activities together. The compulsory participation group were on-campus students who were undertaking virtual world workshops in a computer laboratory. The compulsory participation was by students enrolled in a Bachelor of Education (Primary) course and studying in either a first year ICT or teaching and learning unit. The activities that these students participated in consisted of discussions, attending guest international lectures, virtual tours, participation in role-play activities, learning basic building and scripting techniques and web quests. The voluntary participation group had to access the virtual world from their own home and computer and mostly resided in locations of less than 18,000 people (51%). Figure 1 provides a breakdown of the students who participated in virtual world activities on a voluntary basis.

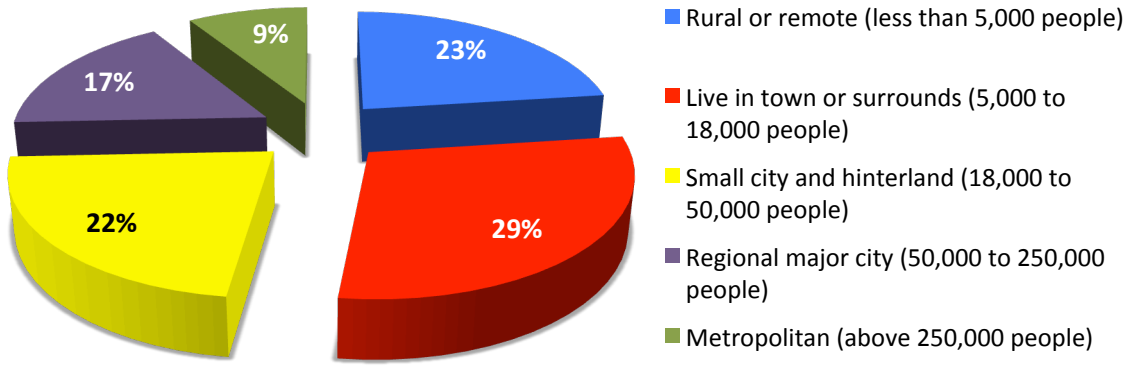

Figure 1: Breakdown of voluntary student's location of residence during the semester

Students at UNE who participated in virtual world activities met in one of two Second Life spaces, Education Online Headquarters or Australis 4 Learning. Education Online Headquarters was developed in 2007 but as the numbers of students who wished to participate increased, Australis 4 Learning was created, enabling more students to be in the one place in Second Life at the one time. Figure 2 provides some images demonstrating how Second Life is used as a teaching and learning tool at UNE in the School of Education.

On Australis 4 Learning, the space that is used more often at UNE, there are six classrooms, a pharmacy, a hospital, and a computer business. The classrooms are used for various lessons in education at UNE, whilst the pharmacy, hospital and computer business are used to make machinima (video taken in the virtual world) providing teaching and learning resources.

A virtual world provides a space where students can come together to learn, from their own home. The students perceive their learning in the virtual world to be just like 'face-to-face' and feel that they are really there, with the lecturer and peers. As one student remarked: "I had a defining experience last week when we sat down in that open-air lecture space and I sat on one side and the rest of you sat on the other side. Suddenly I felt lonely and, without thinking, got up and moved to where you were all sitting. And then, I thought, that felt so real!" (Student feedback, 2008).

There has been much written on the affordance of teaching and learning using a virtual world at UNE. Two authors from the School of Education, one from Pharmacy School and one from UNE Business School have shared their experiences of using a virtual world with their students. (Please see, for more information and results: Gregory, Gregory, & Gregory, 2013; S. Gregory & Masters, 2012; S. Gregory et al., 2012, 2013; Masters & Gregory, 2011).

UNE is well-placed to provide immersive learning through a virtual world to students who are located in rural and remote locations. With 51% of students participating in voluntary virtual world activities located in locations of less than 18,000 people, it is providing them with a way in which to connect with their peers and to engage in their learning that, until recently, hasn't been available. To date, of the students who have participated in voluntary virtual world activities, it has been rare that they haven't been able to fully immerse themselves in their learning due to technical difficulties. This is because, prior to attending these activities, students are asked not to attend if they haven't been able to log on, or that the environment hasn't rezzed (come into focus) as it was felt by this author that students had to have a good experience or not one at all. This hasn't precluded many students. As UNE predominantly has online students, they usually have the capability of using the software and the Internet connection to be able to undertake this form of study. However, this is not always the case for students and outlined later in this article are ways of overcoming this.

Figure 2: Virtual world teaching and learning activities underway in Second Life at Australis 4 Learning and Education Online Headquarters at UNE

Use of virtual worlds at Southern Cross University

Southern Cross University is a regional, multi-campus university in Australia that offers courses in face-to-face, external and blended delivery modes. The three main campuses are located at Lismore, Coffs Harbour and the Gold Coast. It currently has around 16,000 students, internal and external or with one of the university's educational collaborators. The student cohort is approximately 30% external and around 20% school leavers, 23% are low socio-economic status (SES) and 3.4% indigenous (SCU, 2010).

The virtual world of Second Life was first used at SCU in 2009 when Ellis, Hassett, and Rowe (2009) received an innovation grant to develop a virtual campus for use by SCU staff and students. The first SCU virtual campus in Second Life was called Interaction Island. It was designed to look similar to the Lismore campus, in the physical world, and was initially only accessible to staff and students who registered to enter the environment. The intention was "to encourage staff to explore the next phase of the Internet-based information and communications technology revolution – virtual worlds" (DiscoverSCU, 2009, online) through interaction with the platform, objects and other users.

Second Life was chosen by SCU as it offered a stable and mature platform with a marketplace from which ready-made objects could be purchased as well as an extensive network of pre-existing communities and simulation resources suitable for teaching and learning. SCU added two more islands in 2010/2011 - Commerce Town, which had a series of businesses situated around one main street designed primarily for the Business School and Tourism and Hospitality Management; and DBA Island for the Doctor of Business Administration (DBA) program that included domestic and international students. In 2012 the DBA Island was repurposed to be used by the School of Education. Since 2011 the School of Education has been the most active school in the university to utilise virtual worlds. They have utilised Second Life, OpenSim, SOAS and game based worlds such as Minecraft in the development of pre-service teacher's capacity to integrate innovative technology for their future practice.

The first use of virtual worlds by the School of Education was in the Bachelor of Education (Secondary) degree program during the trialling of a university wide project to offer a variety of study options to students (Jacka & Ellis, 2010). The unit in which Second Life was used was the first of two units that the students undertook in preparation for teaching specialist visual arts in secondary schools in NSW, Australia. This was the first time that the students had encountered the use of a virtual world in their higher education studies and the first time that the tutor had used a virtual world for teaching. There were two significant outcomes for the students working in virtual worlds in this unit. The first was the ability to interact with each other while physically remote to each other. The students were able to engage in a number of tutorial activities that would have been impossible using other online technologies. The second was the capacity to visit art spaces that had been designed either as simulations of a real space such as the Sistine Chapel or gallery spaces developed by visual artists. One of the students created her own visual arts space and spoke to other overseas artists in her design of learning activities for her future high school students. She made the following statement at the time:

> I was pleased by the endless possibilities that this virtual classroom has to offer. The interaction between the other students and virtual objects is an exciting way to receive this lesson. Our teacher was able to illustrate points visually as well as verbally with minimum effort. This course has the potential to offer unprecedented opportunities for collaboration among artists as well as between artists and audience. Never before has art been capable of such globalised collectivity (student feedback, 2010).

One of the affordances of virtual worlds for rural, regional and remote students is the capacity to experience environments that students from metropolitan areas take for granted such as museums and art galleries. Second Life has a wide range of galleries and artist spaces. For an education student, access to galleries and museums has the capacity to increase their content knowledge and then to pass on to their future primary and high school students. It also provides alternatives for their future students who are most likely to also be in rural, regional and remote areas as spaces to visit.

Since the first use of virtual worlds in 2010 a total of six staff have utilised virtual worlds in a variety of units in the School of Education. There has also been a collaboration between the School of Education and the School of Arts and Social Sciences (for more information see Jacka & Hill, 2013). Students have had the opportunity to take virtual field trips, have tutorial discussions, build projects (see Figure 2), role play (see Figure 3) and to develop teaching and learning resources. The use of Second Life meant that students collaborated with each other regardless of their physical location. The ability to do so provided students, who are otherwise isolated due to their remote location or limited number of students in their on-campus cohort, with the opportunity to meet with their peers and staff in an immersive environment. Through their avatar, they were able to learn the skills of building in a virtual world and discuss the content of their subject. As a result of their building they were able to explore, as though walking through physical space, the concepts that other students had developed.

In 2012, a standalone virtual world, SOAS, was introduced to students at SCU as a way to include virtual worlds in institutions that lacked the capacity to connect to the Internet. Importantly for pre-service teachers is the ability to use technology that works within the confines of the NSW Department of Education technology infrastructure. Since the first use of SOAS, a number of students have utilised the SOAS to respond to activities at SCU and have taken the technology into the primary and secondary schools. One student, who is now working full time as a primary school teacher, demonstrated how virtual worlds could engage students who were otherwise disengaged with school activities. Jacka and Booth (2012) describe the experience of introducing SOAS to young indigenous and refugee children located in a public regional primary school who used virtual worlds to bridge the gap between their past and present experiences.

Figure 3: A student stirs a pot of soup as part of a space created by a university student on SCU Education Island. The space represented a village in Africa with links to the World Food Aid program and included buildings made by Primary school children.

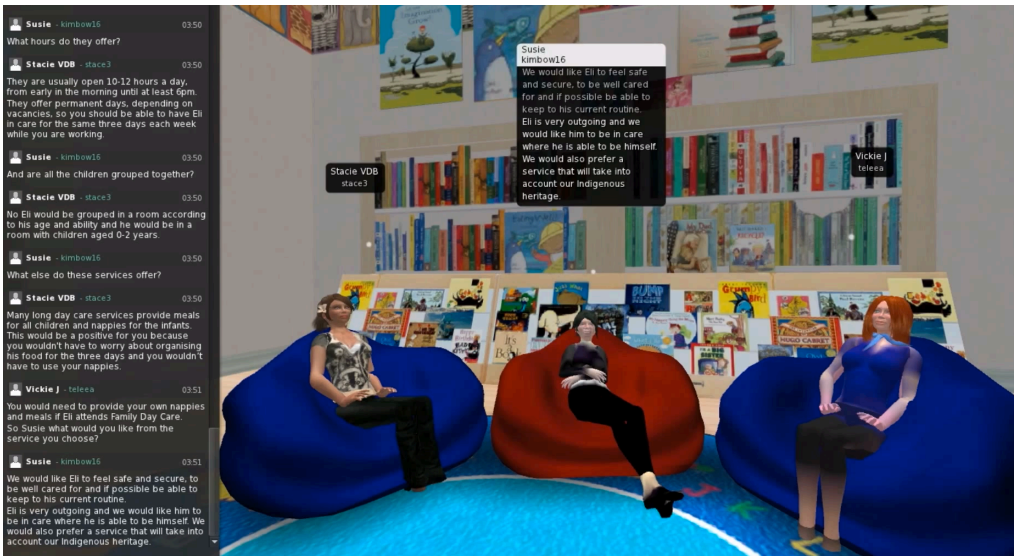

Figure 4: Students undertake a role play activity in which they discuss an Early Childhood Scenario situated in a simulated Early Childhood centre on SCU Education Island.

Use of virtual worlds at the University of Queensland

The University of Queensland is a large 48,000 student, primarily metropolitan based, university with significant cohorts of students who attend the regional Gatton campus and those that engage in distance and remote learning while on placements in regional and remote areas. These include students in such programs as Medicine, Veterinary Science, Environmental Science and Agricultural Science, to name a few. These students are frequently located in areas where Internet connectivity is patchy at best and is often non-existent. Further, UQ has recently joined the EdX consortium to develop a series of massive open online courses (MOOCs) aimed at delivering high quality, technology mediated courses to very large numbers of students both at UQ and from around the world, including those from developing countries, in remote areas and from lower SES backgrounds.

UQ has previously used the virtual world of Second Life as a teaching and learning tool for teaching religious studies through the now defunct 'Religion Bazaar' build in Second Life (Farley, 2008, 2009, 2010). In recent years the use of online virtual worlds such as Second Life has declined as focus and champions have moved elsewhere. However, the use of other virtual worlds have continued on a smaller scale that include Pharmatopia (now based in Unity 3D and run out of Monash University), and 'The Island' an in-house custom virtual world designed for teaching statistics and population health studies.

The problem of delivering such a contemporary learning experience to students located away from the main campuses or those studying in remote areas is a significant issue that still needs to be addressed in order to avoid a widening 'digital divide' between those that are able to take advantage of what MOOCs and digital learning have to offer and those that are 'disconnected'.

Use of virtual worlds at Monash University

Monash University is a large metropolitan multi-campus university. There are currently five campuses in and around the city of Melbourne and two international campuses in Malaysia and South Africa. Monash also has a presence in Italy through the Prato Centre, in India through the IITB Monash Research Academy and in China through the South-East University – Monash Joint Graduate School. Established in 1958, university-wide Monash currently has over 60,000 students enrolled across more than ten academic disciplines. Of these students, just over fifty thousand attend on-campus mode, nearly 6,000 in off-campus mode, and nearly 4,000 in mixed-mode. Chinese Studies is one of the largest language programs at Monash and one of the largest tertiary Chinese language programs in Australia.

Monash first began investigating the use of a range of online multiuser 3D virtual worlds including Second Life, Croquet, Active Worlds, EVE-Online, and Lively as far back as 2007. In recent times this has expanded to OpenSim as well. Early investigation of the teaching and research potential of virtual worlds was carried out by a range of faculties including Arts, Business and Economics, Education, Information Technology, Law, Medicine, and Pharmacy. The Second Life Interest Group (SLIG), made up of academics from a number of different disciplines, was established in 2007. Three key areas involving the long term, ongoing use of virtual worlds/virtual environments and associated research have been Pharmatopia developed by the Monash Faculty of Pharmacy in conjunction with partner universities in Australia, Europe and the USA, Chinese Island, developed by the Chinese Studies program at Monash, and Virtual Prato lead by the Italian Studies program at Monash.

In 2008, the Chinese Studies program established its first presence in Second Life in a small corner of a virtual island shared by a number of other users from around the university. With the idea of providing introductory level Chinese language and culture students with a simulated environment in which to engage in task-based language learning, this initial build included a small Chinese-themed commercial area made up of a fresh produce market, a doctor's clinic, a small shop and a traditional Chinese college. Due to the confined size of the area and inadequate computer hardware only a limited number of lessons were conducted in this first year. As a result, in 2009 the university purchased a second virtual region dedicated to task-based Chinese language learning which was subsequently called Chinese Island. With increased virtual space came the construction of a virtual Chinese township that incorporated a number of venues simulating real life spaces such as a restaurant, a village, a farmer's market, a real estate agency, travel agency, traditional Chinese courtyard house, a train station, an airport, a medical clinic, as well as virtual roads and other basic infrastructure. As well as containing a wide-range of interactive virtual artefacts designed to scaffold language learning and practice, a number of non-character players (NPC) capable of reacting to learner input in the form of Chinese character text-based chat were also placed in a number of the virtual venues. These NPCs act as the main interlocutors with students as they work their way through a range of set tasks that

provide opportunities for students to use language learned in the classroom for purposeful communication in authentic contexts and scenarios. The NPCs and the environment are accessible 24/7 and from any location anywhere in the world where broadband Internet access is available. From 2009 to 2013 approximately one thousand students have participated in lessons on Chinese Island. Six lessons are conducted each year and for the most part learners are co-located in a computer lab on campus (occasionally students who are ill or out of Melbourne for personal reasons attend the classes from outside the computer lab/campus).

For students studying a language like Chinese at introductory level in a foreign language classroom environment (i.e. in a location where the studied language is not commonly spoken), opportunities to practice and use language learned in class for purposeful and meaningful communication within the classroom context are extremely limited given class sizes and limited time. While outside the classroom, such opportunities are often even less easy to come by even on a large multi-cultural campus in a large multi-cultural city like Melbourne. Factors such as time, physical location and even affective factors such as foreign language anxiety that can arise in face-to-face situations (Grant, Huang, & Pasfield-Neofitou, 2013) can make it difficult for learners to find opportunities to interact with native or expert speakers outside the classroom. For students in rural areas studying a language like Chinese such opportunities are even scarcer. There is far less likelihood of easy access to native or expert speakers locally and often even a lack of a community of other students also studying the language.

While clearly not sufficient in themselves, the task-based lessons in Second Life with the NPCs (who are in one sense 'expert speakers') do provide at least some opportunity for context-based practice and for feedback. In 2013, the Chinese Studies program expanded the use of the Chinese Island environment to include two new forms of learning interaction. The first was the addition of task-based lessons on Chinese Island with native-speaker Chinese-as-a-foreign-language educators located at the National Taiwan Normal University (NTNU) using spoken interaction in addition to text-based chat that happened immediately after the NPC-based lessons. As with the NPC-based lessons, the topics and content of the lessons were designed to tie in closely with the textbook used for the unit, but with the addition of further real world elements aimed at activating student's Zone of Proximal Development (ZPD) through interaction with expert native speakers. Lessons plans, tasks and content, and the associated virtual assets needed to carry out the lessons we jointly designed by the NTNU educators in close consultation with the Australian lecturer via regular meetings in Second Life and email. Meetings in Second Life facilitated both discussions about joint testing and refining of the lessons to be implemented. The 150 introductory students (first semester – 90 in second semester) were divided up into small groups of between 4 to 8, with four groups to a lesson and three 1 hour (1.5 hour in second semester) lessons per day over a three day period. After each lesson the Australian and Taiwanese instructors held de-briefing meetings in Second Life aimed at dissecting the lessons, exchanging thoughts about what worked and what didn't and how both the lesson design, the associated pedagogy and implementation could be further refined (Lin, Wang, Grant, Chien, & Lan, 2014). While a number of technical issues did arise during the course of the lessons, with the more experienced Australian instructor troubleshooting at the Australian end, the NTNU instructors were able to focus completely on teaching. Figure 5 provides an image of a lesson in Second Life with Australian and NTNU instructors.

The second new form of learning interaction was the implementation for the first time of flexible off-campus mode for students unable to come to campus for tutorial and seminar classes. This new flexible mode was not actively promoted being the first time it was implemented so only three students participated in each semester. The students watched a video recording of the lecture each week and also did weekly online exercises on Moodle that were auto-corrected. However, whereas their on-campus classmates participated in a one hour tutorial and one hour seminar class each week, the flexible mode students came into Second Life and participated in classes covering the same activities in a virtual classroom on Chinese Island. The classes were conducted using both voice and

text-based chat as well as a number of other virtual teaching aids such as an interactive whiteboard that both instructor and students could write on as required. While much of the early literature on teaching in virtual worlds railed against the recreation of real world classrooms in the virtual environment on the grounds that this was not a good use of the unique affordances of virtual worlds, the replication of a real world classroom and classroom activities was deliberate to ensure that students felt comfortable with the classes, that the same material and activities were covered as in the real classroom, and that the students had a real feeling of belonging to a class group. Other affordances of this online virtual space were in fact also utilised. In first semester, students studying distance education and teaching Chinese as a foreign language at NTNU in Taiwan came along to the inworld classes each week to do some practice teaching. For the NTNU students this was a golden opportunity to work with 'real' 'live' foreign students, something quite rare in their home country. For the Monash students this was a further golden opportunity to interact with native speakers in a semi-structured environment. On a number of occasions the content of the lesson also facilitated the opportunity to visit other regions in Second Life and build the lesson around features of the regions relevant to the topic (for example, a number of regions were visited in relation to the topic of weather). Key assessment (especially written) required attendance at the physical campus, which the flexible mode students had to agree to at the beginning to be eligible to participate, but this was only on six occasions each semester at times that suited the students.

Figure 5: Students participating in language learning at Monash University

In both cases, the borderless connectivity of the Internet and the multiuser virtual environment provided students with rich opportunities for language and communication practice and for receiving feedback, both structured and unstructured.

For students in rural Victoria, particularly in smaller regional towns, learning a foreign language can be challenging. This is even more the case with Chinese which has not traditionally been a widely taught language in these areas. Limited resources, including financial, technical and personnel resources, mean that often language programs are not well supported (Orton et al., 2012). Local attitudes towards the study of foreign languages can also impede student motivation. In one rural school, the Languages Key Learning Area Leader comments that community support for the teaching of foreign languages was about 'fifty-fifty', with many parents feeling that language learning was not practical in their context. A general apathy towards learning languages other than English (LOTE) in Australia has been noted in recent reports. This attitude had a major impact on learner motivation (Dörnyei & Ushioda, 2013). A lack of willingness to learn about other cultures was also cited as another challenging factor (Orton, et al., 2012). Without a surrounding learning community with a critical mass the effect of such attitudes on the motivation of students to take up, let alone continue to learn, a

language like Chinese, is significant. However, the negative effect of these attitudes may be ameliorated by the creation of learning environment that provides micro-motivation effects (good teaching, concrete perceptible sense of achievement, success, etc.) (Lo Bianco & Slaughter, 2009).

Another challenge for students in rural areas is the need to supplement local learning with distance learning. The challenges of establishing networks of language teachers in remote areas means that there is an important role for distance education in language education (Solved_at_McConchie_Pty_Ltd & Australian_Council_of_State_School_Organisations, 2007). A good example of the impact that this can have on a student is David, a learner who did Chinese in Year 12 as part of his study for the Victorian Certificate of Education (VCE) and then while completing an undergraduate degree in biomedical science at Monash studied Chinese up to the highest level offered by the Chinese Studies program (aimed at native speakers). David studied VCE Chinese via correspondence in rural Victoria. He had to make a seven hour round trip using a poor rural transport system or an expensive six hour round trip by private car in order to access the Victorian School of Languages (VSL) for study. Through the VCE years, as an aspiring doctor who needed a high Enter score, David felt much valuable study time was wasted waiting for bus connections. Other key issues he faced included not knowing what level of Chinese to aim for, as he had no peer group support/competition/feedback in class. Contact time with his teacher, who was busy teaching all levels of Chinese in one class, was limited to a maximum of 30 minutes discussion per week. As David commented, many rural schools also have difficulty in retaining Chinese LOTE teachers. Students are often ultimately faced with continuing their studies via distance education with the VSL due to insufficient student numbers and resources at their own school.

VSL offers distance education in a range of languages including Chinese. Currently, teleconferencing is offered to Rowville and Wodonga, and students from rural areas can contact distance educators by phone call once a week or email and this is complemented by hard copy homework sent through land mail (VSL, 2014). There are very few group learning opportunities for rural students. According to Palloff and Pratt (2000, p. 6), “collaborative learning processes assists students to achieve deeper levels of knowledge generated through the creation of shared goals, shared exploration, and a shared process of meaning making”. It is also important to note, as Valentine (2002) states, distance learners also need to feel part of a learning community. As indicated earlier, the borderless connectivity of the multiuser virtual environment of Chinese Island provided Monash’s tertiary level students with rich opportunities for language and communication practice and for receiving feedback, through interaction with the NPCs, NTNU native speakers and with their peers. For students facing the challenges of learning a language like Chinese, the opportunity to join a community of learners from a range of different rural locations that gather, interact and learn in a common virtual space under the guidance of a network of teachers could provide a means to overcome some of these challenges.

The possible use of virtual worlds and virtual learning environments for rural and remote students

The nature of the problems faced by rural and remote schools and institutions can provide valuable lessons as we attempt to address this potential inequity. Remote schools have a number of constrains that need to be considered in developing suitable ICT enhanced teaching and learning facilities. These include poor or non-existent access to Internet connectivity, limited budgets, limited IT support resources, limited access to professional development for teachers and a variety of legacy computer hardware (Lyons, Cooksey, Panizzon, Parnell & Pegg, 2006, Tytler et. al, 2009).

In order to bring ICTs that have the capacity to facilitate an effective and engaging learning experience, suitable solutions that are robust and congruent with the prevailing conditions of rural and remote schools and universities need to be taken into consideration. Some basic requirements must be met that include being inexpensive to acquire and maintain, relatively simple to operate, potentially independent of Internet connectivity and being cross platform compatible as to be able to work with a variety of existing and sometimes out-dated hardware.

In terms of virtual worlds, there are portable and offline solutions available such as SOAS. The SOAS implementation uses the open source Open Simulator (OpenSim) that shares many user interface similarities with the popular, proprietary online virtual world of Second Life. The basic, self-contained nature of SOAS has the advantage of being relatively easy to set-up and use in remote contexts. SOAS has been successfully implemented in public Primary schools in regional NSW where limited resources, out-dated hardware, limited IT support and skills, as well as poor Internet connectivity, are all a reality. Students at these schools have applied their skills learnt playing games such as Minecraft to the building potential in SOAS. They have increased their level of engagement in the classroom through the teacher relinquishing control of the ICT knowledge to the students. Furthermore, the teachers have engaged in a 21st century pedagogy as they allow the students to create work that highlights the skills and knowledge the students are conversant in.

Learning management systems are commonplace in universities and are starting to be utilised in K-12 schools. Such systems enable the integration of learning materials, digital books, learning activities, assessment tasks and record keeping. Moodle is the most commonly used LMS world wide (Menard, 2013) as it is open source and free to use. This suits the economic circumstances of smaller schools and institutions as there are no licence fees to pay – although the hosting and support costs associated with running a LMS remain for all. Moodle has also been made to run 'offline' or 'portable' by a number of prior projects including Poodle (http://www.maflt.org/products/poodle), Portable Moodle (http://sourceforge.net/projects/portablemoodle/) and the now defunct MoWeS Mixer version of Moodle. One of the barriers to full integration of the assessment capabilities of Moodle and 3D environments provided by SOAS is the reliance on Windows to act as a host operating system on user computers for these packages. While Windows is a common platform for many institutions, using it as a host means that the software package is left open to interference and is not able to function natively on Apple platforms.

An alternative solution that builds on a number of projects and concepts is proposed as a way forward in addressing the issues of cross-compatibility and integration of assessment in a controlled software environment. The recent e-Exams System v5 project led by University of Queensland in collaboration with University of Tasmania and funded by the Australian Government Office for Learning and Teaching has developed a prototype portable e-Exam platform designed to work on a variety of student owned hardware (Hillier & Fluck, 2013). In doing so, it had to be independent of the operating system present on the host computer to ensure security and compatibility. The e-Exam System v5 (demo available from http://transformingexams.com) contains a working offline Moodle installation and uses the Ubuntu operating system that can be run 'live' on a range computer hardware by 'booting' the computer from a USB stick, rather than running the USB stick from within windows. This completely by-passes the operating system present on the computer to create a controlled software environment. Further, the Ubuntu operating system is compatible with the widely used OpenSim virtual world. Therefore, this project provides a good base from which to develop a modular offline live virtual world (MOLVW) platform that also contains modern electronic assessment capabilities.

The MOLVW will combine the features of an offline virtual world such as SOAS using OpenSim and an offline learning management system using Moodle. The Sloodle connecter modules and custom components will tie these together and provide administrative tools. The cross hardware compatible Ubuntu operating system will mean that the same software package will be usable on the majority of Intel based hardware produced in the last five or so years that typically runs 'Windows', Apple OSX or Linux (other processor architectures can also be used but require a separate build of the operating system). The status of each of the components of a MOLVW USB stick are outlined in Table 1.

All software components are available on open source licence terms and all hardware components are readily available off the shelf making the development and longer term maintenance of the package more sustainable than a completely custom built one. The whole software bundle will be made

available as a downloadable disk image (ISO) file that can then be 'burnt' to a USB stick on-site or delivered via post. Once burnt to a USB stick the software components and learning materials are fixed in place and cannot be damaged by curious users. The output of student activity, assessment responses and formative results can be saved to the same USB for later submission and collation. A representation of how the MOLVW solution would work is depicted in Figure 6.

Table 1: Modular Offline Live Virtual World components

Component	**Status**	**Role**
Ubuntu	Mature - The most common version of the open source Linux operating system.	Base operating system that forms the 'Live' USB that can be used to start most computer hardware. Network connections are also possible but not required.
Moodle	Mature - Worlds most common LMS. Several offline uses have been proven in the past. e-Exam project at UQ has this working on a Ubuntu Live USB.	Learning management system to house learning resources, assessment submission, quiz, gradebook, etc.
OpenSim	Advanced Developmental. The most commonly used open source virtual world platform.	This is used to provide the 3D virtual space in which students carry out tasks and build objects.
Sloodle	Advanced Developmental – has been in active use for several years by other institutions/individuals.	Connects Moodle to Second Life and OpenSim. This allows data to flow back and forth, for example quiz questions and student responses.
*AMP stack	Mature - the most common 'web server' software bundle containing Apache web daemon, MySQL database and the PhP language.	This is capable of running a wide range of web applications. In this case it will enable Moodle to run from the USB stick.
Configuration scripts	Custom – concept stage (similar techniques have been used in the e-exam project). These use 'Bash' scripts or the common Python language.	Used to configure and control the software environment. Custom user interface features can also be developed including an automated start-up process for users. Users respond to prompts to use them.
Admin scripts	Custom – in beta development. These have been developed for the e-Exam project. These use 'Bash' scripts or the common Python language.	Used to set-up and administer multiple USBs at once. Used in conjunction with USB hubs for greater efficiency. Users respond to prompts to use them.
USB sticks	Common - Commodity components that are cheap and easy to obtain. These can be re-used multiple times.	A USB stick is used to house the MOLVW software that students will use to start-up their computers. One USB per student is needed.
USB Hubs	Common - Same as above.	Used to set-up activities and retrieve student responses on mass. This cuts down the repetitive work that would be required to set-up each USB stick individually. Suggest a couple of 10 port USB3 hubs.

Given reality of the connectivity and resources available in rural contexts, tools such as MOLVWs are needed for students to be able to fully engage with contemporary learning approaches as afforded by modern learning management systems and virtual worlds.

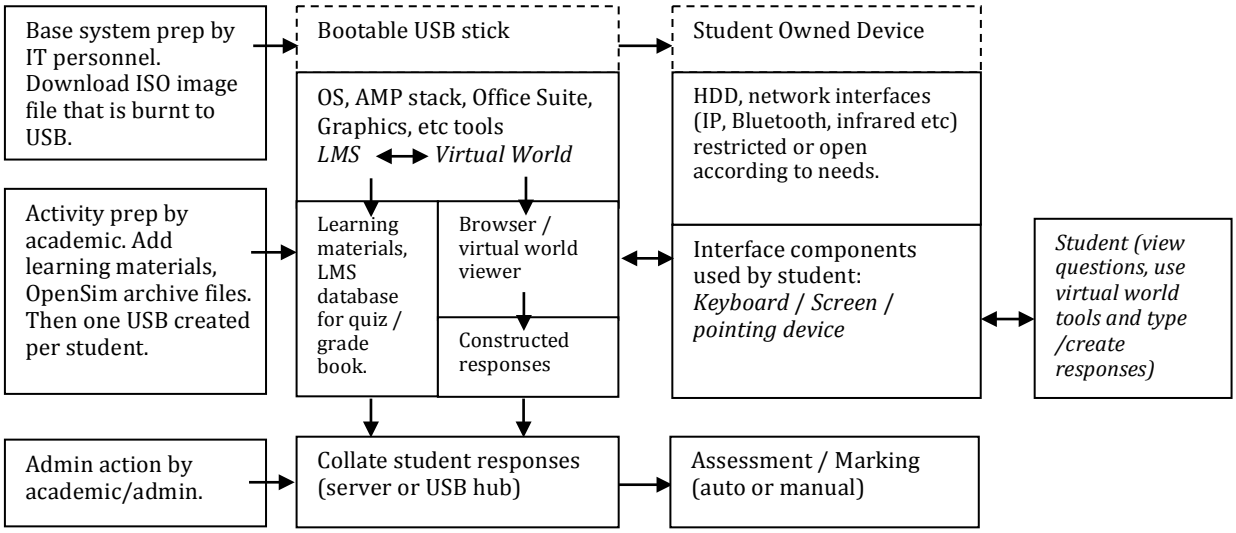

Figure 6: Representation of Modular Offline Live Virtual World solution

The Future and Concluding Remarks

No one can say for sure the future of any technology as they are changing so rapidly. However, it would appear that the use of a virtual world as a teaching and learning tool has been established in most Australian universities in one format or another. How each institution uses the virtual world is varied and multi-disciplinary. The four authors in this article have outlined how their institution has used virtual worlds and discussed how virtual worlds are an ideal tool to use with those students who are learning from a distance. A virtual world can provide an immersive means in which a student can learn their study materials in authentic learning experiences, however, the availability of tools to bring these benefits to rural students is still lagging behind what is available in metropolitan areas. Given the reality on the ground in remote areas we must find innovative ways such as the approaches highlighted in this paper to enable the learning experiences of the 21st Century and beyond.

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Ms Lisa Jacka is a passionate advocate for integrating new technologies in all curriculum areas for K-12 and higher education. Her current role is in the school of education at Southern Cross University, Lismore, NSW where she lectures in new media, emerging pedagogies, change and innovation. Her current research includes investigating teaching and learning in virtual worlds for pre-service teacher education. She is a leader in the field of virtual worlds in K-12 education with her use of the OpenSim virtual world Sim-on-a-Stick.

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Mr Scott Grant is an Assistant Lecturer in Chinese Studies, Faculty of Arts, Monash University. He is the creator of the Monash Chinese Island language learning simulation in Second Life, part of the formal beginner level curriculum at Monash since 2008. Based on his research and developmental work on task-based language learning in 3D virtual worlds he lead two grants from the Languages and Culture Network for Australian Universities in 2012 and an Australian Federal Government OLT Seed grant.

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