3D Virtual Worlds as a Tool for Collaborative Learning Settings in Geographically Dispersed Environments

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Abstract:

There is a growing awareness of virtual 3D worlds such as Second Life and Sun Wonderland within the general population. Virtual 3D worlds are no longer just for the stereotypical geek. By 2011 it is estimated that about 80% of active Internet users will have an "avatar" and a "second life" in some form of virtual world environment. The current virtual world environment is utilized widely as a knowledge and social tool. In recent years, universities are experimenting the use of virtual 3D worlds for teaching and learning. This paper presents a virtual learning environment created using Second Life which provides a common virtual space for students to work collaboratively to accomplish a set task. An experiment is conducted involving university students who are enrolled in a unit with the aim of assessing the use of Second Life for collaborative learning. A pre-survey evaluation was gathered followed by a post-survey evaluation. The results of these evaluations as well as lessons learned during the implementation phase are discussed in this paper.

1 Introduction

It is well documented that learning and teaching approaches have significantly changed over the last century [4; 17]. Political, social, economical, technological and environmental developments have changed the working environment but also the requirements of members involved in the working processes. Consequently, educational approaches must adapt accordingly [12]. In particular technology has influenced learning media and ways on how to educate and learn [16]. Increasingly, our knowledge society and its globalization activities along with new capabilities of information and communications technology (ICT) demand new approaches for educational, vocational, and life-long learning [12; 18].

To illustrate the complex situation for modern learning environments, a selection of challenging aspects are outlined here, however, a more detailed discussion can be found in [5; 6; 7; 12; 15; 19; 20]. From the learning process point of view, learning becomes a day-by-day routine over humans' life cycle where individual learner profiles must be considered. This includes task and role-based aspects, interests, knowledge state, short-term learning objectives and long-term career goals. Furthermore, instead of the structured scheduled learning sessions over a specific time period, a more natural 'continual anywhere anytime learning approach' is required. By focusing on student characteristics, the traditional image of students, especially in higher education, has changed significantly from the picture of a full time twenty year old student. In today's competitive and virtual world fully supported by technological enabled environment, coupled with the opportunities to enrol into programs with flexible delivery modes, many part time students are finding these programs attractive and useful for their career. Moreover, there are

growing interests from different student groups to enrol into these programs remotely. There are also students who prefer to enrol in a specific unit or units from different universities. As a result of this flexibility, there are organizational aspects and structures that educational institutions must follow in order to cater for the different students' characteristics and preferences. In particular centralized physical buildings, face-to-face lectures and consultation hours are not sufficient to meet students' requirements of today's modern learning environment. The traditional centralized meeting space for students may also be restrictive to students who are unable to physically attend lectures, workshops, or meetings for health, employment or other reasons. There are also concerns of environmental protection, economic developments and health issues that may affect and prevent face-to-face meetings. For example, the 2003 pandemic SARS outbreak and the recent H1N1 Swine Flu can affect mobility of the main stakeholders in the learning process. In this regard, different learning environments to capture the challenges of the modern day student learning preferences and styles must be strategically positioned in educational institutions.

In this current climate, technology-supported asynchronous and synchronous communications exist to support geographically dispersed working, learning or social environments. This may be as simple as text-based chat or as complex as virtual meeting systems [11]. Various media, such as radio, television and ICT for distance education have existed for decades. In particular network and computer based applications appeal for education in remote locations [16]. The area on virtual worlds have been an active research topic, however, the technology was unavailable and was not ready for complex application scenarios until recently. New and powerful platforms and tools, such as Second Life, Active Worlds, Multiverse, Open Croquet, OpenSim and Sun's 3D Wonderland, have emerged to complement and in some instances replace knowledge transfer and learning settings. Unlike other ICT-based solutions for distance learning, virtual 3D worlds may benefit from features such as the use of multiple communication channels, the 3D environment (eg. the awareness of other avatars) and learning activities, and the decreased in barriers between students and tutors [13].

The great potential of virtual 3D worlds for knowledge transfer and education has motivated us to start research on collaborative learning and training activities. One specific focus lies in modern learning settings supporting geographically dispersed environments. In this paper we will discuss the design, implementation and evaluation of a virtual 3D environment based on Second Life (SL). This environment is developed to complement traditional learning environment and support students studying a unit at the School of Information Systems at Curtin University in Australia. In Chapter 2, based on a situation analysis, specific needs for learning settings for geographically dispersed environments are discussed and high level requirements for a 3D learning environment outlined. A description of the implementation is presented in Chapter 3, and Chapter 4 outlines the findings from the implementation perspective and Chapter 5 gives the findings from the usage of the 3D learning environment in the unit.

2 Situation Analysis and Overview of Platform Requirements

In March 2008, the Australian Government undertook a review of the situation of the Australian's higher education. The published report known as 'The Bradley Review of Higher Education' [3] indicated that for Australia to meet the demands of a rapidly moving global economy, the nation will need more well-qualified people. It was reported that access and participation rates to higher education must increase by 2010 as the current trend indicates that the supply of people with undergraduate qualifications will not keep up

with demand. There are opportunities to increase the rates of participation and access from groups such as the indigenous people, those from regional and remote areas and those in the workforce. As pointed out in the report, 'the rhetoric term of lifelong learning must be turned into a reality' [3]. In 2007, about 12% of all students (domestic and international) enrolled in higher education in Australian public universities were located in regional and remote areas [8]. To tackle the issue with access and participation, Australia needs a sustainable system of higher education provision which is to be flexible and innovative. An effective and sustainable approach will require collaboration and considerable effort from academia to ensure a viable learning environment. A well-coordinated, systematic approach to addressing these complex issues and increasing the numbers gaining access to higher education is vital [3].

The review also invited submissions from the student body. One submission highlighted accessibility to staff as an important factor in students' learning experience. Access to staff was also a matter of particular concern for distance and indigenous students. The role of information and communication technology (ICT) was seen as an important tool to contact staff and a necessary and useful tool for off-campus students to access learning management system. A number of submissions advocated the use of ICT only as an addition to face-to-face teaching, not as a replacement.

In an effort to bring education to those students in regional and remote areas or abroad and those in the workforce or part-time students, many institutions provide innovative ICT or learning management system for distance learning. In today's modern technological era and learning environments, using virtual 3D worlds may decrease the barriers between students and staff, and students could benefit from features such as the use of multiple communication channels to access other students and staff. Other benefits include the interaction in the 3D environment itself (eg. the awareness of other participants or avatars) and access to the learning activities [13]. In order to create an effective learning environment encompassing virtual 3D worlds, developers must consider a high level requirement of a 3D learning environment system for collaborative learning. The requirement factors to consider are organizational, pedagogical and technological aspects. Consideration for organizational aspects include strategies to (1) complement existing learning environment with the possibility of providing alternative activities for remote learning, (2) easy to access and use learning system by students and teachers, (3) hosting of applications on the institution's servers with firewall restrictions. The pedagogical aspects include the enabling of (1) collaborative learning in small groups, (3) tutoring and teacher consultation, (3) support learning task with appropriate toolset and (4) scaffold inter-group and intra-group discussion. Lastly, the technological aspects to consider include (1) access from within and outside of campus, (2) easy to install and operate system, and (3) minimum hardware requirements for the client (both students and teachers).

3 A Glimpse of the 3D Learning Environment

Following a review of the available 3D environments and in accordance with the high level requirements as outlined above, it was decided to build a learning environment on Second Life (SL). Second Life is a *"free online virtual world imagined and created by its residents"* with broad usages for social interaction, learning and business. SL provides easy ways for creating objects and a huge community offers pre-existing designs, objects and tools [14].

As with social networking and interaction, there are multiple possibilities of simulating and creating new worlds for students to interact in to achieve a learning outcome. With this in mind, we aim to create a virtual environment where students are able to meet and work

collaboratively in a social setting. During the design of the environment we have followed these goals, (1) to make the environment a pleasant place to spend time in, (2) to enable and facilitate communication among users, and (3) to provide useful tools for collaborative work. The learning environment was intended to provide a productive, but also an enjoyable learning space for members to work in.

The environment was built on a part of an island owned by Graz University of Technology and follows a room metaphor. As shown in Figure 1, the learning environment has buildings for group learning and collaboration, an office for virtual consultation hours, and an outside recreation area for social interaction. All collaboration buildings are equipped equally; each of which is meant to be used by one group of students, seen as their private group working space.

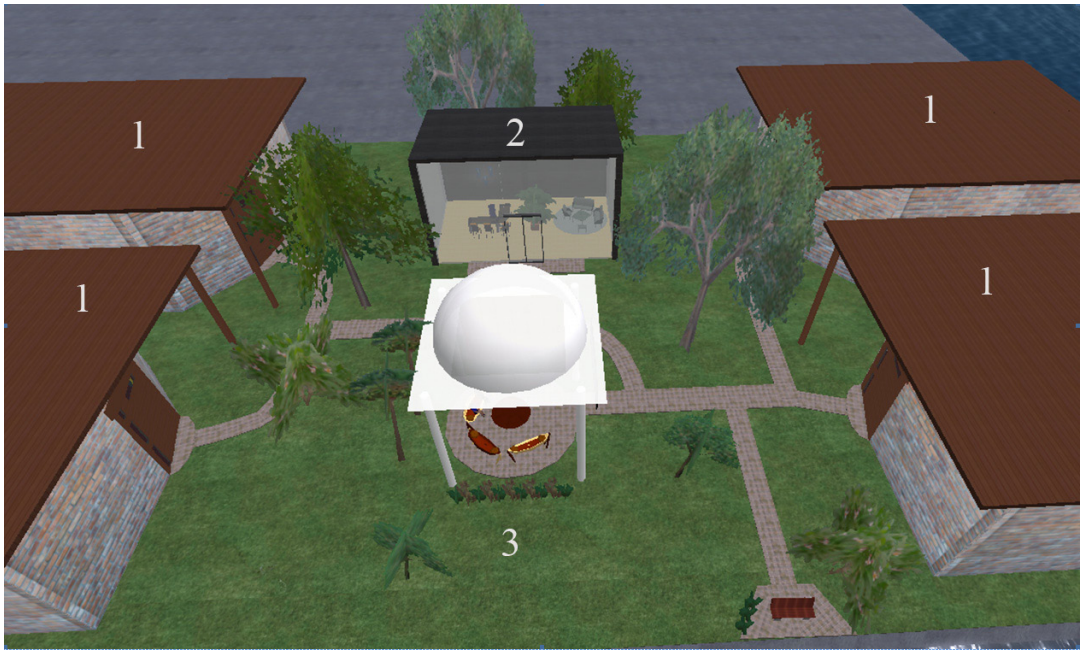

Figure 1 – Overview of the Learning Environment – (1) private group learning room, (2) teacher's office, and (3) recreation area

Private Group Learning Room

The group learning areas has been designed as closed bungalows to indicate and provide privacy. Each of the entrance doors has been implemented as scripted objects with access restriction. Only students of a particular learning group can open the door of their learning room and they can grant other students and teachers to enter the room. Each collaboration room is equipped with tools to facilitate communication, discussion and collaborative learning activities. Access rights for the tools have also been implemented to secure communication and content of the learning groups. A brief overview of the tools is given as follows.

The *Appointment Setter tool* (see Figure 2, left side) allows students and lecturer to send out messages to each other. For example, the agenda and the schedule of upcoming meetings can be set up using this tool without leaving the environment. The list of recipients can be defined in a configuration file.

The *Slide Presenter Board* (see Figure 2, right side) offers a platform to share presentation slides or pictures. This can also be used to create presentations collaboratively with other members. The board may also be used to initiate discussion or reflect on learning material. Since Second Life do not support the native presentation file formats, the slides were

stored and presented as images. Each student of the learning group can add images from his/her inventory to the presentation but also individual slides can be deleted by members of the group.

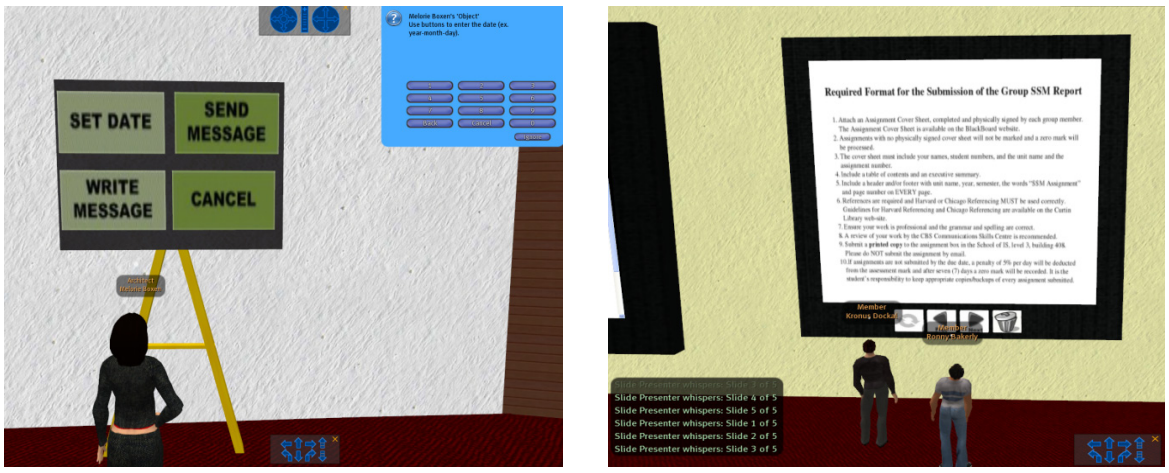

Figure 2 - Appointment Setter (left) and Slide Presenter Board (right)

Figure 3 – Brainstorming Board (left) and Whiteboard (right)

The *Brainstorming Board* (see Figure 3, left side) is a freely available education tool, offered in SL [9]. The purpose of this tool is used to develop and express ideas collaboratively. Every time when a new brainstorming session starts, the application deletes existing content automatically and announces a particular text chat channel on which the new brainstorming would take place. Using this channel, all group members can put their suggestions on the board via text chat.

This Whiteboard tool is part of an education package available in SL [1] and it can used for uploading images, drawing mind maps, presenting slides, and taking snapshots to save changes. The purpose of this tool is to scaffold the communication and collaboration process.

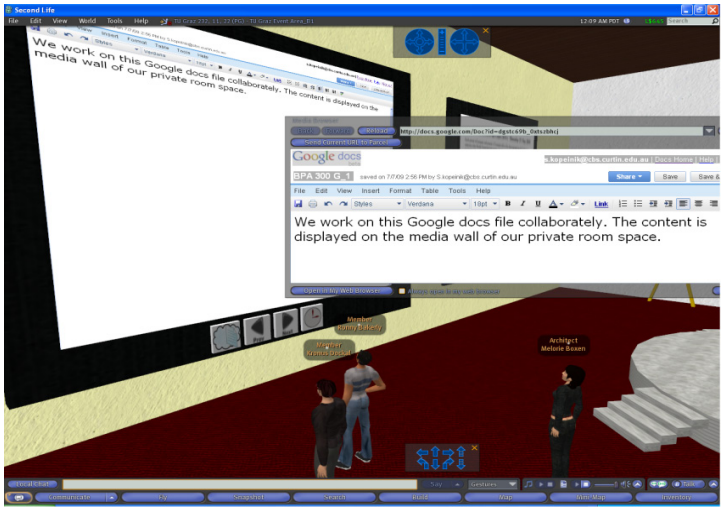

Figure 4 - Media Board

The *Media Board* displays web pages that are specified through a configuration file. It also provides a button which opens a browser showing the current web site. Since SL does not provide document sharing for collaborative writing, this wall has been adjusted to access the Google Docs service. The documents can be viewed in the SL world and can be easily edited out of SL world with a Web browser. This workaround turned out to be a suitable alternative for the lack of document sharing and document authoring support inside SL.

Figure 5 – The Lecturer's Office (left) and Common Recreation Area (right)

Teacher's Office

The aim of *Teacher's Office* (see Figure 5, left side) is to provide students in the SL learning environment with a place to attend for consultation with the lecturer. This was designed to offer two different zones, a formal and a casual setting for meetings. At this stage of the project no supportive tools have been integrated.

Recreation Area

The *Recreation Area* (see Figure 5, right side) is intended to provide a social area for the students to relax, chat, meet, or discuss ideas with other groups. With this, the students get the feeling of being part of the world where they could get more involved and be aware of their presence in SL or the virtual environment. In order to initiate discussion a news reader panel is placed in the middle of the area which provide highlight news of subjects related to the course or any other announcements.

4 Evaluation Results from Development Viewpoint

The dedicated programming language in SL, the Linden Script Language (LSL), is simple to use, in particular for developers who already have background in programming. A variety of online tutorials, wikis and forums on LSL are readily available. The LSL user community provided valuable support during the implementation of the SL learning environment. Developing more complex functionalities, however, can cause difficulties since debugging tools are not supplied.

We did not encounter any difficulties when creating the 3D content using the provided standard objects. Depending on the outcomes required for the learning environment, the Second Life's in-world building tools can provide an alternative to the regular 3D modeling tools (e.g. Blender). Furthermore it is time consuming to integrate objects when the object are created outside the platform; e.g. size of objects and textures need to be adapted. Linden Labs also charges for the uploading of images, sounds and animations. These images, sounds or animations may be necessary to achieve the learning outcomes.

One of the biggest issues influencing our design was the restrictions imposed on some of the SL functionalities. Some of these issues are listed below:

- *Avatars can look into closed buildings or rooms*
  In order to protect users' intellectual property and to control plagiarism it is necessary to screen certain objects from unauthorized access. The creations of walls or scripting doors do not keep unauthorized avatars from every building or rooms as they are able to look into the rooms with skilled operation of their camera views.
- *Allocation of rights*
  Assigning rights to users are problematic. To do this, one is required to restrict objects accessibility to specific groups or users via scripts. Given that group areas are equipped with five different collaboration tools and an entrance door, every time a change occurs, the rights have to be re-configured again. This means that the administration costs will increase in proportion to the sequence of alternation of user groups.
- *Text requires textures to visualize letters*
  Assigning rights to users are problematic. To do this, one is required to restrict objects is currently also not possible. Since our aim is to build an environment for collaborative learning activities, this has become one of the most fundamental shortcomings.
- *It is only possible to play one media per parcel*
  As explained in the previous section on Media Board, a workaround using Google docs was implemented to substitute in-world document sharing. Therefore we stream one media inside each collaboration room. This limitation combined with the visibility restrictions of the media influenced our design significantly.
- *No possibility to scroll media*
  Even though web pages can be displayed at Second Life walls, there is no scrolling option is available. Tricky workarounds might be necessary to offer this feature within our learning environment.
- *The amount of allowed prims per parcel is limited*
  It is easy to exceed the limit of prims; and this issue needs to be kept in mind throughout the construction and design phase.
- *It is very hard to develop user-friendly collaboration tools*
  User dialogs are not easy to work with. Even though there is a built-in function called llDialog that generates dialog boxes with a text and buttons, it takes too much time between the event of pushing a button till the implemented reaction is performed.

- *Usability of text chat*
  Using text chat is an interaction option, however, this is often perceived as inconvenient.
- *Usage of learning environment by multiple groups*
  Another challenge is to provide rooms and tools to multiple working groups that interact sequentially within a certain period of time. Content on Slide Presenter Boards, Brainstorming Boards and Whiteboards, remains static on the equipment. In order to provide this functionality, future research will continue with a work on dynamic changeable learning rooms.
- *High administration cost of access right*
  In LSL implemented http responses and requests allow us to address the administration costs caused by the allocation of rights. Therefore our next implementation step will include the realization of a web interface, used to meet incoming configuration needs.

5 Evaluation Results from Usage Viewpoint

In this section experiment setup and findings are outlined which focuses on the practical usage of the developed learning environment for a group learning activity.

5.1 Experiment setup

The subjects of the experiment are students enrolled in a final year undergraduate degree in a unit (or course) called Business Problem Analysis offered at the School of Information Systems, Curtin University of Technology, Perth, Australia. To assess student's performance in the unit, there are 3 assessment items. The students were given the option of completing one of the three assessment items using the SL learning environment. Normal traditional lectures in a face-to-face mode continue to take place. At the beginning of the semester, the SL tutor (also the SL developer) and the lecturer gave an information session about the proposed experiment using SL learning environment and explained that the students had the option of completing assessment 2 in SL. No penalty was applied to those who chose not to participate in the SL experiment. The students were also informed that they were encouraged to complete a pre-survey questionnaire regardless of their participation in the SL research project. Students who participated in the experiment were also asked to complete a post survey. Twenty students enrolled in the unit. Of the 20 students who were enrolled, 16 students completed a pre-survey, and of the 16 students, 6 students volunteered to take part in the SL project.

The pre-survey assesses the students' background using computers, the availability of Internet access, interests in playing on-line computer games, the students' learning preference and their attitude towards SL and 3D virtual worlds as a learning environment. Following the experiment, the post survey asked the students to report on their attitude towards SL and 3D virtual worlds and their perceptions of the use, benefits, and limitations of 3D virtual worlds and the collaborative learning environment implemented in SL. Paper-based surveys were used for both the pre and post survey. Ethics clearance was obtained from Curtin University of Technology for the use of students in the research project by submitting the pre and post survey questions and the research information sheet to an Ethics Review Committee.

From the research design and questions we intend to find out the students' attitudes towards SL and 3D virtual worlds. In addition we also want to find out students' perceptions with regard to design and usability of the SL learning environment. We also want to find out the limitations and issues surrounding the development of a learning

environment in SL. Recommendations for future learning environment development in SL based on the findings of this study will be provided. Benefits of using SL and 3D virtual worlds for education purposes will also be explored.

The unit assessment chosen to be completed in the SL learning environment is an essay that the students had to write about an analysis of a problem and the proposed solution. The essay includes the use of soft system methodology techniques of rich pictures and charts [2]. The students had 4 weeks to complete the essay and the interaction between the students must take place within the SL learning environment. The 6 students who volunteered to participate in this experiment were divided into 2 groups of 3 students. For these two groups, the members worked together on the assignment in a synchronous online mode in SL. In a real setting, the students were located separately and discussed the assignment only using the chat facility (text chat and VOIP) in SL. Online consultation hours were also provided by the lecturer to the 2 groups of students. This consultation took place with the avatars of the students and the lecturer in either the lecturer's office in SL or the student's group space in SL. Prior to the writing of the essay in the SL learning environment, the SL developer provided assistance for installation and familiarization of SL.

5.2 Students' Perception of SL Learning Environment

Three categories of results were obtained from the students who had completed the pre-survey. These are (1) demographic data, (2) level of computer/IT literacy and experience, and (3) awareness and interest of 3D virtual worlds or SL as a learning environment. The students who were enrolled in the unit were predominantly full time students of Generation Y cluster. Of the 16 students, there were eight female and eight male students. Most of them described themselves as experienced computer or IT users, mainly working with MS-Office products. A few had additional knowledge in C# and HTML. Table 1 shows the participants' demographic data and the level of computer/IT experience; and Table 2 shows the level of familiarity with 3D virtual worlds as a learning environment.

As shown in Table 2, although 9 students indicated an interest in using SL and 10 indicated that they perceived 3D virtual worlds or SL as a useful collaborative tool, only 6 indicated an interest to participate in this experiment. According to Griffith and Hunt [10], males are more likely to occupy themselves with computer games but are also easier to motivate to play online games than females. In this regard, we expected more male students to participant in this experiment, however, 5 out of 6 volunteers turned out to be female.

We asked the students who preferred to complete the assignment in a normal mode (i.e. not using SL learning environment) to give some reasons why they had chosen not to participant in the experiment. The students perceived that there was an increased workload through familiarization of the SL learning environment, the pressure of time, and the concerns with instability (e.g. downtime, access and maneuvering concerns in SL) of the learning environment.

Four students noted that they prefer face to face communication as they were familiar with it and they were more comfortable negotiating and collaborating with students this way. One of the respondents stated that "*It takes a lot of time to get familiar with the game and it seems face to face is more direct and easy to understand*." Against that declaration were those who were in favor of such an experience. As an example, a student noted, "*I would like to try out anything new. I am a bit hesitant but there is no harm in trying. I know I will learn a lot from using it."* Another positive response to the experiment was provided by a

student, *"Because it is something new for me and basically I love playing games, so why not do assignment like I am playing the games."*

In order to use the SL learning environment without technical difficulties, we asked the students if they would have trouble meeting the system requirements. Only 2 of the 16 students had problems meeting the system requirements. Given that most students never used SL before, we asked if the students were keen users of new technologies, and to this, 11 out of 16 students responded negatively and that they were not early adopters. One surprising result of the survey was that the 6 students who volunteered to participate in this experiment spend less time on computer games than the students who did not volunteer.

Demographic Data		**Computer / IT Experience**	
Age Group		**Level of IT Experience**	
18 – 24	14	Highly Experienced	13
25 – 30	2	Little Experienced	3
Gender		**Level of e-learning (LMS) Experience**	
Male	8	Experienced	16
Female	8	No Experienced	0
Student Type		**Regular Computer Games Player**	
Australian	3	Yes	11
Non-Australian	13	No	5

Table 1: Summary of Pre-survey – Demographic and Level of IT Experience

Familiarity with 3D Virtual Worlds Learning Environment	
Currently using 3D/VW environment	
Yes	7
No	9
Currently using Second Life	
Yes	1
No	15
Interested in using Second Life	
Yes	9
No	7
Interested in participating in this experiment	
Yes	6
No	10
Perception of VW/SL as a collaborative learning environment	
Useful	10
Not Useful	3
Don't Know	3

Table 2: Summary of Pre-Survey – Familiarity of 3D Virtual Worlds

The 6 students were asked to complete a post-survey following the submission of the assignment. One of the limitations of this study was the small sample size, although it was a decision that was made deliberately to allow the students to volunteer rather than be instructed to use the new SL learning environment. Nevertheless, the results of the findings reveal the perceptions of this group of students.

In general, the students had no difficulties in setting up SL and they spent an average of 2.25 hours to get themselves familiar with this environment. In terms of the students' perception of using SL as a learning environment, the following gives a snapshot of this:

- 5out of 6 planned to work on collaborative tasks using SL
- 5 out of 6 perceived using 3D virtual worlds offers flexibility in respect to time
- 5 out of 6 perceived using 3D virtual worlds saves travelling time
- 5out of 6 were going to get together with friends in SL

On the negative front, the students were distracted by the poor interface usability of SL. The students found that SL is not intuitive and it was difficult to operate the user interface of the collaboration tools. The missing document sharing feature was one of the major limitations. To overcome this, the students were given the option to use Googledocs and this was proven to be a well appreciated outcome. In terms of the interaction tool, the students rated the text chat as more convenient than the use of VOIP. Due to technical problems with SL's VOIP implementation one group also indicated the use of Skype in their communication.

The students felt that they were under a lot of pressure trying to complete the assignment in an environment that they were not familiar with. Some communication among group members had broken down due to some members' familiarization problems. They did not like the online consultation hours. Several students found using SL was time consuming. A part of the frustration they encountered was the inability to express emotions with the avatars. They also found limitations of the available tools where the students were unable to explain their thoughts or use drawing tools to sketch their ideas.

Regardless of the previous remarks, on the positive sides, the students acknowledged that it was more convenient to meet in SL. Some comments supporting this were:

- *'Even though with our different schedules I believe Second Life made it easier for our group to meet'*
- *'Easier to work around group members other commitments'*
- *'Time saving in regard to travelling time; working at home'*
- *'Flexible – (able to) meet group members even during night time'*
- *Solves the problem of transportation issues*

Using SL also helped the students to plan and organize their work and the students found a single environment helped them to work together effectively. The following comments showed the way in which students found SL helpful.

- *'Helped organise(d) the group'*
- *'Easier to put documents together because they are online and we can each add to the document'*
- *'(The) environment provides media to leave messages or ideas for other group members'*
- *'Whatever work done by a group member can be continued by another group member later on'*
- *'Meetings (can be) minuted through chat'*

Some students found the SL learning environment encouraging and conducive to learning. A comment from a student was that he/she *'appreciate(s) the furniture created in the virtual world as it makes the environment looks more realistic and exciting'*. This student also appreciated the privacy of each room where they discussed the assignments. Almost all of the students indicated that improvements are required for the interface and usability features of the Whiteboard, Media Board, and Brainstorming Board. Ease of navigation and a user-friendly interface are two main features that are required for efficient and effective learning to take place in SL.

In general, the overall students' attitude toward SL and 3D virtual worlds was one which was positive and the survey responses indicated that the students supported the use of SL provided that the design, navigation and features of the collaboration tools enhance the students' learning experience. Without this, the students will be reluctant to adopt a learning environment which was tedious and challenging to use.

5.3 Lecturer's and Tutor's Perception of SL Learning Environment

The lecturer, who was not familiar with SL before the experiment, was asked to comment on the design and usability features of SL and the benefits of incorporating a SL learning environment in the unit. Navigating through the SL learning environment require some familiarization and one has to spend some time to get used to moving the avatar around the island.

Setting up a learning environment in SL requires a lot of planning, effort and time. It is recommended that the SL learning environment be used for more productive activities. The lecturer indicated that SL would allow students to work remotely. One of the disadvantages of interacting in SL was the difficulty in knowing who you interacting with because of the use of avatar names. It was also suggested that names be given to the buildings in the SL learning environment. It may also be helpful to provide a map on the island.

From the lecturer's point of view, using the SL learning platform was time consuming compared to teaching in traditional classrooms. The downside to using SL was if students miss a session, you have to go through the online process again when they are ready. In physical setup or classes, you can refer them to the materials on the learning management system. Another observation was that the lecturer noted that the students were not very familiar with the SL application and this has hampered their learning experience. Although installation assistance of SL, an introduction of SL and the particular environment were presented to the students, an extensive and thorough training to staff and students should be provided for all future learning delivered in the SL environment. Another recommendation was to provide ongoing technical support (such as help desk) to the participants, especially at the onset of using the environment. The technical assistant's perception was that additional tutoring lessons in the labs could improve the students' working abilities in the virtual learning environment.

From the tutors' viewpoint it is worth mentioning that although individual support for installation, getting familiar with the environment and problem solving during the operational phase were offered, only one student took up the offer. In this case the student had serious problems working with the tools in the learning environment because he or she had joined the wrong user group. Although student had some problems operating SL and using the learning environment, it turned out that the reason for not taking the offer of support was the feeling that they were too exposed. To overcome this, it is recommended not only to give a short introduction at the beginning of the unit, but also to give a training session before the working with the environment.

6 Conclusions and Future Work

As the learning and teaching delivery continue to evolve over time and given the superior technological advancement, our society has begun to assess new approaches to explore educational, vocational and life-long learning. Governments are working closely with institutions' academics and administrators to find a better way to reach the work force population and those living in the remote and regional areas. Opportunities to increase access and participation rates to higher education or vocational training exist with the availability of modern learning environments that encompass the use of 3D virtual worlds.

3D virtual worlds learning environment including Second Life is still at its infancy and the technology and application surrounding these will continue to develop and mature.

From this study, the perspective of the users (both students and teachers) affirmed that it is important that all users are familiar with the environment. As indicated in the findings, the students and staff found the learning environment tedious. It is, therefore, important that the students are given ample training to ensure that the tools in the 3D learning environment are not a hindrance but the availability of the tools would enable them to work with other members collaboratively. Although the responses from the students are generally positive and the responses from the staff are encouraging, the limitation of this experiment lies in the small sample size. It is hoped that the setup of this learning environment along with the pre and post survey will be administered for another course in the near future.

Challenges and lessons that we have learned from this exploratory experiment include the need to provide rooms and tools for multiple working groups to use and interact. The tools provided, such as the content on Slide Presenter Boards, Brainstorming Boards and Whiteboards are static tools. For effective collaboration to take place and to offer more functionalities, future research must continue to find a way to offer these tools dynamically which are more flexible and easier to use. It is also a time consuming task to organize access rights on user and group level in world, especially when several tools and areas in the learning environment needs to set specific access rights. Thus in future, we plan to design a web application to handle those rights in a more convenient and efficient way.

References

[1] AngryBeth Shortbread (n.d.). Second Life, MetaLabs Communal Whiteboard, from http://slurl.com/secondlife/Gourdneck/194/236/67 and http://metalab.blogspot.com/2006/06/communal-whiteboard.html

[2] BPA Unit Outline (2009). Business Problem Analysis 300, School of Information Systems, Curtin University, Australia, Retrieved on 5 Mar 09 from http://www.business.curtin.edu.au/business/current-students/unit-and-course-information/undergraduate-unit-information

[3] Bradley, D., Noonan, P., Nugent, H, and Scales, B. 2008. Review of Australian Higher Education Final Report, Department of Education, Employment and Workplace Relations, Australia, Retrieved on 5 July 09 from www.deewr.gov.au/he_review_finalreport

[4] Bransford J.D., Brown A.L., Cocking R.R. (Eds.) (2000). How People Learn: Brain, Mind, Experience, and School. Expanded Edition. Washington DC: National Academies Press.

[5] Brown, J.S. (1999). Learning, Working & Playing in the Digital Age. Transcript of the talk at 1999 Conference on Higher Education of the American Association for Higher Education, last retrieved Feb. 1st, 2008, from http://serendip.brynmawr.edu/sci_edu/seelybrown/

[6] Brodo, J. A. (2006). Today's Ecosystem of e-learning. Trainer Talk, Professional Society for Sales & Marketing Training, Vol. 3, No 4, 2006, last retrieved Jan 26th, 2008 from http: //www.enewsbuilder.net/salesmarketing/e_article000615779.cfm.

[7] Burra, K (2002). Beyond the Frontiers of Traditional eLearning. Whitepaper, NIIT Ltd, last edited, Feb. 9th, 2002, last retrieved Feb 6th, 2008, from http://niit.com/Corp/India/ASP/downloads/pdf/Beyond%20the %20frontiers.pdf.

[8] Department of Education, Employment and Workplace Relations (DEEWR), Higher Education Statistics Collections, last retrieved Aug 26th, 2008 from http://www.deewr.gov.au/highered/statpubs.htm

[9] Dudeney Ge (n.d.). Second Life, EduNation, BrainBoard V4.0 - International Character Set [boxed], from http://slurl.com/secondlife/EduNation%20II/132/215/22/ and https://www.xstreetsl.com/modules.php?name=Marketplace&file=item&ItemID=876838\

[10] Griffiths, M.D., Hunt, N. J. A. (1995). Computer Game Playing in Adolescence: Prevalence and Demographic Indicators. Journal of Community & Applied Social Psychology, Vol. 5, No 3, pp. 189-193

[11] Gütl, C. (2008). Enhancements of Meeting Information Management and Application for Knowledge Access and Learning Activities. Journal of Universal Computer Science (J.UCS), 14, 10, 1625--1653.

[12] Gütl, C., & Chang, V. (2008). Ecosystem-based Theoretical Models for Learning in Environments of the 21st Century. International. Journal of Emerging Technologies in Learning (iJET), Vol 3 (2008), 50-60.
[13] Kappe, F., & Gütl, C. (2009). Enhancements of the realXtend framework to build a Virtual Conference Room for Knowledge Transfer and Learning Purposes. EDMEDIA 2009 (accepted for publication).
[14] Linden Labs (2009). Second Life – What is Second Life? Linden Lab, San Francisco, USA, last retrieved 22 August, 2009 from http://secondlife.com/whatis/
[15] Pirie, C. (2004). E-Learning Ecosystems: The Future of Learning Technology. Chief Learning Officer Magazine, September 200, last retrieved Jan. 29th, 2008, from http://www.clomedia.com/content/templates/clo_article.asp?articleid=618.
[16] Reiser, R. A. (2001). A History of Instructional Design and Technology: Part II: A History of Instructional Design. ETR&D, Vol. 49, No. 2, 2001, pp. 57–67
[17] Sedita, S.R. (2003) Back to "Tribal Fires"? Explicit and Tacit Knowledge, Formal and Informal Learning, Towards A New Learning Ecosystem. DRUID Summer Conference 2003 on Creating, Sharing and Transferring Knowledge - The Role of Geography, Institutions and Organizations. Copenhagen, June 12-14, 2003.
[18] Thompson, J. (2007). Is Education 1.0 Ready for Web 2.0 Students? Innovate Journal of Online Education, 2007, Vol. 3, No. 4.
[19] Wilkinson, D. (2002). The Intersection of Learning Architecture and Instructional Design in e-Learning. 2002 ECI Conference on e-Technologies in Engineering Education: Learning Outcomes Providing Future Possibilities, pp. 213-221.
[20] Witherspoon, J. (2006). Building the Academic EcoSystem: Implications of E-Learning. Vol. 3. No. 3., March 2006, last retrieved Jan. 2nd, 2008, from http://www.itdl.org/Journal/Mar_06/article01.htm

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