USING VIRTUAL WORLDS IN DISTANCE EDUCATION

BY

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Abstract

This case study examines the effectiveness of 3D Virtual Worlds (VWs) in Distance Education (DE). A series of in-world collaborative learning activities (4 in total) was conducted in the virtual world of Second Life (SL) with 9 DE students from Athabasca University. Students were asked to collaborate in a role-playing scenario and evaluate the virtual world of Second Life in terms of its potential to support collaborative e-learning. Based on the overall results of this study, it was concluded that 3D worlds cannot be used as a primary medium for teaching and learning. They can, however, be utilized in combination with 2D learning management systems to strengthen and renew the existing approaches to learning and collaboration and also to explore new practices in DE. A set of fundamental design principles was also generated in order to help educators and designers transform the 3D spaces into collaborative learning places.

Keywords: Distance education, e-learning, 3D, virtual worlds, collaborative virtual environments, collaborative learning, role-playing

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CHAPTER I – INTRODUCTION

Background

The pedagogical value of Virtual Worlds (VWs) is being extensively embraced in the recent research literature (Jarmon, Traphagan, Mayrath & Trivedi, 2009; Lowrie, 2002; Minocha & Roberts, 2008). Although three-dimensional (3D) Virtual Worlds are relatively new, they have already been used as pedagogical media (Dickey, 2003), often towards more personalized learning tailored to the individual learner‘s needs (de Freitas & Yapp, 2005; West-Burnham, 2005) and greater learner autonomy (Field, 2007). This kind of environment has been also widely applied for conducting virtual meetings and discussions (Chow, Andrews & Trueman, 2007; De Lucia, Francese, Passero & Tortora, 2009). The main reason is that VWs are particularly suitable for communicating because they enhance the users' perception of presence, awareness, and communication as well as their sense of belonging to a community -- facts that are of great importance in the field of Distance Education (DE) (De Lucia et al., 2009). In addition, the interaction in a VW provides a feeling of immersion and promotes social learning (Monahan, McArdle & Bertolotto, 2008).

These peculiarities of VWs have made them very appealing and although these environments were not developed specifically with education in mind, their open-ended possibilities have caught the attention of post-secondary educators across a wide array of disciplines. As a result, educators have begun exploring VWs like Second Life as a powerful medium for creating instruction (Schiller, 2009; Wang & Braman, 2009). Second Life (SL) is an Internet-based 3D virtual world and, according to Tsiatsos, Konstantinidis, Ioannidis, and Tseloudi (2009), one of the most promising Collaborative Virtual Environments (CVEs)

platforms in terms of their potential to support collaborative e-learning. In addition, SL has been used as an educational strategy to promote peer-to-peer learning; mentorship, and apprenticeship relationships; learning by doing hands-on activities; role-play; and self-directed, inquiry-based learning to name a few (ANGEL Learning Isle Steering Committee, 2008).

Although it seems likely that VWs will have a large impact on the future Web and, in particular, on teaching and learning, there is still a limited comprehension of their proper usage for pedagogical purposes. VWs have been largely adopted as a learning environment in the last decade. However, there are still some unresolved issues, such as the use of appropriate teaching and learning strategies in such environments, that need to be settled in order for educators and students to take full advantage of the 3D worlds.

Studies to date tend to approach a wide range of research issues related to VWs in education. A small group of studies investigated the factors affecting organizational adoption of VWs (Bowers, Davis & Neely 2009; Taylor & Chyung, 2008; Yoon, 2009). These studies revealed that the use of SL as a training and development tool is still in the early stages of the adoption curve. The results of Taylor and Chyung's (2008) survey indicated that overall, participants agree that SL has potential, but they also indicate that its potential usefulness is overshadowed by what they perceive as functional barriers: a steep learning curve for new users; a non-intuitive interface; and the high investment of time and money required for programming content relative to its benefits. In addition, other factors including interpersonal communication channels and institutional support were also shown to influence the SL adoption as an educational tool.

A second set of studies discussed the developmental process of creating virtual spaces (e.g., buildings, structures, objects, textures) and designing immersive learning experiences

inside them (De Freitas, Rebolledo-Mendez, Liarokapis, Magoulas, & Poulovassilis, 2010; Wheeler, 2009; Winter, 2010). These studies described the procedure of developing virtual spaces, such as those of the virtual Media Zoo at the University of Leicester or the Second Life in Education in New Zealand (SLENZ) project, and identified technical and design issues as well as academic-related hurdles that came up during the implementation phase. Some of the most cited barriers refer to hardware or/and connectivity problems, existing communication mechanisms in the 3D world, difficulty in integrating SL with existing educational technologies, lack of standards in designing virtual spaces for teaching and learning, preparation of suitable SL activities that occur in three dimensions, and high development time and costs.

A third considerably larger set of studies examined the affordances and the challenges of VWs in education through a variety of contexts (Bronack , Riedl & Tashner, 2006; Cheal, 2007; Cliburn & Gross, 2009; Inman, Wright & Hartman, 2010; Kay & Fitzgerald, 2008; Morgano, 2010; Salmon & Hawkridge, 2009; Warburton, 2009). These studies summarized components of the VW experience that can facilitate innovation in pedagogy. These components include extended or rich interactions, visualization and contextualization, simulations, activities in relation to the physical world, informal learning opportunities, and gamification. In addition, other positive features frequently identified in these studies are immersion and community presence. On the other hand, disadvantages of VWs may include a steep learning curve, technical problems, organizational and financial constraints, and academic-related hurdles as well as problems that arise when students inordinately immerse themselves in the VW (e.g., distractions, cultural problems, addiction).

All the above approaches have been used to examine the effect of VWs in education. The evidence is almost uniformly consistent in indicating that both students and instructors reap

a wide range of positive educational benefits through the use of VWs, such as increased levels of student satisfaction, motivation, engagement, immersion, and social awareness, despite any problems that may arise like a steep learning curve or technical issues.

Although there is a plethora of VWs, Second Life is the most widely accepted VW used for educational purposes. According to Inman, Wright, and Hartman (2010), about half of the studies related to the use of VWs in education are conducted in SL by educators either to teach or facilitate a course or as a part of a course. For instance, Wang and Braman (2009) conducted a series of SL activities designed to enhance students' learning experiences in an introductory computer course. Similarly, Schiller (2009) described an SL project that was implemented in an MBA course where students had to manage an avatar in teams and complete a series of business-related activities. Finally, Geigel (2010) described an experimental section of a Computer Science course focusing on animation, offered entirely in the virtual world of SL.

Overall, in all the above studies, SL activities seemed to have a positive impact on students' learning experiences. However, the limitations of these studies, such as the small response rate, technology and time issues, as well as sample size considerations, pose the need for further investigation.

In addition, the majority of these studies focus on the use of VWs in traditional modes of instruction (i.e., classroom-based instruction) rather than in DE in which the students are physically separated from each other. There are currently few studies that focus on the use of VWs as a technology for DE (Brown, Gordon & Hobbs 2008; Chow et al., 2007; Luo & Kemp, 2008).

Through this brief overview, it is clear that VWs and their potential usefulness for DE as a medium for instruction still remain open to question. The scarcity of information about

effective teaching and learning strategies in VWs is an issue of great importance. These strategies hold the potential to transform online education into an ultimate, immersive virtual learning experience.

Context of the Study

In order to examine the potentials of VWs in DE, this study utilized the VW of SL for designing and delivering collaborative e-learning activities for distant learners of Athabasca University (AU); an open call for participation was made to the graduate students of the Master of Education program and the undergraduate students of the BA in Psychology program that were registered in the courses Psyc 228, Psyc 355, or Psyc 381 at the time the virtual learning activities took place. Student demographics as well as their level of familiarity with VWs were collected through an online survey (Part 1 of the online survey).

This strategy for obtaining a convenience sample was followed to increase participation rates in the study and to permit, if possible, comparisons between groups of students. Moreover, it was thought that a larger pool of distant learners may better shape the AU students' general feeling about the possible integration of VWs in a real-instruction setting in the university.

For the purposes of this study, the researcher used the existing infrastructure of AU in SL (AU virtual landscape) and created the necessary virtual spaces (e.g., buildings, structures, objects) to accommodate the collaborative learning activities that took place in-world. The delivery of the learning activities in SL occurred over a 6-week period and involved the sessions described below.

Session 1: The Orientation Session

The orientation session was an asynchronous session that was designed to show students how to get started with SL. This involved instructions on how to download and install the program and how to create their accounts (avatars). In-world tutorials were also used to teach students basic navigation, communication, and interaction skills in order to help them familiarize with the environment. All students visited the AU virtual Island in SL and attended this session asynchronously. Feedback regarding the orientation session and the user familiarization in the VW was obtained from students using an online survey (Part 2 of the online survey).

Session 2: The Introductory Session

The introductory session was conducted synchronously by the researcher in AU Island in SL to inform students about SL and its possible applications in education, as well as to give them a detailed description about the in-world learning activities that would follow. Although data was not collected from this session, its purpose was twofold: first for students' socialization, and second for group formation. Students also had the chance to practice the skills they had learned during the orientation session. At the end of the introductory session students were divided into groups of three or four members.

Session 3: The Collaboration Session

The collaboration session was also conducted synchronously in AU Island in SL with each group separately. During the collaboration session, students were asked to decide upon their group's identity and their own roles in the team. Their task was to study and execute a role-playing scenario and to collaborate in order to complete the tasks described in the scenario. The output of this session was that the group answer a set of questions related to the scenario

and submit them in the form of a notecard.

The idea behind this activity was to facilitate the development of collaborative and team work skills. Multiple timeslots (three in total) were provided for this session as each team worked separately at a mutually agreed upon time. Feedback regarding the collaboration session was obtained from students using an online survey (Part 3 of the online survey).

Session 4: The Learning session

The final synchronous session that took place in AU Island in SL was the learning session. During the learning session, the groups all met together to discuss issues relevant to the role-playing scenario and their findings. In the meeting space, the answers of each group (from the previous session) had been uploaded in separate boards so as to be visible to everyone. This enabled each team to access the findings of the other teams respectively. Two timeslots were provided for this session.

The idea behind this activity was to promote critical thinking and dialogue within and among teams and to help them decide about the most important learning artifacts that should be included in their team's final report. This activity was completed with the submission of each team's final report. Feedback regarding the learning session and suggestions for further development in the SL environment was obtained from students using an online survey (Part 4 of the online survey).

Follow-Up Interviews

After the completion of the in-world sessions, follow-up interviews were conducted with all of the students who were willing to participate further in the study. Feedback regarding students' overall experiences in SL as well as suggestions for improvement was obtained through semi-structured interviews (Interview Protocol).

Significance of the Study

The use of VWs is a creative teaching strategy that educators in a variety of disciplines can use to help students make the transition from theory to practice. VWs can be a safe environment that provides students with opportunities to practice their skills, make mistakes, learn from those mistakes, and reflect on their practice and decision-making abilities in a risk-free, collaborative learning environment. VWs can also help students develop confidence in their abilities prior to being called to operate in a highly stressful environment like the workplace. Therefore, this research may encourage educators to include VWs in their teaching in order to better prepare students for the real world.

In addition, many DE programs suffer from lack of interaction and collaborative opportunities. The physical separation of the instructor and student and between the students themselves can lead to feelings of isolation that can greatly result in lower levels of student engagement, motivation, and performance. VWs provide great opportunities for collaborative e-learning and interaction through a variety of settings (e.g., discussions, simulations, role-play), and therefore this research can offer good practice examples on this pedagogical issue.

Moreover, the existing literature examines the use of VWs mostly in a traditional classroom-based setting rather than in programs delivered at a distance. This study also addresses this unexplored area. Using the VW of SL, this research investigates the instructional effectiveness of the particular 3D world in terms of its usability, collaboration, and learning features and examines how these features can support collaborative learning techniques for DE students. The results of this research may point to best practices in the use of VWs as a teaching and learning strategy and justify the incorporation of this technology into distance or blended education programs. In doing so, this research adds to the body of knowledge in DE.

Finally, this study is significant because it provides an evaluation of AU Island in SL and its existing infrastructures. Additional enhancements have been made in AU Island for the purposes of this study (e.g., CDE building, Orientation Space, meeting rooms, professors' offices). From that perspective, this study also aims to contribute to the design specifications for a suitable evaluation framework for 3D virtual collaborative learning environments and make suggestions for improvement, where possible, on how learning can be enhanced or facilitated in a 3D VW.

Purpose Statement and Research Questions

The purpose of this study is to set the design specifications for a suitable evaluation framework for 3D virtual collaborative learning environments (i.e., usability of the platform, communication and interaction channels, collaboration, and learning tools) through the evaluation of the VW of SL, as well as assessing the extent to which 3D VWs can support collaborative learning techniques (i.e., through role-playing) for DE students.

In order to examine the above, this study addressed the following questions:

1. What are the design specifications for a suitable evaluation framework for 3D virtual collaborative learning environments?

2. How can 3D virtual worlds support collaborative learning techniques for distance education students?

This case study used a mixed methods approach. Quantitative instruments (online surveys), were used to evaluate the SL environment as a collaborative and learning space; qualitative instruments (semi- structured interviews) were used to further explore the participants' experiences in this educational undertaking. The reason for choosing a mixed-

method format for this case study is to better understand this research problem by converging both quantitative and qualitative data.

Limitations

Limitations identify potential weaknesses of the study (Creswell, 1994). This study involved a convenience sample of AU students that volunteered to participate in the study; therefore, the lack of random selection limits the generalizability of the study results.

Time constraints limited the amount of hands-on practice students had in SL during the instructional activities. Students worked in small groups using a role-play scenario case, with each student playing an assigned role. Every student assumed the role of the educational counselor in the scenario. However, there were distinctive roles for each group member (i.e., group leader, group recorder, investigator/note keeper) during the role-play activities and in that sense, each group member may have mastered different skills to a greater or lesser extent according to his/her role. For example, the group recorder was responsible for creating and updating notecards while the investigator explored the surroundings in order to find information relevant to the scenario. The former student may have acquired more experience with notecards while the latter was better able to master his/her navigation skills. As such, the lack of extensive hands-on practice in the 3D world may not have given each student sufficient time to engage in the activities and reinforce their learning in all areas.

Finally, because of the interpretative nature of the qualitative part of this research, the researcher might have introduced bias into the analysis of the findings as she was the coordinator of the in-world activities. To avoid or limit the effects of bias, an independent researcher was asked to review the results of the qualitative data coding and provide feedback

for improvement where possible.

Delimitations

Delimitations identify how the study was narrowed in its scope (Creswell, 1994). This study was confined only to the AU students that engaged in all in-world tasks (SL activities). Each task was built and designed upon the previous task; therefore, any student who missed a critical session was excluded from the study. This resulted in a small sample composed only of MEd graduate students. No undergraduate students from the BA of Psychology program volunteered to participate in the study and consequently, no comparisons between groups occurred; therefore a replication of this experiment is encouraged.

This investigation utilized the collaborative technique of role-playing and therefore participants' responses and reflections are confined only to this technique. It is possible that participants' perceptions may be different if other collaborative techniques had been introduced.

Finally, this research used the virtual world SL, just one of many VWs that are currently available; therefore, the results are not generalizable to other virtual worlds.

Definition of Terms

Asynchronous learning: Learning where participants are in different places and communicating at different times (Mitchell & Honore, 2008).

Avatar: A representation of a real person in an online environment. Avatars range from just a name and a photograph displayed on a bulletin board to a complex manipulated 3D object in a virtual world.

Blended learning: Learning involving multiple methods and approaches, commonly a mixture of classroom and e-learning (Mitchell & Honore, 2008).

Collaborative Virtual Environment (CVE): An extension of a networked virtual environment which aims at a collaborative task. CVEs aim to provide an integrated, explicit, and persistent context for cooperation that combines both the participants and their information into a common display space.

Collaborative Educational Virtual Environments (CEVEs): An educational virtual environment that aims to support Collaborative Learning.

Distance Education (DE): An educational situation that occurs with the learner being physically separated from the instructor and other learners (Keegan, 1996).

E-learning: Learning that is delivered, enabled, or mediated by technology (Mitchell & Honore, 2008).

In-world: Inside the Virtual World, inside the Second Life environment.

Learning activity: A specific interaction of learner(s) with others using specific tools and resources, orientated towards specific outcomes (Beetham, 2007, p. 28).

Massive multiplayer online game (MMOG): A game that is capable of supporting hundreds or thousands of players simultaneously, which by necessity is played over the Internet. MMOGs are not restricted to personal computers but can be played on newer game consoles such as the PSP, Xbox 360, or PlayStation 3 as well as on mobile devices and smartphones.

Massive multiplayer online role playing game (MMORPG): An MMOG that incorporates a significant level of role-playing within the game, which takes place in a persistent online world with hundreds or thousands of other players. Each player controls an avatar that interacts with other players.

Multi-user virtual environment (MUVE): Originally used to describe MMOs that were not game specific. The currently defined MUVE has 3D isometric/third-person graphics, is accessed over the Internet, allows for thousands of simultaneous users to interact, and represents a persistent virtual world. The focus is often on social interaction rather than gaming.

Second Life (SL): A virtual world on the Internet from Linden Research, Inc., San Francisco, CA, in which "residents" create an identity, meet people, buy land, and build their own environment or purchase an existing one.

Simulation-Linked Object-Oriented Dynamic Learning (Sloodle): Sloodle is a free and open source project which integrates the multi-user virtual environments of Second Life and/or OpenSim with the Moodle learning management system.

Synchronous learning: Learning where participants are in different places, but communicate at the same time (Mitchell & Honore, 2008).

Traditional Education: Traditional education also known as conventional education refers to the face-to-face instruction that usually follows a teacher-centered approach. The term is often used to distinguish it from online or distance education.

Virtual Learning Environment (VLE): A VLE is a Web-based platform for the digital aspects of courses of study, usually within educational institutions. VLEs typically allow participants to be organized into cohorts, groups and roles; present resources, activities, and interactions within a course structure; provide for different stages of assessment; report on participation; and have some level of integration with other institutional systems.

Virtual World (VW): A three-dimensional society on the Internet where the user is represented by a third person, a digital alias also called avatar. Socializing and participating in realistic activities are the main purposes in these worlds. Second Life or close substitutes with the same

characteristics will be referred to when mentioning this concept. Further, this concept should not be confused with virtual reality since the level of interaction differs (Günes & Franzén, 2008).

Summary of the Problem

VWs seem to have great potential for teaching and learning. However, there is still limited comprehension about the guidelines and principles that should be followed for designing learning in VWs in order for learning to be meaningful and pedagogically sound. This research aims to contribute to the design specifications for a suitable evaluation framework for 3D virtual learning environments and to make suggestions for improvement, where possible, on how learning can be enhanced or facilitated in a 3D virtual world.

Moreover, the complexity of educational systems in DE may introduce some additional factors for consideration such as limited opportunities for interaction and collaboration that may affect learning. This study also aims to contribute in the understudied area regarding the use of VWs in DE and how collaborative learning techniques could be effectively supported in 3D environments.

Organization of the Thesis

Chapter II describes relevant literature related to this study. It provides a review of the literature on distance education and technology, virtual worlds, and Second Life in education, as well as an overview of the theoretical framework related to this study with a special emphasis on cognitivist and constructivist learning approaches. Chapter III describes the research design, methodology, procedures, instrumentation, and data analysis of the study. Chapter IV provides the findings of the quantitative and qualitative data analysis, as well as a discussion of the study

results. Chapter V contains the conclusions of the study, the steps for a suitable evaluation framework for 3D collaborative educational virtual environments, and a set of design principles that aim to support collaborative learning in VWs for DE. It also includes recommendations for improvements on the role-playing scenario that took place in SL, as well as suggestions for future research.

CHAPTER II - LITERATURE REVIEW

Introduction

This chapter provides an overview of the literature and research related to the study. It begins with a brief discussion of DE and technology, and the evolution of educational technologies from print to Web 2.0 and Virtual Worlds. A background to the history of VWs is also provided in order to shed light on how this particular technology evolved through the years and how it is utilized in an educational context today.

Special focus is also given on the use of Second Life (SL) in education, as this is the VW used for this research. Major findings and conclusions from previous studies related to the use of SL in academia were used to frame the research questions of this study.

Next, a discussion is provided of the leading educational theories and how these are related to SL with a special focus on cognitivist and constructivist learning theories, which can be considered to be the most relevant theories pertaining the design of collaborative e-learning in the virtual world. Other theoretical approaches relevant to this research are also discussed. Finally, this chapter ends with a summary of the most important findings of the literature review, identifies the gaps that exist, and poses the need for the current study.

Distance Education and Technology

It has been argued that there are three generations of DE (Garrison, 1985; Kaufman, 1989; Nipper, 1989). Technology has historically played a role in DE, thus many distance education theorists have described and defined DE based on the predominate technologies employed for delivery (Garrison, 1985; Kaufman, 1989; Nipper, 1989) . The first generation of

DE technology was by postal correspondence. This was followed by a second generation, defined by the mass media of television, radio, and film production. Third generation DE introduced interactive technologies: first audio; then text and video; and finally web and immersive conferencing. The three generations have been characterized by Kaufman (1989) as a progressive increase in learner control, opportunities for dialogue, and emphasis on thinking skills rather than on comprehension alone.

Technology seems to be an integral part of DE, but the use of new innovative technologies has not been always regarded as the element distinguishing DE from other forms of education. Dirr's (1999) interpretation remains contemporary and accurate; that is, that technology, especially electronic technologies, are now certainly viewed as central to DE and prominent in education and training generally (p.41).

Although many educators agree that teaching and learning designs must be pedagogically driven as opposed to technologically such, McLuhan (1994) first argued that technologies also influence and define the usage, in this case the pedagogy, instantiated in learning and instructional designs. Distance educators throughout the years have learned that appropriate technologies can help achieve the objective of promoting self-directed and active learning (Bostock, 1997). At the same time, technology does not, in itself or automatically, transform the learning experience. Strategies and interaction that are based on resources, roles, and structures suited to individual needs must be designed into the learning environment for deep learning to occur (Garrison & Cleveland-Innes, 2005; Oliver & McLoughlin, 1998).

Educational Technologies, Web 2.0 and Virtual Worlds

Technologies are tools that promote or facilitate learning in some way. Educational

technologies do not need necessarily to be electronic. Technologies vary from print-based, audio-based, and video-based to computer-based. However, in more recent years, educators have developed an abiding interest in electronic technologies and especially in what is called *Web 2.0*. Emerging Web 2.0 technologies, such as blogs, wikis, podcasts, mash-ups, social networks, and virtual worlds, which may hold the potential to transform higher education. Brown and Adler (2008) suggest that Web 2.0 tools encourage interaction and collaboration, two concepts that are at the foundation of participatory learning in which participants move from being passive consumers to active contributors. Recent investigations with new participatory educational tools for the college classroom has thrust virtual worlds into the spotlight.

Virtual worlds are richly immersive and highly scalable 3D environments where users, also called residents, enter these worlds through their avatars. An avatar is a digital representation of a person or being within a VW. In most sophisticated VWs, avatars are customizable, so a sense of unique identity and representation is possible. Residents can explore the world, meet other residents, socialize, participate in individual or group activities, and create and trade virtual property and services with one another. The experience is highly social, where avatars interact with one another using voice, text chat, or gesturing. Being logged onto or being inside a 3D VW is referred to as being *in-world*. VWs are open-ended environments in which people design and create the world, its objects, and their behaviors (Delwiche, 2006); therefore, VWs can be applied to any context (New Media Consortium and EDUCAUSE Learning Initiative, 2007).

Examples of 3D virtual world applications include ActiveWorlds (Activeworlds Inc., Las Vegas, Nevada), Second Life (Linden Lab, San Francisco, California), OpenSim (Overte

Foundation, Southampton, UK), OnLive! Traveler (Digital Space Corp., Santa Cruz, California), Open Cobalt - previous called Croquet - (Croquet Consortium Inc., Durham, North Carolina) and There (There Inc., San Mateo, California). The metaphors behind the design of virtual worlds are quite diverse, ranging from replication of real universities to creation of other planets (Prasolova-Førland, 2008).

A Brief History of Virtual Worlds

Current historical reviews of VWs often identify several generations of VWs that have evolved over the years (Bartle, 2003; Call, 2010; Damer, 2008; Downey, 2012; Koster, 2002). Downey (2012) presents three generational ages of VWs, which are based upon the changing nature and traits of worlds from one generation to the next.

First generation VWs were primarily text-based, small in scale (250 users or less), and set in the realm of fantasy adventure (e.g., Dungeons & Dragons and Middle Earth). Notable worlds from this generation include MUD (Trubshaw & Bartle, 1978) and Avatar (Maggs, Shapira & Sides, 1979) that was released for the PLATO system.

Second generation worlds witnessed the growing use of graphical worlds, larger scale systems (1,000 or more users), the introduction of social-oriented worlds, and development of worlds where users could create objects and shape the world in real time. Milestone worlds from this generation include the fully graphical Habitat (LucasArt, 1985) and LamdaMOO (Curtis, 1990) in which users could create their own in-world objects. Second generation virtual worlds migrated from fantasy gaming spaces to social and educational worlds as well.

Finally, the third (current) generation marks the age of massive systems (10,000+ simultaneous users), visually striking 3D worlds, and a growing array of genres and

applications of VWs targeting adults and children alike (e.g., MMOGs, MMORPGs, MUVEs / fantasy, science fiction / gaming, socialization, business and commerce, customer support and retention).

According to the aforementioned, the reader can easily infer that there is a considerable commonality across all generations of VWs, that of collaboration. The inherent collaborative quality of VWs to support games and socialization allow individuals to exist and engage with each other through assumed online identities (called avatars), and to participate in commercial, game as well as pedagogic activities.

Two prominent worlds of this generation are Second Life (Linden Labs, 2003) and World of Warcraft (Blizzard, 2004). While most commercial successes of this generation followed the gaming line of worlds, SL followed the LamdaMOO line of social, user-created VWs. While it may not be the biggest VW in terms of total users, SL gained wide reaching success due its highly diverse range of in-world content and broad application for social, commercial, and educational platforms.

Virtual Worlds in Education

Although the use of VWs has gained ground during the last decade due to the evolution of technology and the widespread use of the Internet, their use and implementation in education has been in place since the 1970s (Livingstone, Kemp, & Edgar, 2008). Educators have been drawn to 3D virtual worlds for a number of reasons including the visualization of content in ways that were impossible before, exposure to risk-free authentic learning experiences though simulations, and opportunities for extended and rich interactions and communication. As 3D immersive worlds provide opportunities for synchronous communication and collaboration

(Kemp & Livingstone, 2006), a prevailing reason to investigate 3D worlds is their use as a tool for distance learning.

Hew and Cheung (2010) reviewed past empirical research studies on the use of 3D immersive VWs in education and found that VWs have been utilized for three main purposes: (a) communication spaces; (b) simulation of space (spatial); and (c) experiential spaces ("acting" on the world).

Communication spaces refer to the use of VWs to communicate information from one person to another. Communication in VWs can take both verbal and non-verbal forms (Robbins, 2007). Verbal communication is typically established synchronously with the text-based chat or voice function, which are usually available in the VW environments. Non-verbal communication can be established through avatar appearance, posturing, and gestures (Robbins, 2007).

One fundamental attribute of a VW is its simulation of space (spatial), which is its ability to project a simulation of 3D space. This spatial aspect affords users the opportunity to be immersed or embodied in the 3D environment through their avatars.

Finally, Hew and Cheung (2010) found that, besides employing VWs as communication and/or spatial spaces, some educators have utilized them as experiential spaces. One of the key elements of virtual worlds is the "worldness" or spaces they create for participants. Moreso than webpages, email text, or photo albums, virtual worlds attempt to create geographies, lands or experiential spaces for students to explore and populate. As such, knowledge is constructed by learners in their attempt to explore the grid (Consalvo & Ess, 2011).

Kolb's (1984) experiential learning cycle concept (Figure 1) suggests that it is not sufficient to simply have an experience in order to learn; rather, it is important to reflect on the

experience in order to make generalizations and formulate concepts that can then be applied and tested to new situations. For instance, users in VWs can act on the objects in the 3D environment, which allows them to learn by doing, to observe the outcomes of their actions, to test their hypotheses about the world, and to reflect further on their own understanding.

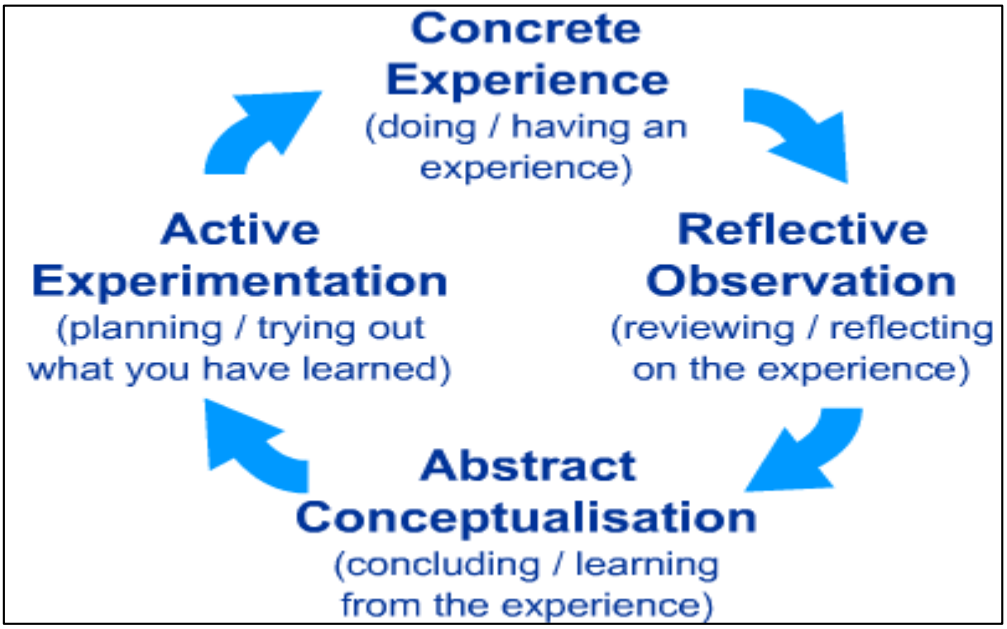

Figure 1. The Kolb Learning Cycle. Reprinted from *simplypsychology,* S. A. McLeod, 2013, Retrieved from http://www.simplypsychology.org/learning-kolb.html.

Educators have also looked upon VWs for research opportunities. Hew and Cheung (2010) found that educators conducted research in VWs to study the following aspects of VW participants: (a) affective domain; (b) learning outcomes; and (c) social interaction. In studies of the affective domain, researchers were interested in examining learner attitudes and feelings regarding the use of virtual environments as educational learning environments. Studies of the second area of interest, learning outcomes, explored whether 3D VWs could either help students learn or improve learning. Finally, researchers interested in social interaction explored whether

3D virtual spaces facilitated social interaction among students, as well as whether and how students used the communication features associated with particular 3D virtual environments.

Finally, educators have also had an abiding interest in VWs due to their potential to foster constructivist learning. Constructivism as a paradigm or worldview posits that learning is an active, constructive process. Constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity that they find relevant and engaging, which in turn encourages negotiation and collaboration among learners (Jonassen, 1999; Vygotsky, 1978). Dede (1995) found that 3D virtual environments could potentially provide safe environments whereby students could learn by doing. Research by Dickey (2003) indicated that, although there are constraints, 3D VWs do support constructivist learning because users interact with each other and the environment.

Educators and learners from all age groups currently frequent several VWs, including Active Worlds (for teens and adults), There (for teens and adults), and Second Life (for teens over 16 years of age and adults). Although there are more than 80 active, available educational worlds on Active Worlds (Active Worlds, 2009), SL has drawn the most media attention as well as attention from educators (Keegan, 2006). As this study focused on the VW of SL, the next sections discuss the SL environment, its strengths and weaknesses as a 3D collaborative virtual environment, and the learning theories that should be considered to inform recommended practices for teaching and learning.

Second Life

Second Life is an Internet-based three-dimensional VW created by San Francisco-based company, Linden Labs (2003). A number of free client programs, called viewers, enable SL

users to interact with each other through avatars. SL is intended for people aged 16 and over and, as of November 2015, has more than 43 million registered user accounts (Crespi, 2015).

Although SL may appear at first like a computer game, it is not; rather, it is a real-time dynamic distributed environment. The primary capability of SL is content creation, as it allows users to build and create a uniquely customized, personalized environment suited for their specific purpose. SL has a high-level, built-in scripting language called Linden Scripting Language (LSL) and programming tools, making it extremely easy for users to build content and to create scripts. The vast majority of all content has been constructed by its residents. Residents use SL to socialize, engage in recreational activities, do business, and learn.

Interestingly, the demographics of SL users are different from those participating in the massive multi-player online gaming environments. Instead of the typical young male audience that is typically found playing online games (Statista, 2014), the average age of individuals participating in SL is early 30s. Participation is equal among men and women, with women slightly more likely to continue participating in SL than men (Ondrejka, 2007).

SL appears to offer additional benefits to the 3D VW platforms. First, because of its virtually unlimited potential for content creation, the concept of *stigmergy* (i.e., the ability to create lasting content) has emerged (Robbins, 2007). As object creation is persistent, development is evolutionary. Residents make changes to their environment that remain consistent from one use to another. Second, personalized identification via highly customized avatars is another unique and positive attribute of SL (Salt, Atkins & Blackall, 2008). This attribute provides opportunities for the creative and personal expression of individual and unique personalities. Third, the global community of SL allows for synergistic contributions of development and design. Lastly, the platform supports multi-modal communication involving

text chat, audio, video, gestures, and action.

Strengths and Weaknesses of Second Life

The adoption of VWs for educational purposes and particularly of SL seems, overall, to have a positive impact on teaching and learning. However, its adoption is not without problems. There has been considerable research on the advantages and disadvantages of SL.

Inman, Wright, and Hartman (2010) analyzed findings and recommendations of 27 research studies on SL. They identified potential problems associated with using SL in education, including issues with the SL software and hardware requirements, a steep learning curve associated with its operation, and the possibility of students being exposed to distractions or inappropriate content. They also identified potential uses of SL including role-play, game and simulation creation, implementation within DE programs, and the ability to encourage student-centered learning activities.

Warburton and Perez-Garcia (2010), in a review of research carried out on VWs, and in particular on SL, identified the following components of the SL experience as facilitating innovations in pedagogy:

1. Extended or rich interactions: opportunities for social interaction between individuals and communities, human–object interaction and also intelligent interaction between artefacts;
2. Visualization and contextualization: the production and reproduction of inaccessible content that may be historically lost, too distant, too costly, imaginary, futuristic or impossible to be seen by the naked eye;
3. Exposure to authentic content and culture;

4. Individual and collective identity play;
5. Immersion in a 3D environment where the augmented sense of presence, through virtual embodiment in the form of an avatar and extensive modes of communication, can affect the affective, empathic, and motivational aspects of the experience;
6. Simulation: reproduction of contexts that can be too costly to reproduce in real life with the advantages that some physical constraints can be overcome;
7. Community presence: promoting a sense of belonging and purpose that provides cohesion among groups, subcultures, and geography;
8. Content production: opportunities for creation and ownership of the learning environment and objects within it that are both individual and owned.

Warburton and Perez-Garcia (2010) through a survey of newsgroups, blog posts, and the extant literature proposed eight broad categories under which barriers to successful implementation of SL as an educational tool could be grouped. The first category concerned technical problems and included two subcategories: (a) machine-related client-side issues such as bandwidth or hardware; and (b) human or use-related issues such as navigation or avatar's manipulation. The second category involved the issue of identity problems. The fluidity and playfulness inherent in SL identity construction was considered to be disconcerting and confusing to users. The third category concerned cultural problems. SL can be an isolating experience and can feel destabilizing and outside the "safety zone" for users, that is, a place of no limits, no boundaries and no restrictions on behavior. The fourth category included collaboration problems. Cooperation and co-construction need to be scaffolded and building trust and authenticity are critical factors for successful group activities.

The next two categories included organizational issues such as lack of time for preparing

well-designed activities in SL and economic factors that may block the implementation of an SL project. A basic account is free, but anything beyond simply being present in-world costs money: buying land to create teaching spaces; uploading images and textures; purchasing useful in-world tools, employing building and scripting expertise. The seventh category was related to the lack of open standards which remain a major problem for developers. The final category concerned scaffolding persistence and social discovery problems. These are closely related with collaboration problems. The in-world profiles associated with each avatar provide a limited mechanism for the social discovery of others. Although a number of web-based services have now appeared to bridge the connection between in and out of world and augment the possibilities for social discovery and scaffold avatar persistence, yet problems in which avatars remain trapped at the center of its own community exist.

Similar findings were reported by Wheeler (2009) based on the development of the virtual Media Zoo and the initial teaching and learning activities undertaken in SL. He reported that there were technical issues and academic-related hurdles to be overcome in order to make the whole experience a success; these concerned development time, client versioning, preparation of suitable activities and communication mechanisms. He also noted that scripting (i.e., programming) skills must be acquired to create islands, landscapes, buildings and objects.

Other studies of educational uses involving SL have identified components of the SL experience that could facilitate a paradigm shift in education. Kay and Fitzgerald (2008) developed a set of categories that represent the current educational activities of SL. These included the following: self-paced tutorials; displays and exhibits; immersive exhibits; role plays and simulations; data visualizations and simulations; historical recreations and re-enactments; living and immersive archaeology; machinima construction; treasure hunts and

quests; language and cultural immersion and creative writing.

Bronack, Riedl, and Tashner (2006) found that the use of SL as an educational tool has helped teachers interact with students in more fluid and natural ways. It also allows students to interact with the virtual environment. Likewise, Cheal (2007) suggests that the use of VWs in education is not only inevitable as part of the evolution of teaching and learning, but also a positive development, as it fosters active, experiential learning. However, using SL as a virtual venue for traditional lectures is likely to be unpopular and ineffective with students, as the format of SL promises interactivity and not the passive nature of lectures.

Similar results were obtained by a pilot study conducted by Cliburn and Gross (2009), using a quasi-experimental, pretest-posttest, comparison groups design in order to compare the experience of a SL lecture to a real world lecture. The authors (2009) found that students who attended the real world lecture performed significantly better on a post-test quiz than those who attended the same lecture in SL.

Wang and Braman (2009) conducted a series of field trials and a case study of the integration of SL into an introductory computer course. The field trials and the case study results demonstrated potentials for SL activities in an educational setting. Based on observations and student feedback, Wang and Braman (2009) found that SL (a) improves students' learning experience through the design of appropriate class activities, (b) provides students the sense of reality through simulation, (c) provides non-verbal cues in online discussion, (d) provides the capability of interaction between students and various people from around the world to discuss class topics, (e) provides an advantage for some assignments through visual and immersive aspects and (f) provides the instructor the key capability of teaching in an online environment without time and space constrains.

Wang and Braman (2009) also summarized the most important barriers which appeared under the development of the course in SL. These concerned the following: (a) the complexity and steep learning curve of the environment; (b) the difficulty in the orientation in the surroundings when guidance is not designated and provided appropriately as part of the instruction; (c) the limitations with computer hardware; bandwidth and lab resources; and (d) the potential for *griefing*. Griefing is a term used for bad behavior, disruption and virtual violence. Abusive language, intentional bumps, being shot by weapons, caging, orbiting and deforming are the most used forms of griefing in SL. One of the most notable examples of griefing occurred in May 2007, shortly after the tragic shootings on the real-world Virginia Tech campus, when a virtual gunman began shooting other visitors on Ohio University's SL campus. While no avatar was hurt or killed, the university temporarily closed its island in SL (Au, 2008).

Having reviewed the most important findings of VWs in education and in particular of SL, as well as the potentials and the barriers of this technology that are most frequently quoted in literature, the next section discusses the role of theory and how it can inform practice when designing and implementing learning activities in SL.

Learning Theories and Second Life

Educational Theory

Behaviorism, cognitivism, and constructivism can be viewed as the "holy trinity" of educational theories within which learning can be analyzed, and have been used to guide instructional design since their inception. However, this section attempts to highlight the

importance of the most relevant theories related to this research and to provide insights on how teaching and learning in virtual worlds merit the inclusion of both dominant but also more innovative and less established theoretical perspectives.

The virtual world project of this thesis study was centered on the creation of collaborative learning activities implemented with AU students, and applied situated learning and socio-constructivist theories to the activities design, therefore the aforementioned theories are discussed. Additionally, this research investigated the ways in which educators could design virtual worlds to best support the embedded activities/curricula. The fluidity and playfulness of VWs are often considered to be disconcerting and confusing to users, and as such they act as distractors to their learning. One approach to solving this problem is to use *multimedia principles* based on cognitive processing theory in the design of virtual worlds. Therefore, cognitivism and multimedia learning are also discussed. Finally, this research examines how learning in 3D VWs occurs across distributed units and networks with the technology to be a key factor in the learning process, hence more innovative learning theories such as distributed cognition and connectivism are also presented.

Cognitivism

Cognitive theory takes into account the mental models and internal processes of the learner, building on a richer psychological understanding of learning and how it occurs (Dron & Anderson, 2014). Cognitive psychology claims that learning involves the use of memory, motivation, and thinking and that reflection plays an important role in learning.

The cognitivist concept uses the constructs of short- and long-term memory, where a finite amount of new information is temporarily held in short-term memory and that events or

activities are required for committing that new knowledge to long-term memory. Learning designers interpret this principle in different ways. Some believe that learners move through information and activities at their own pace and require certain levels of support - commonly known as *scaffolding* that will allow students to meaningfully participate and gain skill at a task that they would be unable to complete unaided. Similarly, for users of SL, there is a considerable amount of prescriptive learning required before becoming relatively independent in the use of the software. Swaine (2007) suggests that the SL Core Competency Framework (Appendix A) can be seen as providing this scaffolding. Others suggest that information and activities should be chunked (i.e., broken down into smaller units of instruction) in order to prevent cognitive overload, and that activities be included to maximize possibilities for deeper processing that may transfer information to long-term memory. Therefore, designers need to ensure that the appropriate existing cognitive structure is present to enable the learner to process the information and, if not, pre-instructional strategies should be included as part of the learning process (Ally, 2004).

Online learning environments that are informed by a cognitivist approach must also use strategies to facilitate maximum user experience through a thorough user interface design. Examples include the proper location of the information on the screen, the attributes of the screen (e.g., color, graphics, size of text), the pacing of the information, and the mode of delivery (i.e., audio, visuals, animations, video). These important elements need to be considered carefully when designing learning in SL.

Another important aspect of cognitive theory is the concept of cognitive load. According to cognitive load theory, learners have a limited amount of mental processing power, or working memory, available for engaging new information. If a person encounters too much

information at one time, his or her "cognitive load" becomes too great to process it all and information may be lost (Artino, 2008). Virtual worlds present a much higher complexity level than students are used to with typical text-based curricula or 2D online environments and as a result students sometimes get lost in the virtual world, losing out on the learning opportunities presented. One approach to solving this problem is to use so-called *multimedia learning principles* based on cognitive processing theory in the design of virtual worlds. Researchers and virtual world designers are exploring the extent to which multimedia principles may reduce the complexity or "high cognitive load" experienced by students in virtual world-based curricula and improve learning outcomes (Erlandson, Nelson & Savenye, 2010; van de Spek, van Oostendorn, Wouters, & Aarnoudse, 2010). Therefore, multimedia learning is also discussed in detail in the following section.

Cognitive Theory of Multimedia Learning.

The Cognitive Theory of Multimedia Learning (CTML) was popularized by the work of Richard E. Mayer and other cognitive researchers who argue that multimedia supports the way that the human brain learns. They assert that people learn more deeply from words and pictures than from words alone, which is referred to as the multimedia principle (Mayer, 2005a). Multimedia researchers generally define multimedia as the combination of text and pictures; and suggest that multimedia learning occurs when people build mental representations from these words and pictures (Mayer, 2005b).

By words, Mayer (2002) means that the material is presented in verbal form, such as using printed text (that is, words printed on the screen that people read) or spoken text (that is, words presented as speech that people listen to through earphones or speakers). By pictures, he

means that the material is presented in pictorial form, such as using static graphics, including illustrations, graphs, photos, or maps, or using dynamic graphics, including animation or video. The term *multimedia presentation* refers to any presentation that contains both words and pictures.

Virtual worlds are ideal for multichannel educational experiences as they allow for extensive multimedia presentation by utilizing all the above combinations of words and pictures in the learning environment. However, the excessive use of media can become overwhelming and lead to cognitive overload and as such instructors and virtual world's designers should be very careful when designing learning in the virtual world. Multimedia instructional design attempts to use cognitive research to combine words and pictures in ways that minimize cognitive overload and maximize learning effectiveness.

Constructivism

Constructivism rests on the assumption that knowledge is constructed by learners as they attempt to make sense of their experiences. Morphew (2000) defines constructivism as "the co-construction of meaning in the learning environment" (p. 5). Constructivist learning advocates active learner participation in problem-solving and critical thinking with meaningful, authentic activities undertaken collaboratively.

The notion of constructivism can be divided into two aspects –social constructivism and cognitive constructivism. Although both viewpoints are components of constructivist learning theory, this research is mostly focused on social constructivism. From a social-constructivist perspective, knowledge and knowledge creation is a fundamentally social phenomenon. Not

only are meanings negotiated and formed in a social context but the process of education is one where learners move from one zone of proximal development to the next, mediated by others (teachers or more advanced learners) who have already gone beyond to where the learner wishes to go.

Sener (1997) suggests that the key principles of constructivist learning are situated or anchored learning, social negotiation of knowledge and collaboration. Situated or anchored learning presumes that most learning is context-dependent, so that learners' cognitive experiences are situated in authentic activities, such as inquiry-based learning, problem solving, role-playing, and result in richer and more meaningful learning experiences. The aforementioned represent typical examples of learning activities that are being conducted in SL. Social negotiation of knowledge is a process by which learners form and test their constructs in a dialogue with other individuals and with the larger society. Collaboration as a principle focuses on learning activities so that negotiation and testing of knowledge can occur.

Jonassen (1994) identified eight features that distinguish constructivism with regard to the development and implementation of learning environments:

1. Constructivist learning environments provide multiple representations of reality.
2. Multiple representations avoid oversimplification and represent the complexity of the real world.
3. Constructivist learning environments emphasize knowledge construction instead of knowledge reproduction.
4. Constructivist learning environments emphasize on authentic tasks in a meaningful context rather than abstract instruction out of context.
5. Constructivist learning environments provide learning environments such as real-world

settings or case-based learning instead of predetermined sequences of instruction.

6. Constructivist learning environments encourage thoughtful reflection on experience.
7. Constructivist learning environments enable context-and content-dependent knowledge construction.
8. Constructivist learning environments support collaborative construction of knowledge through social negotiation, not competition among learners for recognition.

Most of the above features are directly applicable to the 3D virtual worlds and specifically in SL. SL is a complex environment that provides multiple representations of reality through the various in-world interactions that can occur. In order for students to be successful in the VW, they must develop new literacies, think creatively within the constraints of the world itself, learn to collaborate with other avatars to achieve shared goals, and learn to accept their new identity -- their virtual self. If learners grasp these new skills, the virtual simulated experience provides a constructivist learning environment that engages learners through the use of compelling activities that enhance active learning opportunities (Halverson, 2005; Edirisingha, Nie, Pluciennik, Young, 2009).

Collaborative Learning.

Collaborative learning can generally be defined as learning activities expressly designed for, and carried out by, pairs or small interactive groups (Barkley, Cross, & Major, 2014). The approach of collaborative learning is mainly related to the principles of social constructivism which focuses on an individual's learning that takes place because of their interactions in a group. However, online interactions differ in quite important ways from face-to-face discussions (Curtis & Lawson, 2001). Online interactions lack the non-verbal cues that are a

component of face-to-face instruction and much online conversation is conducted asynchronously, features that may reduce the extent of communication that occurs.

In 2D virtual environments, interactions are provided by tools that do not resemble the reality of the conventional classroom, as they rely on the computer screen to provide the learning environment rather than emulating the real world as in 3D environments. On the other hand, in 3D virtual environments, people and information can be organized in more natural ways. Students are able to visualize the presence and location of other participants in action, and consequently to increase awareness, communication, and the perception of belonging to a learning community (De Lucia et al., 2009). SL provides opportunities for both synchronous and asynchronous communication through a variety of tools such as local chat, instant messaging, and voice chat, and it also offers opportunities for non-verbal communication. The possibility to provide avatars with emotional gestures, expressions and postures greatly enhances communication in collaborative virtual environments (Fabri, Moore, & Hobbs, 2002). These unique qualities of 3D VWs can provide the setting for a high quality collaborative learning experience.

Therefore, SL and similar technologies have been extensively used in education as collaborative virtual environments. Activities for experiential learning, simulation, role-play and modeling of complex scenarios are only few of the opportunities that 3D VWs offer for collaboration and the co-creation of knowledge, which cannot be easily experienced using other platforms.

Situated Learning.

Situated learning stems from constructivism and is based on the perception that people's knowledge is embedded in the activity, context and culture in which it was learned. Learning is social and not isolated, as people learn while interacting with each other in Communities of Practice. Community provides the setting for the social interaction needed to engage in dialogue with others to see various and diverse perspectives on any issue (Brown, 1994; Lave & Wenger 1991).

Through community, learners interpret, reflect, and form meaning. Linking that to the SL, supporting students to construct their own meaning and recognizing incidental learning on the periphery (e.g., chatting in the meeting room, sending instant messages, chatting with bots/scripted agents) is central to learning and should be nurtured and planned for. This process where newcomers become experienced members of the community is termed "legitimate peripheral participation" (Lave & Wenger, 1991).

Situated learning also requires meaningful and authentic activities. Activities should match as nearly as possible the real-world tasks of professionals in practice rather than decontextualized or classroom-based tasks in order for learning to be perceived as useful outside the virtual environment. It also requires significant opportunities for discussion and time, with perceived learning from online courses directly related to the amount of discussion actually taking place in them.

Distributed Cognition

Distributed cognition can be seen as another approach informed by the constructivist and cognitivist theoretical frameworks. Distributed cognition proposes that cognition and

knowledge are not confined to an individual, but distributed across objects, individuals, artifacts, and tools in the environment. The goal of distributed cognition is to recognize how distributed units are coordinated by analyzing the interactions between individuals, the representational media used and the environment within which the activity takes place (Hutchins, 2005).

Therefore, distributed cognition provides an effective theoretical foundation for understanding human-computer interaction and a fertile framework for designing and evaluating digital artifacts (Hutchins 1995; Norman 1993; Salomon 1997). As such, the concept has been widely applied in the field of distance learning, especially in relation to computer supported collaborative learning and other computer-supported learning tools.

Similarly, distributed cognition should inform the design and delivery of the learning activities within the virtual world through the creation of digital learning artifacts and their interaction with others in-world, in ways that are often impossible to replicate in real life. SL software provides tools and guidance for manipulating the environment, allowing action scripting and object construction; in this way, SL helps students ground their knowledge in meaningful practice and rehearsal of skills.

Connectivism

Connectivism theorizes that knowledge is distributed across networks and the act of learning is largely one of forming a diverse network of connections and recognizing attendant patterns (Siemens, 2005). Connectivism is an approach to learning that considers technology to be a key factor in the learning process; as such, it is applicable to the use of 3D virtual worlds. Technology integration allows learners to make more solid connections with the content. In

conjunction with pedagogically sound instructional design models, virtual learning environments support the integration of multiple types of web resources into the learning environment. Virtual worlds harness student interest and promote active learning thus allowing for increased levels of student engagement, better literacy skills, and inquiry-based learning experiences (Solomon & Schrum, 2007).

Loureiro and Bettencourt (2010) contend that SL as a learning environment reflects the assumptions of Connectivism in many ways. SL enables the contact and connection with a diversity of opinions, nodes, links, and specialized information sources. Because it is digital, virtual, and immersive, SL allows those information links to be more interactive, which enhances learning and information sharing. On the other hand, motivation, feelings, and the sense of community belonging that are generated among SL users helps to create, develop and maintain connections, and facilitates a process of continuous and natural learning.

Summary

Chapter II has provided a review of the literature on distance education and technology, VWs, and SL, as well as the role of dominant but also more innovative learning theories and their contribution to the current project. Although past empirical research has extensively studied how VWs have been utilized in education, the pros and cons of these 3D environments, as well as their potential to affect students learning outcomes and social interaction, yet design issues for learning and especially for collaborative learning in VWs does not have the focus of significant research. Due to the lack of literature offering practical guidelines for learning design in VWs, it is necessary to set the design specifications for a suitable evaluation framework for 3D collaborative learning environments. Moreover, the ability of 3D worlds to

support collaborative e-learning techniques for DE remains an unexplored area as the complexity of DE systems and the diversity of VWs environments poses the need for further investigation on the transferability of collaborative e-learning concepts into the VW. Those research gaps in the literature provided the conceptual bases to guide this research study. By exploring these new avenues for research, the study aims to contribute to the fields of VWs and distance education.

CHAPTER III – METHODOLOGY

This chapter provides a description of the methodology used in this research study to investigate the instructional effectiveness of SL as a tool for collaborative e-learning. Information on the research design, instrumentation, procedure, data collection, data analysis, and reporting are included in this chapter.

Research Design

A case study research design was chosen to investigate the following research questions of this study:

1. What are the design specifications for a suitable evaluation framework for 3D virtual collaborative learning environments?
2. How can 3D virtual worlds support collaborative learning techniques for distance education students?

A mixed-method sequential explanatory strategy for data collection was considered appropriate for this case study, as the combination of quantitative and qualitative approaches offers a deeper understanding of the research questions (Creswell, 1994). The sequential explanatory strategy is characterized by the collection and analysis of quantitative data in the first phase of research, followed by the collection and analysis of qualitative data in the second phase that builds on the results of the initial quantitative results. A sequential explanatory approach is typically used to explain and interpret quantitative results by collecting and analyzing follow-up qualitative data (Creswell, 2009).

The quantitative component of this research used an online survey to assess the VW of

SL as an instructional tool in terms of its usability, collaboration, and learning features. After the conclusion of the learning activities in SL, students completed the 96-item online survey to evaluate the core features of SL, the communication and collaboration mechanisms of the SL platform, the design of the activities, and the system's functionality in terms of their learning.

The qualitative component of the research involved semi-structured interviews with students who volunteered to be involved further in the study. These interviews were conducted in order to obtain richer and more detailed information about the learning activities, such as students' feelings about the experience, the new skills and knowledge they obtained, their attitudes towards the technology, their confidence in using this technology, and suggestions for further improvement regarding SL's functionality. Creswell (2009) notes that qualitative methods focus on the whole experience and the meaning subjects give to that experience and, therefore, they provide a broader and deeper understanding than quantitative methods. Interviews have the ability to obtain specific kinds of information, such as attitudes and beliefs that would be difficult to obtain without asking the subject directly. Students were asked about their learning experience in SL, the problems and difficulties they encountered during the activities, the effectiveness and the quality of communication and collaboration that occurred, the presence of other avatars and how it affected the collaboration process, as well as their perceptions about the incorporation of VWs technology in a real instruction setting at Athabasca University.

The study can be viewed as a single instrumental case study. One rationale for selecting a single case, is to study the representative or typical case, where the objective is to capture the circumstances and conditions of an everyday or commonplace situation (Yin, 2009). In an instrumental case, the researcher focuses on an issue or concern, and then selects one bounded

study to illustrate this issue (Stake 1995). One of the challenges inherent in all types of case studies is that the researcher must identify the case and decide on the "boundaries" of the case in terms of time, events, and processes. The next section provides further details on this issue.

Bounding the Study

In order to examine the potential of VWs in DE, two programs of Athabasca University, the Master of Education in Distance Education (M.Ed.) and the Bachelor of Arts in Psychology (BA Psych), were selected for the recruitment part of the study as they were considered "typical cases" of online programs delivered at a distance. A typical case highlights what is normal on average. In that sense, the case of the M.Ed. and the BA Psych program were considered to represent a typical case among open distance education programs where the profile of the adult online learners differed from traditional college-age students. The findings from this case were assumed to be informative regarding the AU students' experience in the virtual world.

The task for AU students from both programs was to participate voluntarily in a set of four in-world learning activities conducted in SL in order to evaluate the platform in terms of its usability and interaction features. In addition, as the learning activities were designed to support collaboration, students were also asked to assess the SL environment in terms of their learning. The learning activities, which took place during the spring semester of 2013, are described in detail later in this chapter.

Target Population and Sample

Graduate students who were enrolled in M.Ed. program during the spring semester (April to July) of 2013 (n=275) and undergraduate students from the BA in Psychology program that were enrolled in the courses Psych 228, Psyc 355, or Psyc 381 during the same period (n=600) were identified as potential study participants. An information letter and consent form along with a detailed description of the SL activities (Appendix B) was sent to the two sample pools (Appendices B1 & B2).

Twenty-two students from the M.Ed. program and 4 from the BA in Psychology program (26 students in total) volunteered to participate and signed the informed consent form. The researcher emailed each of the students to provide them further details about the research project. As students participated voluntarily in this study, a convenience sample strategy was used for recruitment.

Inclusion criteria for the study included the following: students' provision of informed written consent for the study; their participation in all four of the in-world group tasks; and completion of the online survey. Moreover, students' technical capability (i.e., having a suitable computer and Internet connectivity) was also a prerequisite. Students unwilling or unable to meet any of the above criteria were excluded from the study; however, they were able to take part in the SL activities, if they wished to.

Because the current research involved a significant workload for the volunteer participants, the researcher provided an incentive to honor participants' time and effort as well as the value they lent to the study. According to Cohen, Manion, and Morrison (2007), "incentives may be useful in reducing dropouts, ensuring that respondents continue an online survey to completion (up to twice as likely to ensure completion) and... that they may be useful

if intrinsic motivation is insufficient to guarantee completion" (p. 239). Therefore, the participants who completed all the tasks related to this research were able to participate in a draw for $300. This level of incentive was considered necessary since the researcher was asking the research participants to engage in a series of instructional and research activities and that amount reflected their level of involvement. Funding for this incentive was approved by the GSRF committee (Appendix C).

From the initial pool of 26 students, only 9 students completed all the instructional and research tasks and therefore met the criteria for inclusion. Those students who did not complete all the above tasks were excluded from the study and their data was removed prior to analysis.

Instrumentation

This research study used an online survey (Appendix D) separated in four main parts (Demographic Questionnaire, Familiarization Survey, Collaboration Survey, and Learning Survey) and semi-structured interviews (Appendix E) to investigate the instructional effectiveness of SL in terms of its usability, collaboration, and learning features for distance education students. The following section summarizes the instrumentation and data collection methods that were used in this study.

Demographic Questionnaire

The Demographic Questionnaire (Part 1 of the survey) was developed by the researcher to obtain data on gender, age and previous experience with virtual worlds. The 8 items of this questionnaire involved a combination of multiple-choice questions, Yes/No questions, multiple-answer questions, and open-ended questions. Information from this instrument was used to

describe the sample of the study.

Familiarization Survey

The goal of the Familiarization Survey (Part 2 of the survey) was to uncover usability problems of the most important parts of the user interface concerning the basic functionalities of the SL environment. Issues such as usability, user friendliness, appearance, aesthetics, interactivity, and adaptability were examined in this part of the survey. Example evaluation subjects included 2D and 3D interface, graphics, navigation, camera controls, avatar manipulation, and interaction with 3D objects and the virtual spaces. The Familiarization Survey consisted of 16 questions in total. A Likert 5-point scale ranging from "1 = Strongly disagree" to "5 = Strongly agree" and a "3 = Don't know" option was used to measure each student's response to the issues.

Collaboration Survey

The goal of the Collaboration Survey (Part 3 of the survey) was to uncover usability problems associated with the communication and collaborative functionalities of the SL environment. Issues such as the SL communication tools, feedback mechanisms, interactions with other avatars, and evaluation of the role-playing tasks were examined in this survey. Example evaluation subjects included control of avatar gestures and facial expressions, communication and collaboration tools, group coordination tools, data sharing capabilities, the collaborative role-playing scenario (e.g., learning objectives, instructions, the time required, feedback, and support on the learning task completion). The Collaboration Survey consisted of 50 questions in total. A combination of different formats such as appreciation and evaluation questions (using a Likert 5-point scale), Yes/No questions, and some open-ended questions

were used to measure students' attitudes towards these issues.

Learning Survey

The goal of the Learning Survey (Part 4 of the survey) was to discover the pros and cons of the virtual environment in relation to the learning process and to collect further requirements and additional functionality. Issues examined in this survey included the following: (a) ability of users to progress without guidance; (b) how users took advantage of SL collaborative functionality in order to carry out the learning; (c) users' rating of the system in terms of group awareness, social presence, and immersion concerning learning in SL; (d) integration of features for additional functionality (e.g., video/audio sharing, tools for assessment, forums, voting and decision making tools, Sloodle); and (e) users' intention to organize or attend a course in SL. The Learning Survey consisted of 14 questions in total. A 5-point Likert scale ranging from "1 = Strongly disagree" to "5 = Strongly agree," and a "3 = Don't know" option was used to measure students' attitudes towards these issues.

Interview Questions

Semi-structured interviews took place with participants who volunteered to participate further in the study. The researcher developed a set of questions to serve as a guide for the interviews with the students. The student interview guide is described below.

Student Interview Guide.

The student interviews were based on 15 open-ended questions related to the research questions and addressed the following: (a) ease of use; (b) communication; (c) collaboration; (d)

learning; (e) application in the real-world setting; and (f) issues for future development.

The 15 interview questions were as follows:

1. How did you find your experience in the Second Life project? How did it unfold?
2. Did you encounter any problems with orienting and moving in SL? Please explain
3. What important issues or problems (if any) did you face in SL? Probes for this question included the following:
    - Orientation issues (e.g., moving avatars, find resources in the virtual space)
    - Communication issues (e.g., chat, talk, share resources)
    - Learning issues (e.g., difficulties in learning, too many distractions)
    - Other (please specify)
4. How easy or difficult was it to communicate with other individuals in SL?
5. What were the most frequently used methods (SL features) you used to communicate with other residents within SL itself? Probes for this question asked about the following:
    - Chat feature
    - Voice feature
    - Notecards
    - Other (please specify)
6. How easy or difficult was it for you to collaborate with other individuals in SL?
7. Did the presence of other students in SL (avatars) help with your learning? If so, how?
8. What were your positive experiences during the project?
9. What were your negative experiences during the project?
10. Did you feel you needed help or support during the process?
11. What is different between 3D (e.g., Second Life) and 2D (e.g., Moodle) virtual environments for learning?
12. Do you have any suggestions for how to improve learning in Second Life? Please explain.
13. Would you like to see Second Life integrated into your courses at Athabasca University? Please explain when and/or how do you think a 3D environment would be useful.
14. How useful do you think SL is as a tool for distance education?
15. What other observations or comments would you like to make about the use of virtual

worlds for learning?

Optimizing the Research Instruments

Before delivering the survey to the actual study participants, a pre-survey evaluation was performed by three experts (the survey validity test group - comprised of the Thesis Committee Members), who were familiar with the VW of SL and the activities that would be conducted in-world.

The survey evaluators, who had previous experience in studying VWs in an educational setting, were asked to screen the survey for its relevance and consistency. By delivering the survey to the evaluators, it was possible to improve the utility and validity of the survey instrument in view of its research perspective. Some anomalies requiring adjustment were provided as feedback, mainly pointing towards questions that could be optimized, adjusted or revised. More specifically, in Part 1 (Q7) was optimized. In Part 2 (Q9) was rephrased. In Part 3 (Q11) and (Q12) were adjusted, (Q13) was optimized, the former (Q14) was deleted, and Q19 was revised. This resulted in an optimized online survey that was used as a basis for the quantitative part of this research.

The Interview Questions were also reviewed by the three experts prior to the official interviews that took place with the study participants. Two out of fifteen questions (Q3) and (Q5) were rephrased in order to capture the order of importance instead of simply asking about the most important issues participants faced in SL and the more frequently SL features used by the participants for communication. The sub-constructs added in the above questions were based on the frequency of answers that participants gave in the first quantitative part of this research.

Optimizing the Research Procedures

Pilot Sessions

To try out the SL activities and make any necessary revisions before the actual study took place, two pilot sessions in SL were scheduled during the winter semester of 2013, in the context of the MDDE 620 course (Advanced Technologies for Distance Education and Training). The instructor of the MDDE 620 course volunteered to post an invitation (Appendix F) in the course forum for the pilot sessions as an optional course activity, through which students would have the chance to experiment with the 3D world of SL as well as collect empirical data for a course assignment related to the evaluation of some educational technology in a DE context. These pilot sessions were instructional in nature and not research-related and the students who wished to participate emailed the researcher to receive further instructions.

The pilot sessions were self-paced and conducted in a two-week period. The first session took place from March 18 to 22, 2013 and included the SL Orientation. The purpose of this session was for students to visit AU Island in SL and attend the in-world orientation in order to familiarize themselves with the basic features of the environment. The second session was held from March 23 to 29, 2013; students were asked to visit AU Island in SL and review the educational activities and resources of the environment and make suggestions for improvement, where possible. Both sessions were conducted asynchronously.

The pilot sessions did not involve a complete implementation of all the in-world activities. No collaborative tasks took place as group organization and synchronous communication were beyond the scope of the MDDE 620 course. Therefore, students in the pilot sessions were not expected to complete any surveys or interviews. However, they were asked to review the activities and resources to provide feedback (via email) where possible,

prior to the official start of the research project. Pilot testing provided the opportunity to validate the digital artifacts created in SL, test the learning resources, understand the time necessary for the session, and ultimately to fine-tune the learning activities and ensure that no major usability problems existed.

The SL Facilitator

A strong body of research indicates the importance of incorporating technical training and support into any planned SL activity (Chow, et al., 2007; Mayrath et al., 2007; Jarmon et al., 2008; Sanchez, 2007b). Second Life's steep learning curve as well as technical problems associated with SL's heavy requirements for computing capacity may cause significant frustration and consternation, especially for novice users (Chow et al., 2007; Delwiche, 2006; Franklin et al., 2007; McVey, 2008; Sanchez, 2007b). When users struggle to understand how to utilize VW software, both their performance and satisfaction with the technology dwindles (Bulkeley, 2007). Thus, it was decided that the presence of an SL facilitator during the synchronous in-world sessions would be a necessity.

The facilitator was an external contractor, named Vasilis Giannoutsos and his role was absolutely neutral. He was employed by the Virginia Department of Education and had extensive experience with SL software. He was also a member of International Society for Technology in Education (ISTE) group. The facilitator was selected by the researcher among three other applicants as he offered the most competitive quote. The facilitator had been granted permission to access AU's virtual land by Gunnar Schwede - Systems Analyst of Faculty of Business - who was the creator and the owner of Athabasca University Island in SL and the Faculty of Graduate Studies. His task was to act impartially and provide help and support to the

participants in case they had technical difficulties.

Main study

Recruitment. AU students were notified six weeks in advance of the start of the study that a series of instructional activities would be held in the VW of SL. An announcement was posted to Athabasca Landing – the university's social media network -- to inform students about the purpose of the research and to describe the quantitative and qualitative parts of the study. Students were asked to email the researcher indicating their intent to participate in the study. In addition to the invitation, three weeks prior to the beginning of the in-world activities, the program assistant of the CDE Office and the coordinator of the courses Psyc 228, Psyc 355, and Psyc 381 sent a letter via email to the M.Ed. (n=600) and the BA Psyc students (n=275) respectively, containing the "Information and Consent to Participate in a Research Study" form (Appendices B1 & B2). This letter described the research study, including the risks and benefits, the right to refuse, and matters pertaining to the privacy and confidentiality of the study participants. Details about the in-world sessions, the timeframe of their implementation and the inceptive were also provided. Those students who wished to participate signed and returned the Consent Form. This step ensured that each student participating in the study had submitted a written consent form prior to the implementation of the in-world activities.

Orientation session. The Orientation session in SL was designed to help students familiarize themselves with the 3D environment and the SL features before the collaborative tasks took place. This one-hour session was conducted asynchronously and students had the chance to learn and perform certain in-world tasks in SL, such as walking, flying, changing view, creating notecards, zooming, interacting with objects or people etc. Students were asked

to join the Orientation activity at a time of their choice during a one-week period (July 1 - 7, 2013).

Prior to the session, the researcher emailed all participants the "SL Orientation Instructions" (Appendix G) to explain how to download and install the program and how to create their accounts in SL. When these tasks were accomplished, each student was able to join the in-world Orientation and practice basic navigation and communication skills in SL. For that purpose an "Orientation building" had been created in SL, where students could visit and perform certain tasks (Figure 2). Each space of the Orientation building was designed to accommodate a learning task. Participants were asked to visit all spaces and complete each of the learning tasks in order to complete the Orientation session (Figure 3 & Figure 4). The orientation building and the learning tasks were developed by the researcher. For content creation, information and instructions from the Second Life official site (http://secondlife.com/) were used.

Figure 2. Orientation Building

Figure 3. Zooming Activity

Figure 4. Creating and Submitting a Notecard Activity

Introductory session. The Introductory session was the first synchronous activity in SL. Its purpose was to inform students about SL and the collaborative activities that would

follow and also act as an icebreaker activity between participants. A Doodle poll (https://doodle.com/) was conducted by the researcher through which participants indicated their availability for the introductory session. Based on the responses, two timeslots were provided for this session (Monday, July 8, 2013 – 02 pm to 03 pm MDT and Tuesday, July 9, 2013 – 11 am to 12 pm MDT) in order to ensure the maximum possible participation of the participants. An invitation and instructions (Appendix H) for this session were emailed to the participants.

The Introductory Session took place in the AU virtual amphitheater in SL (Figure 5 & Figure 6) and involved a 30-minute presentation by the researcher about the use of SL in academia and a detailed description of the learning activities that would follow. The content of the presentation was based on the researcher's academic article "The path from first to second life" that had been presented at the ED-MEDIA conference in 2011 (Nteliopoulou & Tsinakos, 2011).The presentation was followed by a 30-minute discussion between the participants and the researcher.

The Introductory Session was the first time students had met in SL and they were encouraged to socialize and get to know each other. During this session participants also had the opportunity to practice the skills they had learned in the Orientation session. At the end of the session, students were divided into groups of three or four so as to be able to participate in the role-playing activity that would follow.

Except for the researcher, the facilitator was also available to help students in case any technical problems arose. The session was recorded and the recording was sent to participants via email after the end of the session.

Figure 5. Panoramic view of AU Amphitheatre

Figure 6. Attendees' Seats

Collaboration session. The collaboration session was scheduled one week after the Introductory Session. It involved a group role-playing activity that was designed to facilitate

the development of collaboration and team work skills inside SL. Three groups had been created during the previous session. In the Collaboration Session, each group had to visit the VW at a mutually convenient time and perform the role-playing scenario.

An invitation (Appendix I1) was sent via email to all group members as a reminder for this session. Group 1 joined the session on Saturday, July 20, 2013 - 06:00 PM - 07:00 PM, group 2 on Friday, July 19, 2013 04:00 PM – 05:00 PM, and group 3 on Wednesday, 17 July, 2013 06:00 PM - 07:00 PM.

The collaboration session involved the following tasks:

1. Initially, the group members were gathered in the meeting room that had been created in SL for that purpose where they could find information and instructions for the role-playing scenario (Figure 7).
2. There, they had to choose their group's identity for the role-playing activity. The two available options were the Blue and the Orange team. According to this choice each team would visit different places and access different resources in the virtual world.
3. Students were also encouraged to decide their role in the team. The available roles for the activity were the Group Leader, the Group Recorder and the Investigators/Note Keepers.
4. After having decided their group's identity and their roles in the team (10 min. duration), students' task was to study the role-paying scenario. According to that, students were called to act as educational counselors coming to advise the University's Dean about a proposed educational change regarding the introduction of Mobile Learning in the University.

5. The group's task was to visit some of the University Professors (bots designed to perform as non-player characters in the roleplaying scenario), see what their thoughts and concerns were on the issue and then report to the Dean their suggestions on what should be done (Figure 8).
6. According to their team's color, the educational counselors visited two out of four Professors in their offices and interacted with them through notecards as well as other resources available with additional information. The Blue team visited two Professors that were proponents of m-Learning while the Orange team visited the other two that were against the integration of m-Learning in the University (20 min. duration).
7. After their investigation, the groups had to return to the meeting room, discuss their findings, and answer a couple of questions that had been given to the group in the form of a notecard based on what they had observed (30 min. duration). (see Appendix I2 for a complete description of the tasks of the Collaboration session).

Figure 7. Students at the Meeting Room

Figure 8. Students visit at Professor's Robert Office

The content used for the creation of the digital artifacts related to m-learning was extracted from the UNESCO website (http://www.unesco.org). The role of the researcher during this activity was to observe and not guide the groups. The facilitator was always present in order to provide technical support. The group sessions were recorded and the recording was sent to participants via email after the end of the session.

Learning session. The Learning session was scheduled two weeks after the collaboration session. The Learning session was also a role-playing activity during which all groups had the opportunity to meet as a whole in the virtual world and discuss their collective findings from the previous session. The Learning session took place on Saturday, August 3, 2013 – 11 AM – 12 PM. An invitation (Appendix J) was sent via email to the participants as a reminder for this session. The learning session involved the following tasks:

1. The three groups were directed into the meeting space, where each group's answers from the previous session had been uploaded on separate boards so as to be visible to all

the participants; for example, the Blue teams were able to access the observations of the Orange teams and vice versa.

2. They were also able to ask questions to one another and discuss issues relevant to the scenario or the strategy they followed (20 minutes were allocated for this part of the session) (Figure 9). This activity was designed to promote critical thinking and dialogue among teams and to help them decide about the most important learning artifacts that should be included in their group's final report.
3. After the information exchange task, each group re-gathered separately to prepare their report with their suggestions to the Dean (25 min. duration).
4. The activity was completed with the group leaders presenting their team's suggestions to the Dean (15 min. duration).

The role of the researcher during this activity was to observe and facilitate the discussion. The facilitator was always present in order to provide technical support (Figure 10). The group sessions were recorded and the recording was sent to participants via email and after the end of the session.

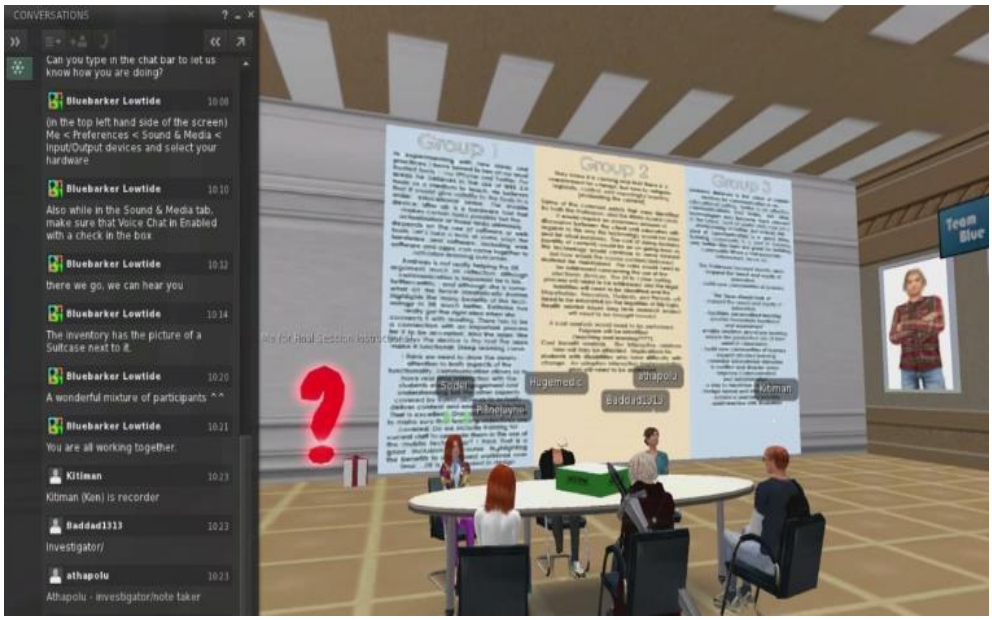

Figure 9. Students discuss their findings

Figure 10. The facilitator of SL sessions

Data Collection

After the end of the in-world activities, the researcher emailed those participants who had completed all the in-world activities inviting them to participate in the online survey (Appendix E). Initially, it was planned that each one of the 4 sections included in the online survey be a separate instrument that would be completed by the participants after the end of the corresponding session. However, in order to reduce the workload for the participants, the researcher decided to merge the Questionnaire and the surveys into a single instrument that would be sent to participants after the end of all the in-world activities.

The online survey was administered using the LimeSurvey software tool (https://www.limesurvey.org). The LimeSurvey software was chosen because it was an open source survey software tool hosted in AU servers and allowed easy and cross-platform mobile accessibility.

Interview Procedures

Interviews took place during a four-week period after the end of the in-world activities. An email was sent to the participants who had stated on their consent form that they wished to be contacted for the second phase (interviews) of this research. Six of the nine participants had indicated they were willing to be interviewed.

Initially, it was planned to conduct three interviews with volunteers that would be randomly selected. However, due to the low participation rate, the researcher decided to conduct interviews with all the volunteer participants (n=6). Those students were contacted by the researcher and the interview was scheduled at a mutually convenient time.

The researcher contacted each student via Skype. The mp3 Skype recorder, Simkl (http://simkl.com/) was used to record each interview in its entirety. The researcher conducted

each interview, reading from the "Student Interview Questions" guide sheet to ensure consent and consistency.

Each interview began with a short introduction and explanation of the interview process, as well as a request for permission to record the conversation for accuracy. All participants were told that they could refuse to answer any question and that they could end the interview at any time. A set of open- and closed- ended questions were identified for the interviews. Questions were repeated at a participant's request. The interviewer rephrased questions to clarify or expand on a participant's answer as needed. The repeated questioning and verifying is an important part of qualitative data collection and analysis as researchers must listen carefully to what they hear and experience in order to determine meaning (Shenton, 2004). Each interview ended with the question, "Do you have any additional comments that you would like to add?" Then each participant was thanked for their participation in the second phase of this research.

Data Analysis

Quantitative Data Analysis

Prior to analyzing the quantitative data, all data entries were reviewed for entry errors. All errors were corrected prior to analyzing data using SPSS ® Version 17.0. Descriptive statistics were obtained first, followed by appropriate statistical analysis.

Demographic data was described in terms of frequency and percentage. Age, gender, program, and previous experience were measured on a nominal scale as they describe the attributes of a sample (Huck, 2000).

Descriptive statistics were also used to analyze the data obtained by the Familiarization,

Collaboration, and Learning surveys. Data from the Familiarization survey was analyzed and an overall mean and standard deviation was calculated for each of the 16 items (of Q9) in the familiarization survey. This analysis was done to examine the participants' levels of satisfaction with the SL user interface and the basic functionalities of the environment.

Using the data from the Collaboration survey, an overall mean and standard deviation was calculated for each of the 10 items (of Q10 and Q12) related to the collaborative capabilities of the SL environment. Mean scores were also calculated for the ratings of SL features according to their level of use and their ability to boost the interaction process (Q13 and Q14). These scores were obtained by adding the participants' positive, negative, and neutral answers. Finally, an overall mean and standard deviation was calculated for each of the eleven items (Q16) related to role-playing activity design. Overall, this analysis was done to examine the participants' levels of satisfaction with the SL collaboration capabilities.

Descriptive statistics were also used to analyze the data provided by the Learning survey. Users rated 21 items (of Q20) regarding their learning experience in SL and an overall mean score and standard deviation was calculated for each item. This analysis was done to examine the participants' levels of satisfaction with their learning experience in SL as well as to obtain their suggestions for improvement.

Qualitative Data Analysis

Data analysis for the qualitative part of the research study began with the students' interviews and continued through transcription, coding, and interpretation of the interview text. Students' interviews were recorded with permission and transcribed by the researcher into MS Word files.

Interview transcripts were subjected to qualitative analysis using a selective approach for isolating thematic statements. The selective approach focuses on phrases or sentences that are considered to be essential or revealing about the experience described in the transcripts (van Manen, 2015). Thematic analysis is a method for "identifying, analyzing and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 79). A theme identifies something important in the data in relation to the research questions and implies a level of patterned response or meaning. Thematic analysis is a step-by-step process that begins when the coder/researcher notices patterns of meaning in the data and ends with the reporting of those patterns/themes and sub-themes (Braun & Clarke, 2006). The data generated from the qualitative analysis added detail, providing a rich description and insight into what was being studied.

Coding methodology.

The coding and qualitative analysis for this project was done in NVivo 9.0. A simple project design was used consisting of source documents and a hierarchical node table. The source documents consisted of audio files that were transcribed into MS Word files. Given the relatively small sample size and the nature of the project, other features of NVivo were not deemed necessary and were not applied.

Although the interviews were structured as responses to 15 questions from the interviewer, a decision was made not to follow a priori structure for the coding, but rather to perform open coding consistent with the grounded theory methodology.

The coding began with an initial reading of the entire set of interviews without performing any coding at all. At this point the coder/researcher reflected on what was read and decided on an initial set of high-level nodes consisting of "Experiences using the technology"

and "Learning experiences in SL." The entire set of interviews was read again and then coded against the two high-level nodes. While conducting this initial coding, the coder determined that there were important findings that did not fall into either of the two initially defined nodes. Therefore, three additional high-level nodes were identified and termed "Ad hoc."

Following the two complete readings of the interviews, the coder applied the node filters and then began reading through each filtered node. The sub-nodes were identified and coded ad hoc at this point. The coder conducted two additional readings of the filtered nodes and continued to refine the coding. The coder then reviewed the coding results and consolidated similarly defined nodes and further segmented others. This step resulted in the final hierarchical node structure.

The coder ran several NVivo reports to look at node density and to review source coverage. Satisfied with the results, the coder conducted an additional examination of each node's coded elements to make certain that each element was properly understood in its context. NVivo displays coded elements with the surrounding uncoded text, which allows for examination of each coded element in context of a larger portion of the source materials. Once this step was completed, the coder exported the hierarchical node structure and the filtered coded elements to an Excel spreadsheet for ease of analysis.

The coder again read through and analyzed the coded elements for each node. These were again read through to ensure clarity and accuracy. Finally, the coder identified and documented the meta-themes that were running through all of the findings.

Rigor in Qualitative Research

Qualitative research is often criticized as biased, small scale, anecdotal, and/or lacking rigor; however, when it is carried out properly, it is unbiased, in depth, valid, reliable, credible, and rigorous. In qualitative research, there needs to be a way of assessing the extent to which claims are supported by convincing evidence (Creswell, 2009). Although the terms reliability and validity traditionally have been associated with quantitative research, increasingly they are being seen as important concepts in qualitative research as well. Qualitative validity means the researcher checks for accuracy of the findings by employing certain procedures, while qualitative reliability indicates that the researcher's approach is consistent across different researchers and different projects (Gibbs, 2008).

There are major critical strategies, suggested by leading qualitative researchers from various fields as essential for producing trustworthy and believable findings in qualitative research. These are (a) triangulation, (b) multiple repetitions of measurement, (c) expert consensual validation from others, (d) member checks, (e) searching for disconfirming evidence, (f) checking for representativeness, and (g) thick descriptions (Creswell, 2009).

To improve the qualitative validity of the thesis research study, rich and thick descriptions were used by the researcher to convey the findings in order to make the results more realistic and detailed. Member checks were used to determine the accuracy of the qualitative findings by taking the final report back to the participants and determining whether participants felt that the findings were accurate.

Respectively, to improve qualitative reliability, the researcher double-checked transcripts to make sure that they did not contain any obvious mistakes made during

transcription and used the cross-checking technique to assess the codes that had been developed. The cross-checking process involves an inter-coder agreement whereby the researcher finds another person to cross check their codes (Creswell, 2009). The level of agreement between two or more coders is known as inter-rater reliability (Creswell, 2009). To promote inter-rater reliability, this study used emersion (i.e., reading and re-reading the interviews) and discussion between the researcher and the co-coder at the various stages of the coding process (i.e., constantly checking individual and collaborative interpretations) to understand the meaning of the data. In the thesis research study, the inter-coder agreement was made with an independent researcher who had an academic research background in the virtual worlds. Finally, the researcher/coder ran several of the NVivo reports to examine node density and review source coverage. This technique provided additional insights on the level of consistency of coding.

Ethical Considerations

Ethical issues and standards must be considered and met in both quantitative and qualitative research. Researchers have a responsibility to design their study in a way that maintains ethical principles and protects human rights (Shenton, 2004).

To ensure informed consent, students were notified verbally and in writing about the research objectives as well as the requirement to attend the SL sessions and complete the related research tasks. They were also informed that their participation in the study was voluntary and that they could refuse to participate in the study or leave the study at any time without prejudice. Consent forms were obtained prior to data collection.

Researchers must consider issues of anonymity and privacy during data collection

and manuscript writing (Shenton, 2004). Once quantitative data collection was completed, any identifying information was removed and identity codes were affixed. Interviews were audio-taped with permission, and transcribed by an automated electronic transcribing service. Participants could refuse to answer any question in the interviews or stop the interview at any time. The use of pseudonyms and identity codes ensured that the identities of all participants could not be determined in the presentation of qualitative data). All data was kept confidential and stored in a locked filing cabinet as well as in password-protected computer files. Data obtained in the online survey was collected on a server located at Athabasca University in Canada.

Every precaution was taken in this research study to protect the participants from physical or mental harm and ensure their comfort. During the Orientation session, the participants had the opportunity to familiarize themselves individually with the environment before the collaborative tasks took place. Role-playing objectives, expectations, and ground rules were given verbally and in writing during the introductory session to decrease any potential risk of student anxiety or stress.

The thesis research study was approved by the Research Ethics Board (REB) at Athabasca University and as such this research study and the related, drawn-up consent forms as well as methodologies, data storage, and analysis have been submitted and scrutinized by the Athabasca University's Ethical Review Committee (Appendix K).

Role of the Researcher

As mentioned in the limitations of this study, the researcher was part of the learning and research environment, as she was the coordinator of the SL activities and conducted/analyzed

the interviews. Creswell (2007) stated that "it is important that researchers describe their own experience with the phenomenon under study in an attempt to set aside the researchers personal experiences so that the focus can be directed to the participants in the study" (p. 159). This is the case for this study, as the principal investigator was the organizer of the SL activities. As such, she was directly concerned with the engagement and participation of the learners that joined in the in-world activities. This role could have resulted in bias towards the interpretation of the data, or could have influenced the data provided by the course participants. Nevertheless, the researcher of this study took every measure to decrease – ideally remove – bias from the analysis and conclusions by involving an independent researcher to review the coding, by keeping an open dialogue with the course participants, and by questioning her own analysis while keeping in mind her role throughout the process.

In order to provide full transparency of the role of the researcher, it might be important to know that one of the factors leading to this study was the researcher's personal experience in using virtual worlds in an educational setting. Since 2011, the researcher has been a member of SL educators group (SLED) and the SL researchers list (SLRL) and she retains an ongoing interest in this academic topic. She is also a member of several virtual communities (e.g., Virtual Pioneers, Virtual Worlds Best Practices in Education, Virginia Society for Technology in Education, Virtual Worlds Education Roundtable) which provide useful information and resources on the use of VWs in education. As such, she considers this study as an opportunity to expand her knowledge further and in that sense, the researcher's involvement in the study may be perceived as useful and positive rather than detrimental.

Summary

Within the context of the implementation of the collaborative role-playing tasks in SL, a case study research design was used to evaluate the VW of SL so as to provide useful insights into the instructional effectiveness of the platform and generally of 3D worlds in terms of their ability to support collaborative learning techniques for DE students. A convenience sample of 9 students participated in the in-world activities. Data was gathered using an online survey instrument developed by the researcher to obtain demographic data and to examine certain issues related to SL environment and the activities that occurred in-world. Descriptive statistical analysis of the quantitative data was performed. Data was also obtained by the follow-up interviews. For the qualitative data, thematic analysis with a selective highlighting approach was used to identify common themes. Ethical considerations were also discussed.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents the results obtained from the data analyses and discusses the findings. It is divided into three main sections: (a) a description of the characteristics of the sample obtained in the study, (b) the results of the descriptive statistical analyses of the quantitative data, and (c) the thematic analysis of the qualitative data obtained in the study. A summary of findings concludes the chapter.

Characteristics of the Sample

This research study involved a convenience sample of nine AU students (n=9) that participated in this study. As far as the demographic characteristics of the sample starting from the gender distribution it was observed that the ratio of male and female participants was 55.6% (n=5) and 44.4% (n=4) respectively. The average age of the participants was 50.6 years old with standard deviation equal to 8.6 years old. The youngest person was 39 years old and the oldest 61 years old. All the participants attended one program, which was the master of distance education. Regarding any previous experience of the participants in VWs (Second Life, Open Simulator, Croquet Project, Active Worlds, Quest Atlantis) only one replied that he had in the past. His experience was linked with gaming and educational reasons. Moreover, he used to spend less than one hour time per week in the virtual world.

Quantitative Analysis and Findings

Analyses were conducted of the data obtained from the online survey. For the statistical analysis of this research descriptive statistics (mean, standard deviation) were used to present students' evaluation of the SL environment during the phases of familiarization (Table 1), collaboration (Table 2), (Table 3), (Table 4) (Table 5) and learning (Table 6) for the in-world activities that took place in SL.

Familiarization survey

After the end of the in-world activities students were asked to complete the familiarization survey (part 2) to evaluate issues related to the most important parts and basic functionality of the SL user interface. Descriptive statistics were used to rate the 16 items of the familiarization survey. Mean ratings for these items ranged from 2.0 to 4.2 (out of a possible score of 5.00). Respondents rate their degree of agreement with each statement. Their response shows both the direction (for or against) and intensity (strength) of their attitude. Results for each item of the familiarization survey are reported in Table 1.

Table 1

Familiarization –Interface Issues

	N	Frequency					Mean	Std. Dev
		1	*2*	*3*	*4*	*5*		
h) I had no problem to move or teleport from one virtual area to another.	9	3	4	1	1	0	2.0	1.0
j) I did not lose my orientation inside the virtual environment.	9	3	3	0	3	0	2.3	1.3
f) It was not difficult to move my avatar.	9	2	2	2	3	0	2.7	1.2
e) Learning to use the functions of the environment was easy.	9	0	5	1	3	0	2.8	1.0
b) 3D user interface was not difficult (e.g. 3D avatars, worlds, textures, forms, objects and places/scenes).	9	0	5	0	4	0	2.9	1.1
n) I was not sure when to right-click or left-click on the objects of the environment.	9	0	2	3	4	0	3.2	0.8
a) My first impression of the environment was positive.	9	0	2	2	5	0	3.3	0.9
c) 2D user interface was not difficult (e.g. pictures, words, pages, windows on the flat screen).	9	0	3	2	1	3	3.4	1.3
i) I found the feature "change view" useful inside the environment.	9	0	0	4	5	0	3.6	0.5
o) The animation of the avatar was satisfactory.	9	0	2	1	5	1	3.6	1.0
l) It was easy to learn how to interact with 3D objects (e.g. touching objects, sitting on a chair).	9	0	2	1	3	3	3.8	1.2
d) I found the graphics of the environment satisfactory.	9	0	1	1	5	2	3.9	0.9
g) Virtual areas (spaces, buildings) of the environment were satisfactory.	9	0	0	2	6	1	3.9	0.6
p) The avatar's appearance modification tool was satisfactory.	9	0	1	1	5	2	3.9	0.9
m) I could easily distinguish 2D from 3D windows.	9	0	0	2	5	2	4.0	0.7
k) The system was fast enough in my computer.	9	0	1	1	2	5	4.2	1.1

1=Strongly Disagree, 2=Disagree, 3=Don't Know, 4=Agree, 5 Strongly Agree

The lowest mean scores were obtained for the statements [h] "I had no problem to move or teleport from one virtual area to another" (M = 2.0) and [j] "I did not lose my orientation inside the virtual environment" (M = 2.3). These scores indicated that students perceived it was

difficult to move, teleport, or orient themselves within the 3D environment. Medium mean scores between 2.5 and 3.5 were obtained for the statements [f], [e], [b], [n], [a], and [c]. Important issues that were addressed in those statements included a steep learning curve in SL, a medium level of difficulty regarding 3D and 2D interface although students perceived 2D interface was less difficult (than 3D), and a relatively positive first impression of the environment. Higher scores ($M > 3.5$) were received for the statements [i], [o] [l], [d], [g], and [p]. These revealed that participants found the function "change view" useful and that it was relatively easy to learn how to interact with the 3D objects. Moreover, participants agreed that the avatar's animation, the avatar's appearance modification tool, the graphics, and the virtual spaces of the environment were satisfactory. The statements with the highest ratings were [m] "I could easily distinguish 2D from 3D windows" ($M = 4.0$) and [k] "The system was fast enough in my computer" ($M = 4.2$).

Collaboration Survey

After the end of part 2 of the survey, students were asked to continue with the collaboration survey (part 3) to evaluate SL's capability to support the collaboration process during the role-playing activities as well as the design of the collaborative tasks themselves. Descriptive statistics were used to rate the quality of collaboration that occurs in the 3D world (Table 2), the SL features students used most (Table 3), the SL features that student believe boosted interaction (Table 4), and the collaborative role-playing scenario (Table 5) that was designed for that purpose.

Table 2

Collaboration Issues

	N	Frequency					Mean	Std. Dev
		1	***2***	***3***	***4***	***5***		
g) I found avatars gestures useful for the collaboration.	9	2	4	3	0	0	2.1	0.8
i) The representation of the other user though an avatar helped me to collaborate effectively.	9	0	4	2	3	0	2.9	0.9
j) I consider I could collaborate more effectively with my partner in a 2D environment.	9	0	2	5	1	1	3.1	0.9
h) I found the feature of being able to see other users interact with objects useful.	9	1	1	1	6	0	3.3	1.1
b) I did not encounter any technical problem inside the environment.	9	1	2	0	4	2	3.4	1.4
d) I found useful to see the way my partner interacts with the environment.	9	1	0	3	4	1	3.4	1.1
f) I found useful the representation of the user's field of view/vision through the avatar's head movement.	9	1	1	1	5	1	3.4	1.2
e) I would prefer to contact my partner though VoIP or other communication tools.	9	0	2	2	3	2	3.6	1.1
a) System features helped me to collaborate effectively with my partners.	9	0	1	1	5	2	3.9	0.9
c) The system's feedback mechanisms were fast in my computer.	9	0	1	1	4	3	4.0	1.0

1=Strongly Disagree, 2=Disagree, 3=Don't Know, 4=Agree, 5 Strongly Agree

Table 2 addresses issues related to SL's capability to support the collaboration process students experienced in the 3D world. Mean ratings for the items ranged from 2.1 to 4.0 (out of a possible score of 5.00). The lowest mean score was obtained for the statement [g] "I found avatars' gestures useful for the collaboration" (M = 2.1). This indicates that participants perceived it was difficult to collaborate via gestures with their team members inside SL. Medium mean scores between 2.5 and 3.5 were obtained for the statements [i], [j], [h], [b], [d], and [f]. Most of the participants agreed they did not encounter any major technical problem inside the environment. Participants also found it somehow useful to see the way their partners

interact with the environment and/or the 3D objects. Other SL functionalities such as the representation of the user's field of view through the avatar's head movement as well as the representation of other user through an avatar also gathered positive reviews in regard to collaboration. This indicates that user's awareness of presence and co- presence in the 3D world was rather helpful for the collaboration process. Participants also appeared to be uncertain as to whether they could collaborate more effectively in a 2D environment.

Higher scores ($M > 3.5$) were received for the statements [e] and [a]. Participants agreed that the system overall helped them to collaborate effectively with their partners (any disadvantage was associated with the volume adjustment and the time element for group comfort and formation prior to more engaging conversation). However, they expressed a strong preference to contact their partners through VoIP or other communication tools available in SL. The statement with the highest rating was [c] "The system's feedback mechanisms were fast in my computer" ($M = 4.0$). This indicates overall that participants appeared to be overall satisfied with the system's responsiveness in regard to their interactions.

Table 3

Features Level of Use

	Yes		No		Uncertain	
	N	**%**	**N**	**%**	**N**	**%**
Navigation tools (walk, run, fly, sit, stand)	9	100.0	0	0.0	0	0.0
Speak tool	9	100.0	0	0.0	0	0.0
Notecards	9	100.0	0	0.0	0	0.0
Teleport	9	100.0	0	0.0	0	0.0
Share tool (e.g share notecards, objects)	9	100.0	0	0.0	0	0.0
Camera Controls	8	88.9	1	11.1	0	0.0
Chat tool	8	88.9	0	0.0	1	11.1
Search tool (search places, people)	7	77.8	2	22.2	0	0.0
Gestures	5	55.6	3	33.3	1	11.1
Mini map	5	55.6	1	11.1	3	33.3
World map	5	55.6	3	33.3	1	11.1
Snapshot tool	2	22.2	5	55.6	2	22.2

Table 3 shows the SL features' level of use during the collaboration process. According to Table 3 all participants (n=9) said they have used navigation tools, the speak tool, notecards as well as teleport and the share tool. Furthermore, 88.9% of the participants (n=8) reported they have used camera controls and the chat tool. 77.8% of the participants (n=7) said they have used the search tools while 55.6% of them (n=5) used gestures, the mini map and the world map. Finally, only 22.2% of the participants (n=2) stated they have used the snapshot tool during the collaborative activities.

Table 4

Features that Boost the Interaction Process

	Yes		No		Uncertain	
	N	**%**	**N**	**%**	**N**	**%**
Chat tool	9	100.0	0	0.0	0	0.0
Speak tool	9	100.0	0	0.0	0	0.0
Notecards	8	88.9	1	11.1	0	0.0
Search tool (search places, people)	8	88.9	1	11.1	0	0.0
Share tool (e.g share notecards, objects)	8	88.9	0	0.0	1	11.1
Navigation tools (walk, run, fly, sit, stand)	6	66.7	2	22.2	1	11.1
Camera Controls	6	66.7	2	22.2	1	11.1
Gestures	4	44.4	2	22.2	3	33.3
Mini map	4	44.4	1	11.1	4	44.4
Teleport	2	22.2	4	44.4	3	33.3
World map	1	11.1	1	11.1	7	77.8
Snapshot tool	1	11.1	2	22.2	6	66.7

Table 4 shows which of the SL features students believe boosted interaction. According to Table 4, all participants (n=9) believe that the chat and speak tool supported effectively the interaction process. Moreover, 88.9% of the participants (n=8) reported that the search tools, the share tools, and the notecards also augmented interaction. 66.7% of the participants (n=6) believe that navigation tools and camera controls were valuable for their interactions while 44.4% (n=4) believe that avatars' gestures and the mini map increased their awareness of avatars' expressions and the 3D space respectively. The rest of the features like snapshot tools, world map and teleport were supported by a small percentage of the respondents.

Also, three of the participants (n=3) commented difficulties in using some of the above SL features like navigation tools and the snapshot tool. One participant stated *"I found the navigation of various tools clunky. If used regularly, this would become more apparent, but a lot of time was wasted figuring out how to navigate/find many of these features."* The second

one commented *"Yes trying to focus on 2D information and taking snapshot. Large learning curve, wished I spent more time getting orientated."* while the third one said *"Difficulties were with the inexperience of the user and not the application."*

Table 5

Evaluation of the role-playing scenario

	N	Frequency					Mean	Std. Dev
		1	*2*	*3*	*4*	*5*		
i) There were a sufficient number of time-slots choices for each session.	9	2	2	0	1	4	3.3	1.8
h) There was sufficient time for each task.	9	0	4	1	0	4	3.4	1.5
e) During the activities, individual success was dependent upon group success.	9	1	0	3	3	2	3.6	1.2
a) The purpose (learning objectives) of collaboration and expectations of the learners were very clear.	9	1	0	0	7	1	3.8	1.1
b) There were adequate instructions before and during each activity.	9	0	2	0	3	4	4.0	1.2
d) The role-playing activities were meaningful.	9	1	0	0	5	3	4.0	1.2
g) Each group had the freedom to decide what team will be and the strategy that will follow.	9	1	0	2	1	5	4.0	1.4
j) The number of participants in each group session affected the duration and the quality of the activity.	9	1	0	0	5	3	4.0	1.2
c) Each study group had the chance to work as a team but also individually by taking on different roles.	9	1	0	1	1	6	4.2	1.4
f) During the sessions, group members were able to discuss possible scenarios for the task.	9	1	0	0	3	5	4.2	1.3
k) There was immediate feedback and support during the activities.	9	1	0	1	1	6	4.2	1.4

1=Strongly Disagree, 2=Disagree, 3=Don't Know, 4=Agree, 5 Strongly Agree

Table 5 shows the items that were constructed to evaluate the design of the role-playing activity. Mean ratings for the items ranged from 3.3 to 4.2 (out of a possible score of 5.00). The overall high scores indicated that students perceived most of the role-playing design items to be well presented during the role-playing session. The lowest mean score was obtained for the statements [i] "There were a sufficient number of time-slots choices for each session" (M = 3.3) and [h] "There was sufficient time for each task" (M = 3.4). This indicates that some of the participants felt it would be helpful if multiple timeslots were provided for each session and if more time was allocated for each task. Higher scores (M > 3.5) were received for the statements [e], [a], [b], [d], [g], and [j]. Most participants agreed the learning objectives were clear, there were adequate instructions before and during each activity, and the activities were meaningful. They also agreed that individual success was dependent upon group success but also admitted that each group had an active role to take decisions about the scenario, their roles, and the strategy that would follow. They also felt that the number of participants in each group affected the duration and the quality of the activities. Smaller groups felt that the workload was greater. The role-playing items receiving the highest score were [c], [f], and [k] with an overall mean score of 4.2. Students agreed that the role-playing activity was balanced between individual and group work, that possible scenarios could easily be discussed, and that there was immediate feedback and support during the activities.

Finally, some students made comments on how collaboration could be improved in the VW of SL. Some of their comments concerned a) More training and orientation time within SL. b) Offline team work could aid to team building, and c) Ensuring the same level of ability among group participants could be a plus.

Learning survey

After the end of part 3 of the survey, students were asked to proceed with the learning survey (part 4) to evaluate their learning experience in SL and to suggest issues for further development that could overall enhance learning in the 3D world. Descriptive statistics were used to rate the 21 items of the learning survey. Mean ratings for these items ranged from 1.8 to 4.6 (out of a possible score of 5.00). Results for each item of the learning survey are reported in Table 6.

Table 6

Learning Issues – Issues for further development

	N	Frequency					Mean	Std. Dev
		1	*2*	*3*	*4*	*5*		
k) I think it would be easy to organize and run a course through Second Life.	9	5	2	1	1	0	1.8	1.1
p) I found avatars' facial expressions useful.	9	1	4	2	2	0	2.6	1.0
n) I believe that I could easily attend a course through Second Life.	9	2	3	0	3	1	2.8	1.5
f) I think that if avatars were less anthropoid (not people but animals, vehicles, robots) they would not cause any disturbance in the educational procedure.	9	3	1	0	4	1	2.9	1.6
c) I found the feature of editing my avatar's appearance useful.	9	0	2	3	4	0	3.2	0.8
q) I consider users' ability to create and share 3D objects would be useful.	9	1	2	1	2	3	3.4	1.5
b) I found the "bubble chat" feature overhead the avatar useful.	9	0	1	5	0	3	3.6	1.1
o) I think that the existence of suitable objects relevant to the learning scenario that is executed could support user's immersion.	9	1	0	1	5	2	3.8	1.2
h) I consider that Second Life environment supported the educational scenario effectively.	9	0	1	2	3	3	3.9	1.1
m) I think that the existence of a forum inside Second Life would be useful.	9	1	1	1	1	5	3.9	1.5
s) I consider users' ability to record video inside Second Life would be useful.	9	0	1	1	4	3	4.0	1.0
a) I find the "save text" feature of the chat tool useful.	9	0	0	2	4	3	4.1	0.8
d) I would like to be able to distinguish the role of each avatar (students, researcher, facilitator) through its appearance.	9	0	0	2	4	3	4.1	0.8
r) I consider users' ability to create and share simulations would be useful.	9	0	1	0	4	4	4.2	1.0
u) I consider the interconnection of 3D with 2D environments (e.g. via Sloodle) would be useful.	9	0	0	3	1	5	4.2	1.0
j) I would like to be able to use and share audio and video files inside Second Life.	9	0	0	1	4	4	4.3	0.7
l) I believe that Second Life could provide tools for assessment such as tests, quizzes etc.	9	0	1	0	3	5	4.3	1.0
g) I found that the existence of "SL agents" (e.g. Sunny Davros) useful.	9	0	0	1	3	5	4.4	0.7
i) I found useful that the "SL educational agents" (e.g. Andreas, Robert, Mary, Kathrin) provided information relevant to the educational scenario that is executed.	9	0	0	1	3	5	4.4	0.7
e) I think that a map of the AU island inside Second Life would be helpful.	9	0	0	0	4	5	4.6	0.5
t) I consider that voting and decision making tools would be useful.	9	0	0	2	0	7	4.6	0.9

1=Strongly Disagree, 2=Disagree, 3=Don't Know, 4=Agree, 5 Strongly Agree

The lowest mean score was obtained for the statement [k] "I think it would be easy to organize and run a course through Second Life" (M = 1.8). This indicates that participants' general feeling was that considerable workload and time commitment was required in the process of designing and delivering instruction though SL. Medium mean scores between 2.5 and 3.5 were obtained for the statements [p], [n], [f], [c], and [q]. Regarding avatars' customization most students felt that the feature of editing their avatar's appearance and the use of avatars' facial expressions were useful. They also felt that if avatars were less anthropoid they would not cause any disturbance in the educational procedure. Students also agreed that co-creation and sharing of 3D objects inside SL would be a plus. However, participants' perceptions about whether they could easily attend a course through SL were almost equally split.

Higher scores (M > 3.5) were received for the statements [b], [o], [h], [m], [s], [a], [d], [r], [u], [j], [l], [g] and [i]. Students found "save text" and the "bubble chat" features of the chat useful. They also thought that the differentiation of other avatars through their appearance would be helpful. Participants also found the existence of suitable objects relevant to the scenario and the pre-programmed avatars (chatbots) inside the environment extremely useful. They felt that their interactions with the chatbots were both valuable and informative. Participants also agreed that SL environment overall supported the educational scenario effectively. However, they felt that additional enhancements both in users' permission level (e.g. ability to share audio and video files or to create and share simulations) as well as in platform's extensibility level (e.g. integration with assessment and/or recording tools, the existence of a forum inside SL or the integration with other educational platforms - Sloodle) could further enhance the learning experience. The items receiving the highest score ratings

were [e] and [t] with an overall mean score of 4.6. Participants fervently supported that a map of the AU island inside SL as well as voting and decision making tools would be helpful.

Participants also made several other comments. Some of the positive comments regarding SL functionality included a) SL's ability to support real time collaboration and group work, b) Extended and rich interactions via visual and vocal modes, and c) Ability to use multiple forms of media to present content. Some of the negative comments included a) A steep learning curve and b) A non-intuitive interface. Safety issues were also reported by one participant.

Quantitative Analysis – Summary & Conclusions

Results indicate a positive reaction to the general feel of the platform. The environment of SL was deemed satisfactory, as was the quality of its 3D graphics, the virtual spaces and the avatars' animation. Also, students seemed to have no difficulty in distinguishing which window was 2D or 3D but they felt it was more difficult to operate in 3D interface rather than in 2D. They also had no considerable difficulty in managing basic SL functionalities. Functionalities such as the ability to change the viewpoint, the interaction with 3D objects as well as the avatar's appearance modification tool garnered positive reviews. The functions that received a low rate were the navigation scheme (moving or teleporting) and the ease of orientation within the platform. The majority of students reported it was difficult to perform basic navigation and movement inside the virtual environment and that overall there is a steep learning curve in SL. This may be attributed a) to participants' unfamiliarity with 3D environments (as revealed by the questionnaire) and b) to the insufficient orientation time within the platform (as reported in participants' comments).

The majority of students considered that SL supported the collaboration process effectively. Also, the collaboration survey revealed a satisfaction regarding system stability and response time. Features such as representing an avatar's viewpoint with a head movement and being able to see the other users' interactions were commended. According to the users' ratings the major advantages of the platform were the communication tools (such as speak or chat tool) as well as other SL facilities that provided extended and rich interactions with the environment, the content, and the other participants (such as search functions, share functions and notecards). The only major problem as reported by the users was the use of non-verbal cues and in particular of gestures in their attempt to foster collaboration. This may be attributed either to users inexperience in using non-verbal cues in SL or to the environment itself which inherently supports only a specific set of actions through non-verbal cues. However, additional functionality in this issue can be added using the built-in scripting language of SL (Linden Scripting Language).

Besides the SL capabilities to support the collaboration process, students also highlighted the importance of providing well-designed activities to promote collaboration in the 3D world. They agreed that the learning objectives were clear, that they were provided with adequate instructions and feedback before and during each activity, and that the activities were meaningful. They also commented positively on the opportunity to make decisions during the activities (team color, roles, strategy) and the chance they had to work both as a team and also individually. However, they stated that they would prefer to have more time for each task and a sufficient number of timeslots for each session. They also felt that the number of participants in each group affected the duration and the quality of the activity. Participants also made suggestions which according to their opinion could further enhance the collaboration process.

They felt that more training and orientation within SL would be valuable for the collaboration, that offline group work could aid to team building and that ensuring the same level of ability for all participants could be a plus. Safety issues were also reported by one participant.

Finally, most of the users agreed that the learning role-playing process was executed without significant problems. Results of the learning survey indicated the users' approval of most of the SL features but also revealed that the integration of the system with additional educational tools for assessment and collaboration (such as quizzes, forums and voting tools) would significantly improve the learning process. Regarding avatar functionality, results were mixed. Participants appear to be uncertain about whether the ability to modify their avatar was useful but they do believe that collaboration would be augmented, if one could distinguish roles from avatar appearance alone. On the other hand, users do not consider humanoid avatars a necessity for meaningful learning. Furthermore, users agreed that the existence of SL educational agents (chatbots) was helpful. The implementation of a map of AU Island inside the environment, additional virtual learning objects, recording tools and file sharing capabilities were also discussed and recommended by the users. Finally, students' general feeling was that organizing and running a course in SL would presuppose a considerable amount of time and effort from both the instructors and the students and felt that overall it would not be easy to attend an entire course through SL.

As it can be seen from the quantitative analysis of this research, SL proved to satisfy to a high degree some common design requirements regarding user interface, as well as collaborative and learning capabilities of 3D worlds and thus provides the functionality needed to support a variety of teaching methods and scenarios. The functions examined covered the most important needs for communication, collaboration, awareness, and learning while at the

same time uncovered some new areas for improvement. These issues will be further explored in the qualitative phase of this research.

Qualitative Analysis and Findings

The second, qualitative phase of this study focused on interpreting the results of the statistical analysis, obtained in the first, quantitative phase and using these results as a basis for in-depth semi-structured interviews with all the participants that had given their informed consent to participate. Given the relatively small sample, the researcher pursued to conduct the maximum possible number of interviews so as to strengthen the credibility of the research results. The interviews were conducted online, using Skype software, in combination with a Skype recording tool which enabled the researcher to record the interviews. Before the interviews were recorded, the researcher confirmed that interviewees agreed to the fact that the interview would be recorded by asking for their verbal affirmation right before the actual interview. The recordings were then used for data analysis through transcription, coding and interpretation of the interview texts.

Once the first draft version of qualitative research results was written, the researcher emailed the draft to the participants so as to provide the respondents the opportunity to assess adequacy of data and preliminary results as well as to confirm particular aspects of the data. In qualitative research this technique is known as member checking and according to Lincoln and Guba (1985) is the most crucial technique for establishing credibility.

Student Interviews

Six students – 3 male and 3 female - volunteered to participate in the second part of this study. The set of questions was sent to participants in advance to the interviews so as to enable them to prepare for the interview. The interviews were between 19 to 33 minutes with an average time of 25 minutes in length and yielded a total of 2 hours and 33 minutes of student interviews.

Data Analysis

The data analysis procedure was based upon the three phases of coding – open, axial, and selective – as advanced by Strauss and Corbin (1990). Open coding is the process of breaking down, examining, comparing, conceptualizing, and categorizing data. Axial coding is a set of procedures whereby data is put back together in new ways after open coding, by making connections between categories. This is done by utilizing a coding paradigm involving conditions, context, action/interaction strategies and consequences. Finally, selective coding is the process of selecting the core category, systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development (Strauss & Corbin, 1990). To analyze the recorded interviews Nvivo 9 was used. The preliminary findings are noted below:

There were 2 preliminary coding categories that were originally identified by the researcher in the qualitative analysis of the student interview transcripts; “Experiences using the technology” and “Learning experiences in SL”. The entire set of interviews was again read through and this time was coded against the two high level nodes. While conducting this initial set of coding the coder determined that there were significant findings that did not fall into either of the two initially defined nodes. This yielded the creation of three new high level nodes

that were defined ad hoc. These were “Nexus of learning and technology”, “Misc”, and “Comparisons to other learning environments”. Table 7 summarizes the results of the open coding based on the interviews that came out after a series of coding and reading iterations.

Table 7

Themes and Subthemes (Student Interviews)

Categories (Nodes)	Category Frequency	Codes & Sub codes	Code Frequency	No of items coded
Experiences using the technology	**90**			**6**
		Technolgy challenges	17	6
		Technology affordances	18	6
		Avatars	14	6
		Pre-learning for SL	14	6
		Technology familiarity	9	5
		Technology support	7	4
		Technology value proposition	7	3
		Generational technology familiarization	4	2
Learning experience within Second Life	**88**			**6**
		Challenging learning experiences	11	5
		Positive learning experiences	33	6
		Chat and voice		4
		Notecards		4
		Sitting at the table		2
		Collaboration	15	6
		Learning design features	8	4
		Learning experience recommendations	7	2
		Other possible applications for SL	14	6
Nexus of learning and technology	**21**		**21**	**6**
		Cognitive Overload	16	6
		Impact of differences in skill levels on learning	5	3
Comparisons to other online learning experiences	**24**		**24**	**6**
Miscellaneous	**5**		**5**	**3**

Theme 1: Experiences using the technology

This theme pertained to the experiences with the 3D technology of SL that distance students gained by completing the in-world collaborative activities. A total of 90 codes were included in this category. Eight subthemes were identidied: (a) Technology challenges (17 codes), (b) Technology affordances (18 codes), (c) Avatars (14 codes), (d) Pre-learning for SL (14 codes), (e) Technology familiarity (9 codes), (f) Technology support (7 codes), (g) Technology value proposition (7 codes), and (h) Generational technolgy familiarization (4 codes). Analysis for each one of the eight subthemes is presented below.

Subtheme 1.1: Technology challenges
(No of coding ref.:17/ No of items coded:6)

The participants experienced different kinds of difficulties in using SL technology. Difficulties ranged from inconvenience to significant impairment of the learning experience. Participants indicated that they had difficulties learning how to navigate within the virtual environment. Navigation problems that were reported were not related to SL user interface but to participants' ability to move their avatars with precision within the virtual space. Participants responses also indicated that they had difficulty in orienting themselves inside the environment and finding the workspaces where the learning materials were presented. The richness and the fluidity of the environment commented by the participants led some of them to feel mis-oriented inside the virtual space (orientation problems). Personal technology problems with computer (software & hardware requirements) and network capabilities (bandwidth) were also reported by some participants. A summary of the comments related to the subtheme "Technology challenges" is presented below.

S1: Yeah, and just using the keys to move myself, and to make myself sit, and to move the avatar around. I don't believe that in the time that we had together I mastered it. I think I got better, but I don't believe that I mastered it enough, that still there was a hindrance to the learning part of it.

S4: I was never quite sure that I had found all of the information in the environment. You're moving through the environment, and it's quite a rich environment. My concern was that I hadn't taken the right turn. Perhaps, there was another room I hadn't visited, so I was never quite sure that I had found everything I was supposed to find. Well, I'd say the 3D environment is just more complex, and consequently it requires a lot more focus on the environment and the challenge of navigating through it.

S3: Second Life is very video intensive. If you do have a slow connection, it's almost impossible to do Second Life. If I was to set up a course in Second Life, I would have to make sure that one of the pre-requirements was a certain bandwidth so that people could participate and fully benefit from the aspects of Second Life. For me, because I have an unreliable connection, sometimes it would be chappy and the audio seemed to be all right generally but there were times when there was just way too much buffering going on so there would need to be a requirement that there was a certain level of internet connection.

Subtheme 1.2: Technology affordances
(No of coding ref.:18/ No of items coded:6)

Although all of the participants experienced some difficulty learning to navigate within SL, all of the participants also identified the communication functionality as easy to work with. The first preference was for the voice feature with the second preference for the chat capability. One participant noted that this might be due to the pre-exisitng familiarity with texting, email, and telephone technologies. A summary of the comments related to the subtheme “Technology affordances” is presented below.

S1: I didn't think the communication was difficult at all, either through the chat or voice. And in the chatting between, I thought it worked fine. I think that's because we are used to e-mails and instant messaging, so that again is because we have prior knowledge of

how to use it.

S2: I would say it was very easy, whether using the chat or the voice, it was similar to having a conversation.

S3: Then, the voice feature was good but when the voice feature wasn't working and some people who had logged on didn't have audio, the text feature came in very, very handy as a backup. Plus, if someone was speaking and we didn't want to interrupt them, we could communicate amongst ourselves by using the text feature.

Subtheme 1.3: Avatars
(No of coding ref.:14/ No of items coded:6)

All of the participants made observations about the avatars. Results were mixed with some of the participants enjoying the experience while others being dissatisfied. While some participants considered the avatars' customization an entertaining and playful aspect, some others characterized it as distracting, since they had difficulty in identifying their peers who changed their appearance in the middle of the role-playing activity. From a design perspective, when using avatars for group work in SL or similar technologies, it may be necessary to design features (e.g., attire or accesories) that will distinguish one participant/group from another or limit the variability that participants are allowed in customizing their avatar. Another negative observation made by some of the participants included difficulty in manipulating their avatars. Interestingly, there were two contradictory statements on this ssue. One participant observed that using avatars can be a positive experience for individuals with handicaps or body image challenges, while another one felt that the amount of navigation and motor control can be overwhelming for people with disabilities. On a positive note, one participant commented on the potentials of the pre-programmed avatars (chatbots). A summary of the comments related to the subtheme "Avatars" is presented below.

S1: I haven't worked with avatars before, so it was a really nice experience to be able to do that. I really enjoyed that.

S2: I spent the majority of my time trying to control the avatar, rather than actually doing the work. I just felt that, for me, that took away the experience of the project itself.

S3: It's interesting seeing the way people dress their avatars because it's somewhat a window into their personality, if you look at it from that perspective. There were people who were very shy who, would take a vehicle form and they weren't really comfortable with the technology. Then there were people like me who would change outfits and would be different colors from we what are in real life and really played with it, enjoyed it.

S6: I think it interfered with my learning, because I didn't always know who was who, and once people changed their avatars, it was really hard for me to follow and to follow any sense of logic and pattern, and I found that really, really distracting.

S5: The other pieces I've thought-- I'm not sure that it would be really good software for people with disabilities. If you had a motor disability, the amount of navigation and motor control to manipulate your avatar would be an issue. Perhaps for students that have anxiety disorders or that sort of thing, where they need a really structured environment, it would be way too overwhelming.

S6:The fact that they all look the same, there's know distinction, no variation, they go into an environment, and everybody is on a level playing field. It's huge. It would be a huge task to be able to look at making education fit for everybody.

S3: I think if I took the time to design a course utilizing specifically Second Life, I think it would be very useful and because you can program responses from avatars, it actually could work very well in asynchronous environment, as well as synchronous so I think it would be a very valuable tool.

Subtheme 1.4: Pre-learning & Orientation for Second Life
(No of coding ref.:14/ No of items coded:6)

All six of the participants made comments about the pre-learining experience in SL and all of them agreed that it was critical to the success of their learning. Several noted that it might

be useful to have a whole class on how to work within the SL environment. There was unanimous agreement that the ability to successfully learn within SL depends on pre-training. Several of the participants felt that they needed more orientation time and that this would have resulted in an enhanced learning experience. When an institution intends to use an environment such as SL for teaching and learning, pre-learning and orientation should be a key priority for both instructors and students. A summary of the comments related to the subtheme "Pre-learning & Orientation" is presented below.

> S1: So... Yeah. So if you were going to use Second Life extensively, then I would say that for your new students coming in, such as me, exposure to the avatar life, or to Second Life, it would be one of the objectives of the course.
>
> S4: My prescription would be to have a good orientation and training in advance of any real learning activity, but this is kind of a problem of Second Life. So for a class that is going to be using Second Life, it would be important to devote a couple of weeks and a number of sessions just to getting people very familiar, comfortable with that environment, before ever actually having to do anything in it.
>
> S5: Orientation would be a really key area to focus on, not just for students, but for instructors or faculty teaching it, and how to troubleshoot situations.

Subtheme 1.5: Technology familiarity
(No of coding ref.:9 No of items coded:5)

Five participants commented about differences in technological familiarity between the various participants.. Participants who self-identified as being less comfortable with technology needed more time to meet the demands of the role-playing activities. This may be attributed either to insufficient orientation in SL specifically, or due to a lack of comfort with technology generally. Those who identifed as having more technology proficiency expressed dissatisfation with having their learning experience curtailed by the additional time that was needed to

support those wilth less technical competence or with inadequate computer hardware or network capabilities. When designing learning in a virtual world it is important to ensure that all participants have adequate technological competency before official learning takes place and meet minimum requirements of computer and network capabilities to avoid participant dissatisfaction. A summary of the comments related to the subtheme "Technology familiarity" is presented below.

> S3: Yes. I think it could be much better from that if all the participants had at least the same level of comfort with Second Life, have the orientation actually because it's an important issue.
>
> S4: I guess the one issue was that some of the other participants in the space seemed to be having technical issues, or perhaps they were having learning issues too. Typically our sessions begin with a number of minutes, sometimes going to quite a few minutes where you were helping somebody sort out a technical issue, whether it was feedback on their line or the microphone wasn't working or whatever.
>
> S5: Somebody was having tech problems, and so we were waiting around and some people were getting intolerant with the time that it took to get everybody together.

Subtheme 1.6: Technology support
(No of coding ref.:7/ No of items coded:4)

Four of the participants commented about the technical support they received within the SL environment. The amount of help that was needed varied significantly depending on the skills of the participant. However, all of the respondents indicated favorable experiences with the technical support they received. For some of the participants their comments indicate that the technical support they recieved was vital to their learning experience. So, even if all of the participants in a virtual learning environment are well trained, it appears that having technical support in the virtual environment is necessary and beneficial. A summary of the comments

related to the subtheme “Technology support” is presented below.

> S1: Whoever the helper was, it really was reassuring, that he recognized I was having problems and he came to my rescue. He was sort of like a safety net.
>
> S2: Not very much. Initially, getting used to Second Life and the interface. Every once in a while if people were confused about the process of the activities, then we would need a little bit of input.
>
> S3: Yes, the black bird. He was very helpful as a guide through the process within the activities.
>
> S4: I think when it was there,it was much more helpful, because then it was clearer what was to be done.

Subtheme 1.7: Technology value proposition
(No of coding ref.:7/ No of items coded:3)

Three participants made observations about the overall value of using the SL virtual environment. The opinion was favorable in regard to the efforts of the instructor in designing the learning environment. Observations made indicated that the participants felt that the environment took a great deal of effort to develop and that this effort was not justified in contrast to the value returned. There were two negative comments from participants who did not feel that the benefits outweighed the effort needed to create a learning environment. They also noted that this learning environment requires a great deal of skill and commitment from the instrustors. This indicates that a significant investment in the part of the organization is required to train its staff and instructors to support this learning experience. Such a decision would have a huge impact on the organization and would require significant decision making efforts. A summary of the comments related to the subtheme “Technology value proposition” is presented below.

> S4: Certainly, one comment/observation that I would make is the high cost of creating these environments and the amount of time - cost in terms of money and time - which is extraordinary compared again to the alternative technologies.
>
> S5:From a faculty perspective, I could fully appreciate the time commitment that went into developing the site and the activities and trying to coordinate a collaborative working space.
>
> S5: The only other thing is I would imagine the time devoted. I don't know how much it cost to set it up - but certainly, man-power hours to set up the sites well, so that people can use them effectively, would certainly be a consideration.

Subtheme 1.8: Generational technolgy familiarization
(No of coding ref.:4/ No of items coded:2)

Participants who identified themselves as older or of another generation self-identified as being less comfortable with the technology. Two of the participants explicitly commented about their own awareness of their age in relation to other participants and a feeling that this contributed directly to their difficulty in learning how to navigate in the SL environment. Even though the profile of the users that will use e-learning technology such as SL may vary, however, each application could ideally be specialized based on some common characteristics of the majority of the users it aims to support. These characteristics could involve, among others, the age of the target group and their orientation to learning. A summary of the comments related to the subtheme "Generational technology familiarization" is presented below.

> S1: I am sure you realize that I am not a young person, so it is not as intuitive to me to just go in and find my way… Well, we didn't grow up with video games. And so, I am not accustomed to maneuvering even my avatar or knowing how to instinctively know how to move from one location to another location. So I think the hurdles I had were age-related.

> S6: I don't know whether you'd consider this part of your research, but I'm almost 60 years old, and I'm a computer geek, there's no question about it. I do lots with computers, but I'm wondering if because of my age, there was an issue with the whole movement of avatars. Whether younger people who are more - what's the word? More savvy with working with this thing, they would have fewer issues.

Theme 2: Learning experiences with Second Life

This theme pertained to the learning experiences of distance students with SL was gained by completing the in-world collaborative activities. A total of 88 codes were included in this category. Six subthemes were identidied; 1) Challenging learning experiences (11 codes), 2) Positive learning experiences (33 codes), 3) Collaboration (15 codes), 4) Learning design features (8 codes), 5) Learning experience recommendations (7 codes), 6) Other possible applications for SL (14 codes). Analysis for each one of the six subthemes are presented below.

Subtheme 2.1: Learning Challenges
(No of coding ref.:11/ No of items coded:5)

Five of the participants commented about difficulties that they experienced with the learning environment. Difficulties ranged from mild to significant. There was quite a bit of dissatisfaction with the notecard format. Some of the participants had problems maneuvering around them. There were also problems with time constraints in reading them. One particular problem is worth noting. One participant commented that it was diffiicult to know whether all the learning material had been found in the SL learning enviroment. The design required walking around to different rooms in search of learning material and there was concern from one participant that not all of the material was found. In early stages of adoption of 3D e-learning technology such as SL, it may be beneficial to limit the requirements of navigation

inside the environment. A summary of the comments related to the subtheme "Learning challenges" is presented below.

> S1: So when you had us going from one room to another, I found that I had to quickly take paper notes because there was so much material, and you were asking us to respond to it, I was trying to quickly take notes so that I could compile my thoughts at the other end because there was so much to read.
>
> S2: It wasn't as easy as I would have hoped. Because the note cards can't be updated by more than one person at the same time. Like you can't both type on the same note card and have it come in live. I think that would have been very useful.
>
> S4: I was never quite sure that I had found all the information in the environment because we're constantly moving through the environment, and it's quite a rich environment. My concern was that I hadn't taken the right turn. Perhaps, there was another room I hadn't visited, so I was never quite sure that I had found everything I was supposed to find.

Subtheme 2.2: Learning Affordances
(No of coding ref.:33/ No of items coded:6)

All 6 participants responded with postive comments about the learning experience. The dominant feeling was that the opportunity to collaborate on a project with common goals was both very successful and a most enjoyable experience. Several noted about the social engagement and the opportunity to get to know the other participants better. There was one observation that noted that other online learning environments felt impersonal whereas SL experience was much more personal and brought in a sense of 'humanness'. This may be attributed to the fact that meeting and working with each other in multiple settings - walking around and talking together, sitting at the table, and moving to different activities provided a variety of ways to interact and get to know each other. Two participants also commented positively on the rich visual element of the SL environment. Offering a variety of modalities

for learning can be beneficial in that one can reach more students . A summary of the comments related to the subtheme "Learning affordances" is presented below.

> S1: I support the idea of virtual worlds, because I think that they at least start to give a little bit more of humanness to learning. As online learning and on-demand learning has become very impersonal, it's very difficult to create learning when the learner sits there and clicks, and clicks, and clicks through something. So, I see where something like Second Life sets to bringing back humanness to learning.
>
> S2: In general, I would say it was just that being able to reconnect with some people who I've had previous courses with was much more socially engaging as we were able to have actual conversations and speak with each other and things like that.
>
> S3: I felt that there was a feeling of satisfaction where we were working towards a goal and we were communicating very well to each other towards that end.
>
> S4: I enjoyed the rich visual environment. I thought that was well done - the presentation environments, the poster-type environments, the rooms with many objects. So I think the playfulness of the experience was the most positive thing about it for me.
>
> S5: I really enjoyed exploring the different ways that the information and activities could be presented through the software for your videos. I liked your whiteboard, I thought that it was pretty neat. The way that you can send information back and forth to each other, say through the note cards was a bit difficult as I wasn't very proficient at it but that was just a predicament.

Subtheme 2.2.1: Chat and voice.
(No of coding ref.:7/ No of items coded:4)

An internal subtheme that of "Chat and voice" was identified as part of the higher level subtheme "Positive learning experiences". Four of the participants commented on the positive aspects of the chat and voice features. One of the observations was that 'chat' allowed for reflection about what you wanted to share where voice was immediate. The advantage of voice was that it allowed for real time instruction which was very useful in assisting people

challenged with navigating through SL. Voice response allowed for a more personal level of communication while the positive aspect of chat allowed for time to reflect about what was said and the participant response. This implies that both levels of communication are valuable to the learning experience. One participant noted frustration about that fact that some of the other participants didn't have voice capability and was grateful for the notecards and chat features as backup. Overall, it can be said that it is useful and perhaps essential to have multiple communication channels to accommodate the learning preferences and technology capabilities of the participants. A summary of the comments related to the internal subtheme "Chat and voice" is presented below.

> S2: I would say it was very easy, whether one used the chat or the voice. It was similar to having a conversation.
>
> S3: The voice feature was good but when the voice feature wasn't working and some people who had logged on didn't have audio, the text feature came in very, very handy as a backup.
>
> S4: Yes. I think that voice speech will make it more personal in terms of communication but not in terms of reflection compared to a chat feature or a forum.
>
> S6: I liked the real time chat as we could get where we needed to be in the time that we needed to get there.

Subtheme 2.2.2: Notecards.
(No of coding ref.:6/ No of items coded:4)

A second internal subtheme that of "Notecards" was identified as part of the higher level subtheme "Positive learning experiences". There were four participants who talked about the notecards. The results were mixed. While there were some positive comments about the notecards as a way to share information there was also some dissatisfaction in regards to how to

use them to communicate. The problem noted, was that only one person could be adding content to a notecard at a time and this diminished the experience of an interactive learning environment. To be an effective learning tool the notecards's functionality will have to be increased to support multiple concurrent inputs or they will need to be used in a different way, perhaps as announcements or instructions. A summary of the comments related to the internal subtheme "Notecards" is presented below.

> S2: The notecards were certainly useful for gathering notes and comparing and sharing ideas but they weren't as easy as I would have hoped. I think because they can't be updated by more than one person at the same time. Like you can't both type on the same notecard and have it come in live. I think that would have been very useful.
>
> S3: The notecards were an integral part of to the activities because we could to a large extent communicate back and forth and add like Google Docs… The first exercise where we went to investigate the Professors' offices by getting the notecards with different instructions, worked very well, and then to do the pitch to the Dean, was a really great activity as well.
>
> S5: The way that you can send information back and forth to each other, say through the notecards - I wasn't very proficient at it, but that's an underestimation.

Subtheme 2.2.3: Sitting at the table.
(No of coding ref.:3/ No of items coded:2)

A third internal subtheme that of "Sitting at the table" was identified as part of the higher level subtheme "Positive learning experiences". Two of the participants noted that they particularly liked the experience of sitting around the table. They liked the group discussion that occurred. This might be due to the fact that this format minimized the effort required to move around in the SL environment which has been noted elsewhere as a detractor to the learning experience. It might also be due to the familiarity of the format that resembles a traditional

seminar classroom environment. One participant noted that the structure of sitting around the table as a group in a familiar place resulted in more engagement around the table as compared to walking around and talking to individual participants. This should be explored further as a design issue. A summary of the comments related to the internal subtheme "Sitting at the table" is presented below.

> S1: The other positive thing was when there were a couple of times when we actually went and sat at the table, and talked, and I thought that was a very positive experience in that environment.
>
> S5: It was fairly easy, certainly through the meetings. I found sitting at the table with everyone was probably more effective rather than people standing around, didn't seem to engage as much. From a designing activities perspective for a class, creating that sense of structure that people are familiar with would be helpful.

Subtheme 2.3: Collaboration
(No of coding ref.:15/ No of items coded:6)

All 6 participants commented about the collaboration experience. Comments were generally positive and indicated that the ability to collaborate in real-time was one of the most significant advantages of the SL experience. Several of the particpants noted that collaboration expanded to supporting each other with their technology challenges such as getting online and moving their avatars around. Several of the participants noted that the technology was both beneficial for collaboration and also made collaboration challenging due to a lack of skills on the part of less competent participants. Technologies such as Second Life can significantly contribute to creating collaborative learning environments. It is essential however that all participants have skills sufficient to take advantage of these environments. Otherwise, a lack of skills may become an obstacle to collaboration. A summary of the comments related to the

subtheme “Collaboration” is presented below.

> S1: I just think that there is a uniqueness about it. I do believe that it will never replace face-to-face interaction, but it is a good replacement of face-to-face. I think the important thing is that you give people the opportunity to connect, and what their avatar looks like is not important as much as the opportunity to talk with each other, and share what we know, and learn from each other. So, I think Second Life is a really good tool for that.
>
> S3: I found it very easy. I don't know if I can expand on it. I just found it lends itself to collaboration…The activities we were provided with encourage collaboration. The environment itself encourages it.
>
> S6: I really enjoyed the experience, because I'd never done anything like that before and I liked the group work, I liked the projects, and I really felt we worked well together as a group. The collaboration was great.

Subtheme 2.4: Learning design features
(No of coding ref.:8/ No of items coded:4)

Four of the participants made observations about the design of the SL learning opportunity. Participants observed that design is critical to the success of learning. It won't work if it’s just thrown together. The participants liked design components that facilitated collaboration and that organized the learning experience. The impression was that it will take a phenominally skilled designer to create a good environment. However, participants also felt that certain improvements (such as the time allocated to the tasks or the number of timeslots) could have made the learning experience better. A summary of the comments related to the subtheme “Learning design features” is presented below.

> S2: If it's designed well and integrated well with the course objectives, it can be very useful. If it's just tacked on or added to a situation because the teacher thinks that it's a neat tool, then I don't think it would be very useful. So, I think it's entirely dependent on

> the pre-existing design of the course and why they want to use Second Life. And, if it's the best tool for the job then I think it could be useful.
>
> S4: It was easy once duties had been assigned in that final exercise, where we sorted out what we were going to be doing and what rooms we were going to be checking out. Then things went very smoothly, but I think if there had not been that organizational context, it might not have been as easy to collaborate, but the way you set it up I thought made it helpful. We each knew what our duties where. We agreed to do those duties, and off we went, and actually the results were quite satisfactory, using that as your organizing technique.
>
> S6: Yes, a different design could well have changed the experience. I'm not sure what the best practices would be yet, and that's probably something you're trying to find out as well.

Subtheme 2.5: Learning experience recommendations
(No of coding ref.:7/ No of items coded:2)

Two of the particpants were instructors themselves and made some recommendations for improvements. The recommendations were allowing time for discussion and work-ahead assignments. There was also a recommendation for blending SL learning with other learning modalities. In-world presentations or live class/group discussions could be used to enhance learning in SL. A summary of the comments related to the subtheme "Learning experience recommendations" is presented below.

> S1: Well, I'm thinking that if you did give assignments outside Second Life, and you were to come prepared to discuss, and have sort of a round the table discussion, would be one of them.
>
> S2: An online problem-solving exercise would be really interesting in a situation like that. For example, to set up a virtual space in SL, let's say a room, where people could log on at a specific time and solve problems all together. Something like a discussion forum but in 3 dimensions.

Subtheme 2.6: Other possible applications for SL
(No of coding ref.:14/ No of items coded:6)

All of the participants made comments about other applications. Five of the participants had ideas about how to use SL for other learning opportunities. Among the ideas presented were distance learning, practicums where students could do role plays, paramedic training, inquiry based learning and special events. Critically, however these were vision statements without any comments about how this would happen. There were several observations that indicate that SL has potential but the environment is not really where it needs to be in order to effectively support education.The participants commented that learning would be enhanced by a better software functionality and much more effort put into the design. A summary of the comments related to the subtheme "Other possible applications for SL" is presented below.

> S2: I guess that it would be very useful for inquiry-based learning, practical laboratory exercises and projects and solving problems and things like that, particularly in a distance environment because it provides some immediacy and allows greater synchronous conversations among a group of people because it can be difficult to get more than five or six or seven people on a Skype conversation, so I think using Second Life-- seems like it does a better job of managing bandwidth and getting more people involved.
>
> S3: I've been thinking about the possibility of using Second Life for patient simulations over long distances because we use high fidelity simulators in real life right now but from a patient treatment standpoint.
>
> S4: As the environment develops and as the resource is able to support the creation of custom-made environment advances, it may well prove useful.
>
> S5: I was thinking, that if you were doing practicum, and you had students doing interviews with families, you could do role-playing. If you were in marketing, you could be pitching in somebody and they could be giving you direct feedback, immediately. You can set up labs for nursing, for walking through different procedures and pieces of

> engagement with your client. I could definitely see more applications, but again, how it's set up would really need to be, for me at least, really structured or well-directed in advance.

Theme 3: Nexus of learning and technology

The theme "Nexus of learning and technology" is related to the connection between the experience of using the technology and the learning experience itself . A total of 21 codes were included in this category. Two subthemes were identified; These were 1) Cognitive Overload and (16 codes) and 2) Impact of differences in skills levels on learning (5 codes) Analysis for each one of the two subthemes is presented below.

Subtheme 3.1: Cognitive overload
(No of coding ref.:16/ No of items coded:6)

All of the participants commented on the interface between the academic learning experience as well as not just learning the technology but also using it as a learning vehicle. The predominant opinion was that it was necessary to split the learning experience between learning how to use the interface and the actual learning activities. Participants felt that they could not devote all of their energy toward the learning activities because they also had to contend with learning how to navigate within SL. To be a completely effective learning environment participants will need to completely master the functionality of SL or any other similar technology before official learning starts to take place. Otherwise the learning experience will be split between mastering the course and mastering the technology. A summary of the comments related to the subtheme "Cognitive overload" is presented below.

> S1: And then, we had to read the information -- It was a little bit overwhelming, and I don't know whether the fact that I was unsure of myself because of the orientation part influenced my confidence in participating actually in the lesson itself.
>
> S4: The biggest issue for me was divided attention between figuring out how to use the interface and actually doing the learning activities. Your brain has only so much bandwidth, and if you're concerned about what button to click, what menu to pull down and where comments should be recorded, almost by definition you're not giving undivided attention to the actual learning activity.
>
> S5: As a learner coming in for the first time, I think it would be much more difficult to learn that way, mostly because of the challenges with technology. I think there's a steep learning curve there. For students that might struggle with learning, I think it probably would be quite frustrating. It's not very intuitive.

Subtheme 3.2: Impact of differences in skills levels on learning
(No of coding ref.:5/ No of items coded:3)

Three of the participants commented on how the differences in skills levels between participants impacted their own learning experiences. This was resented by at least one participant. Differences in skill levels meant that time that would otherwise be spent on course material was spent on assisting the participants who were less technologically adept. This took away from the learning experience of the more technologically adept. To provide equity in the learning experience it may be necessary to test for a minimum level of technological skill and user hardware capabilities before allowing them into the class. A summary of the comments related to the subtheme "Impact of differences in skills levels on learning" is presented below.

> S3: It was hard because we had different levels of comfort with technology the group I was working with, I felt that, sometimes, I was tutoring my other students which, from a pedagogy point of view, is good because it's student-to-student instruction but it was difficult because I didn't want to feel like I was taking away from someone else's experience.

> S4: I think in one instance we wasted probably 20 or more minutes, while you shepherded people into the site and explained things. That's time lost, basically.
>
> S5: But I think in the last one, somebody was having tech problems, and so we were waiting around and some people were getting intolerant with the time that it took to get everybody together.

Theme 4: Comparisons to other online learning environments

All of the participants made observations comparing SL to other online learning environments (27 codes). Moodle was the primary online environment that comparisons were made on. Participants observed that Moodle was much easier to learn to use but did not have the interactive and collaborative functionality that SL provided, given that the collaborative and interactive capabilities were what the participants valued the most. Many saw value in both types of online learning environments and suggested a blended learning environment that made use of both types of online experiences. Other online experiences that were mentioned included Sakai, Skype, and Google docs. Based on participant observations it seems that no one was entirely satisfied with the online learning experience with either second life or other virtual learning environments. This seems to imply that technology may not be quite ready for online learning for all learners and for all instructors. A summary of the comments related to the theme "Comparisons to other online learning environments" is presented below.

> S1: I think that's one of the parts of Moodle, or Sakai, WebCT, or whatever else. It is that you don't necessarily create community, because you're only creating it through discussion threads, and it's not in real time. It's very difficult to connect with people.
>
> S2: In SL you don't get the actual face-to-face talking to somebody but you do get to communicate in real time, which I think is beneficial in some cases, but on the other hand, I really like Moodle for my courses just because I could have time to think. I found it really valuable just being able to consider my responses to questions and things

like that.

S3: Well, Moodle's okay because it's text-based. It's very quick transmission of massive amounts of data but there is no real tactile feeling to the participation within the activity, I dare say. In Second Life, there are three dimensions so you're interacting with the environment and the activities where in Moodle, you're just sort of typing back and forth. Honestly, it's somewhat tedious in Moodle because of the amount of information. I'm a visual learner but I'm also very sociable and Moodle doesn't really have that social aspect. It's all reading. There's no emotional inflection…I think that's the tool that's missing within the 2D tools.

S4: Well, I'd say the 3D environment is just more complex, and consequently it requires a lot more focus on the environment and the challenge of navigating through it. A 2D environment like Moodle, which is more book-like is first of all a little more intuitive for people who are familiar with earlier generations of computer environments and interfaces. It's not as rich, but you understand how to work with it. With the 3D environment and its greater complexity, you're in unfamiliar territory, and that focus on the environment creates opportunities but also barriers, so that's the difference.

S5: I would say, the one tool I use is Collaborate, and it's similar to Adobe Connect, and I was considering the difference between using that type of synchronous software to Second Life and the piece around entertainment which is connected to Second Life. If you want to create that - you're introducing a different level of motivation for students, which is more visual and interactive, where Adobe Connect or Collaborate is less so. It's more instructional than more traditional tools. Does that makes sense?

Theme 5: Miscelleneous

One female participant made comments which while not directly related to the the topic of this research do bear further exanimation perhaps in another research project (3 codes). First, the participant commented on a strange feeling of uneasiness when alone in the SL environment. Second, the participant took issue with what she saw as a sexist and stereotypic way of working with the avatars. Finally, the participant reported that she was sexually accosted in the SL environment. As someone new to the environment she did not know how to report the

abuse. Ensuring the safety of any participant must be of absolute importance in any learning environment. The comments related to the theme “Miscalleneous” are presented below.

> S5: Sometimes there are some eerie elements in being in this space. When you go in and there's nobody around it's really quiet, unnerving. I found that part interesting, but still, it unnerved me. If you saw somebody in this space, but they never communicated with you, then you just felt like you were being watched. Right? If you're learning independently, you'd have this "Big Brother" watching you or something. [laughter]
>
> S5: The really only negative experience was when I was first acquainting myself to the software, and I think this was within the first five minutes of entering, some pervert - I’d say was accosting me - but he kept positioning his avatar, either on my crotch or stuck right up to my back and then followed me. It created this really psychologically unsafe learning space. I was still trying to figure out how to move myself around all of that. As an initial introduction, it was a big turn-off. For students, who had any issues with abuse or anything like that, that would not be a good learning environment.
>
> S5: This is how Second Life looks, and just the construction of individuals, has very stereotypical look for women: the big boobs, the long legs.

Qualitative Analysis – Summary & Conclusions

The participants made several comments during the interviews regarding their experience with SL. Most of their comments were related either with the experience of using the technology itself or with the learning that occurs in the 3D world. Regarding the participants’ experience of using the technology of SL, the dominant feeling was that there is a steep learning curve in SL and this was confirmed by the navigation/orientation problems the participants experienced in SL as well as their difficulty in manipulating their avatars. However, all participants commented positively on the communication capabilities of SL and spoke in favor of voice and chat features.

All of the participants agreed that pre-learning and support in SL are key areas in order to perform well within the environment. Some students, especially the older ones, felt their attempt to strike the balance between learning the environment and the learning task itself curtailed their learning experience or led them to cognitive overload. Therefore, pre-learning and support should be a priority before any real learning task takes place. Students also commented that the adoption of the 3D technology in an educational setting requires a great deal of effort and higher costs in comparison to other technologies that may not be offset by the educational value returned.

Regarding their learning experience students felt that the factors that mainly challenged their learning inside SL were insufficient navigation skills, time constraints related to the activities' execution and the fluidity and playfulness of the environment which often acted as a detractor to their learning. On the other hand, participants recognized the potential of the environment to promote collaboration and social engagement. This may be attributed to the platform's ability to support multiple communication channels, to the extended and rich interactions, as well as the "metaphors and affordances" that have been transferred to the virtual environment either through the design of 3D space (e.g., meeting room, working space, and amphitheater) or the design (concept) of the role-playing scenario (AU professors, Dean, Educational counselors). The learning design was recognized as an important element that significantly affects learning. Well-designed activities and content are prerequisites for successful learning to occur in any virtual learning environment but in a 3D environment the above should be further supported by the creation of digital artifacts that are intended to support or facilitate learning in 3 dimensions.

Some of the participants also made suggestions that could improve the learning

experience inside SL. One suggested that more discussion time and work ahead assignments could have limited the "burden" of navigation inside. This indicates that design of both the environment and the activities should reduce or ideally eliminate the amount of extraneous load of the users SL. Others suggested that blending SL with other learning modalities could have been valuable for learning. Maximizing the flexibility within a virtual space would allow the execution of multiple collaborative learning scenarios. Participants also commented on other possible applications for SL such as experimental learning, inquiry based learning and problem solving. A virtual world with an ergonomic design could be accessible by a larger audience, for many people with different needs.

The difference in skill levels with the technology was also commented as another factor that impacts the participants' learning experience and in-world collaboration. Those who were more technologically adept felt that extra time was spent in assisting or waiting for the less technologically adept students figuring out things in SL. This also highlights the importance of pre-training in the VW as to decrease as much as possible any disruptions or inconveniences that may arise from participants' insufficient orientation and also downgrade the quality of group work.

All of the participants also made observations comparing SL to other online learning environements. Moodle was the primary online environment that comprisons were made on. Participants observed that Moodle was much easier to learn and use but did not have the interactive and collaborative functionality that SL provided. They also commented positively on the aspect of social engangenment that SL provided.

Finally, one of the participants made comments that were not directly related to the topic of this research but do bear further exanimation perhaps in another research project. Those

comments were related to safety issues inside SL and to the stereotypical look of avatars. Social and cultural parameters also need to be considered carefully when designing learning in the VW and it is pivotal to ensure safety to the utmost.

Summary

This chapter presented the findings of both the quantitative and qualitative analysis. The quantitative analysis used descriptive statistical procedures to describe student's evaluation of SL platform in terms of user interface, collaboration capabilities and learning functionality. Students indicated a positive attitude towards the general look and feel of the platform and also agreed that their interactions with the content, their peers and the environment provided a fertile ground for collaboration. On the other hand, they recognized that the steep learning curve and the fluidity of the environment in some cases downgraded their learning experience. Overall, it can be said that although SL is quite a mature 3D world in terms of features, significant improvements in both the software functionality and the design of the 3D space are needed in order to be considered a suitable 3D collaborative learning environment.

The qualitative analysis of interviews with students, revealed specific themes and subthemes that confirmed many of the results of the quantitative analysis but also uncovered some new areas of interest. Students discussed both about their experience in using the technology and also the learning experience itself inside the VW. They reported difficulties, especially in navigation and moving in the 3D world and noted that pre-learning and support are key areas for successful learning to occur. They also recognized SL's potential to provide a sense of humanness and community, facts that may be a great benefit for DE students and affect their learning in a positive, supportive way. However, the majority of the students felt that it

would not be easy to attend a whole course through SL but suggested possible applications for SL that could support or complement an online course (blended format).

The next chapter discusses the significance of these findings and provides recommendations for further research.

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Virtual worlds present new opportunities for education. In a continuously evolving educational landscape, the unique opportunities of creating interactive environments occupied by avatars with advanced communication abilities have opened up new avenues for a variety of educational experiences. These may range from creating simulations and role-playing to collaboration. However, the complexity and the variety of 3D virtual world applications also poses challenges for designing effective learning experiences inside them.

While there is research to support the use of 3D virtual worlds as an extension of the traditional classroom, little research has been in place to support the use of VWs in DE where some technical, physical and psychological constraints should be overcome. DE programs share common values about (a) the importance of establishing a virtual learning community to promote connectedness and collaboration between DE students, (b) the suitability of the virtual learning environment to support wide accessibility, ease of use as well as extended and rich interactions and (c) the instructional strategies that should be followed in these environments to promote motivation, engagement, active participation and support for DE students. In addition, there are even fewer studies that have explored the design specifications for 3D virtual learning environments when intended to promote collaborative e-learning.

The results of this study add to the body of research in both areas and provide a deeper insight on the instructional effectiveness of VWs as collaborative learning environments for DE. Due to the lack of literature offering practical guidelines for designing learning in VWs, this research attempted to contribute to this unexplored area by evaluating the VW of SL through the implementation of collaborative role-playing activities.

Toward an evaluation Framework for 3D virtual collaborative learning environments

The methodology followed for this study supports that for the evaluation of a 3D world as a collaborative virtual environment, certain stages should be followed in order to help educators and designers uncover any issues it terms of usability interaction and learning potentials of the 3D world and help them decide on its eligibility for collaborative learning. These are the following:

1) Investigate the main aspects of the 3D collaborative virtual environment.
2) Design elements of the collaborative learning environment.
3) Assess and enhance learning and collaboration in the 3D world by adding further functionality.

The place to begin the evaluation of a functional and effective 3D virtual world is to investigate its main functional features. These features should differentiate a 3D collaborative learning environment from other virtual environments which are designed for other uses. According to Harrison and Dourish (1996), the virtual spaces should be designed in accordance to the concepts of space and place. In that sense, all tools and functions of the 3D world that are designed to support collaboration should exploit aspects of space and spatial mechanisms, such as providing identity, orientation, a locus for activity and a mode of control. In addition, design has to deal with some aspects of the real world so as to provide critical cues which allow individuals to organize their behavior accordingly (such as moving toward other avatars to talk to them or referring to objects so that others can find them). In accordance with the above, the orientation and the introductory sessions were organized to allow participants to familiarize

themselves with the 3D environment, explore SL in terms of space and place and also test all its core features and functionality.

The second stage is to design additional elements of the 3D virtual environment which are focused on collaboration and learning. These could include: (a) Situated remote communication by supporting multiple communication channels such as voice, text chat or avatars gestures, (b) remote task collaboration through manipulation of shared objects, presentations, and/or by supporting users having different roles in the environment , (c) remote task support so as to enable actions such as co-browsing or data sharing through notecards or other available tools, (d) scaffolding tools such as whiteboards, notecards etc. that will support collaborative scenarios as well as supporting the learners to undertake tasks in the virtual space and e) representation of the environment by various representation forms which can range from simple text to 3D worlds. The realization of the above was made through the implementation of the role-paying scenario during the collaboration session where participants were able to experience collaboration in hand. At this stage it is also critical to provide well-designed activities that focus on collaboration so as to enable users to interact with each other, take different roles, make decisions, co-create and reflect on the given (learning) task.

At the third stage, it is important to assess and enhance learning and collaboration into the 3D world by adding further functionality that will resolve issues that have been detected in the previous stages. After having explored the core functions and the collaboration capabilities of the environment, the focus is moving to the design features that will improve the quality of the collaborative learning experience. According to Konstantinidis, Tsiatsos and Pomportsis (2009), these features/functions may belong to one of the following categories:

1) Dialogue and action. These tools provide the essential means for the collaborative learning activity itself. Text chat, e-mail, forum, video conference, voice chat are included in this category.

2) Workspace awareness. These are the tools or functions that provide knowledge about others' interaction with a shared workspace. Avatars' representation, avatars' customization, avatars' interaction with objects, avatars' gestures, facial expressions etc. may be included in this category.

3) Student's self-regulation or guidance. These functions support or directly guide students' reasoning on a meta-cognitive level. Annotation tools and pre-programmed avatars may be included in this category.

4) Teacher's assistance. These are the tools that enable teachers to review all the actions that took place during a collaborative session. Useful tools in this category are recording tools and log files.

5) Community level management. These are the tools and functions related to the management of the activities and material produced amongst a wide community. Tools that are supported to this direction are file sharing, forum and voting systems.

With the implementation of the learning session students were able to affirm their knowledge through discussion, preparation and presentation of their findings based on the role-playing scenario. This enabled them to reflect on the learning procedure and provide feedback on how learning could be enhanced in the VW.

These above stages provide the basis for a suitable evaluation framework for a 3D virtual collaborative learning environment and can act as a guide for educators and designers so

as to help them select and evaluate a 3D world in accordance with certain criteria for collaborative learning.

Design Issues for Collaborative learning in 3D Virtual Environments

Due to the lack of literature offering practical guidelines for learning design using VWs, it is necessary to refer back to established literature relating to e-learning. Existing approaches to online learning design are relevant to designing for SL. Salt, Atkins and Blackall (2008) suggest that four steps need to be considered when designing learning in SL. These are: (a) context, (b) activities, (c) resources and (d) support.

The place to begin is to understand the context, that is, the students and the learning outcomes. After agreeing on the details of learning, the second step is to develop the learning activities, and SL offers new opportunities and challenges here. It may be beneficial to supplement in-world activities with others in real life or other online environments to achieve the desired learning outcomes. The third step is finding, customizing or building resources. It is important to test these resources with users and to rethink the activities and build where necessary in response to user feedback. In parallel, it is also important to think about effective support that relies on both physical and human elements. Well-designed resources that clearly communicate to students the purpose of activities and the expectations of students and tutor, are important for effective virtual learning and can decrease demands on human support. At each stage, the virtual world environment means that extra questions need to be considered and answered.

Wang and Braman (2009) summarize findings concerning the effective design of

activities for learning in an environment like SL and provide a list with five recommendations:

1) Provide training to students before carrying out any serious tasks to make sure students know how to navigate in the system and how to control their avatars.
2) Use a combination of class discussions, videos, hands-on lab sessions in SL and research-based projects to improve student engagement and learning.
3) Give students the freedom to form groups and to select project topics in an area related to the course to increase student motivation.
4) Design activities for small groups to make sure that both the instructor and students will not be overwhelmed by the amount of work involved.
5) Determine the role of SL in the course before designing or implementing any activities.

De Freitas, Rebolledo-Mendez, Liarokapis, Magoulas and Poulovassilis (2010) suggest that educators and designers use a four-dimensional framework for designing and evaluating immersive learning experiences in a virtual world. The framework proposes four dimensions: the learner, the pedagogic models used, the representation used and the context within which learning takes place. Each dimension has dependencies upon the others; however, jointly, the four dimensions provide a conceptual framework for exploring immersive learning and, have implications upon learning design as a whole, particularly when applied to immersive learning environments.

Finally Inman et al. (2010) summarize findings from fifteen research studies concerning the effective design of activities for learning in an environment like SL and provide a list with four recommendations: (a) establish a clear connection between course objectives and activities in SL, (b) incorporate technical training and support into any planned SL activity, (c) create

scaffolded learning activities for students so they can practice inside SL and acclimate to the virtual environment and d) design and construct different spaces to encourage different types of student interaction.

Design Principles

Based on the findings of this study, the following section proposes a set of principles for assisting design and implementation of 3D collaborative learning spaces. Their use is mainly viewed as augmenting rather than replacing in overall existing principles. They express a new emphasis in the use of these environments rather than a radically distinct set of intentions. These principles are the following:

Principle 1 – Provide a safe in-world training space

Design a training space in the VW so as to provide students safe playground for experimentation before entering the more complex in-world tasks. Although SL website provides step-by-step tutorials for mastering basic SL skills, the Orientation building was created inside the AU Island so as to enable students to practice those skills in-world. A maze design was used for that purpose, where students had to walk through corridors and perform bite size tasks in order to master certain skills. This preparatory activity was conducted asynchronously so as to enable students to concentrate on mastering the interface, the basics of navigation, orientation and movement without being worried about social interactions within the SL environment.

Principle 2 - Augmenting user's representation and awareness

A 3D collaborative learning environment should increase awareness. There are two types of awareness: the awareness of other people and the awareness of objects. It is critical that the virtual space provide combination of both types of awareness in order for the users to be aware not only of the others and the content but also of their actions on the objects. According to the results of this study, SL seems to support the awareness of other people and their activity effectively. Moreover, the combination of gestures, mimics, head movement, user representation and user actions on objects that were used to support the educational scenario increased spatial and user awareness.

Principle 3 - Design a media-centric virtual space

The virtual space should be enhanced by multiple communication and media channels. Each media type (e.g. text, graphics, sound) has its advantages. The virtual space should integrate many communication channels (e.g. gestures, voice and text chat) in order to enhance awareness and communication among the users. SL is by design a media-centric platform. Users can communicate through means such as text and voice. However, this needs to be extended in order to support the collaborative scenario effectively and to satisfy users' needs. The results of this research showed that additional media, such as maps for example, that guide users in the 3D space, could further enhance collaboration and learning. Media should be integrated in a way so as not to become intrusive but to assist users to learn and facilitate the transformation of the learning space into a collaborative learning space.

Principle 4 - Design to support multiple collaborative learning scenarios

A useful tool for collaboration would support the execution of many e-learning scenarios. E-learning scenarios can combine one or more instructional methods like role-playing, case studies, team projects, brainstorming and many more, as long as the environment supports their functional requirements. We have implemented a role-playing technique to evaluate collaborative learning in SL. However, many collaborative learning scenarios could be supported in SL due to the fact that it supports text and voice chat, interaction with objects and group formation. Also, a variety of tools is available in SL marketplace or can be developed such as shared whiteboards, slideshows, built-in browsers/search engines etc. in order to support effectively multiple collaborative learning scenarios. However, the lack of automated updates in notecards' functionality and file sharing is definitely a drawback which needs to be addressed.

Principle 5 - Integrate collaboration into the pedagogical design

Even if a virtual environment can fully support the in-world transferability of a collaborative learning scenario, in terms of tools and functions, this may not be enough, if collaboration has not been integrated into the pedagogical design of the given scenario or activity. Collaboration should be intrinsic to the tasks being presented to the students. A common understanding of the meaning of collaboration should be reached by clarifying the type, level, suitability, people and need for collaboration. Purpose, learning objectives, instructions, roles, group and individual work, time allocated to the assigned tasks are major factors that need to be considered when designing collaborative learning in the virtual world. If collaboration is not intrinsic to the task then it needs to be signaled as optional and time needs to be factored into the activity to allow for these group working skills to develop. Ice-breaking

and socialization activities between students should ideally be considered before the collaborative learning task takes place.

Principle 6 - Design to reduce the cognitive overload of the users

Designing for collaboration is not a straightforward process and requires attention to a range of factors to be successfully achieved. The added complexities of working within a virtual space with a steep curve, in terms of orientation and acclimatization as well as the fluidity and playfulness of the space, were factors that distracted students from the tasks in hand. Students commented that their attention was split between learning the environment and the learning task itself. The main objective of a virtual learning environment is to support the learning process. Therefore, the users should be able to understand the operation of the learning environment and easily participate in the learning process. This could be achieved by providing more orientation time, by reducing the amount of navigation in the VW and by providing work ahead tasks outside the VW.

Principle 7- Design to maximize the flexibility within a virtual space

Due to the need for implementing different collaborative techniques within a virtual environment, it should be possible to quickly reorganize the virtual space for a particular activity or scenario. Moreover, the tools and 3D objects that are customized for the needs of a particular activity or scenario should not be overcomplicated so as to be easily re-usable. SL provides many capabilities in both areas. The meeting room that was created in SL for the implementation of the synchronous sessions was easily re-organized for the learning session where the findings of all groups had to be uploaded on whiteboards so as to be visible from

everyone. An approach for increasing the flexibility is the division of the virtual environment in smaller areas, so as to allow for specific functions (e.g. orientation building for practicing skills, amphitheater for presentations, meeting rooms for group work). This approach however, as shown in the results of this study, may result in disorientation and increment of the cognitive load of the users concerning the operation of the virtual space. Limiting the navigation requirements for the novice users should be a consideration.

Principle 8- Take advantage of third party tools for supporting collaboration

There are a variety of tools that have been developed to support collaborative processes in the virtual world. These include items such as shared whiteboards and to-do lists, communication managers and web-based protocol exchanges for browsing internet resources in-world. There is also a number of available Viewers (clients) and APIs which allow adding further functionality to the environment. Finally, there is the open source project - SLOODLE, which provides a range of tools for supporting learning and teaching in the immersive virtual world. SLOODLE integrates the multi-user virtual environments of Second Life and/or OpenSim with the Moodle and should probably be a high priority consideration for DE institutions that use Moodle as their primary learning environment for teaching and learning.

Recommendations

Based on the findings of this study, recommendations are made in the two areas presented below.

Role-playing scenario improvements

To improve the role-playing experience or other collaborative experience:

1. Allocate more time for activities. Student interviews revealed that there was not always enough time for students to work within their assigned roles in the role-playing scenario. Each session was scheduled for 60 minutes. The roles of group leader, group recorder and investigator/note keeper were assigned as agreed by the group participants and each student had the opportunity to play the assigned role in the collaboration session. While students recognized the benefits of working both individually and as a team, they also felt that having more hands-on practice time within SL and taking different roles in the scenario may have resulted in an enhanced learning experience. However, the fact of coordinating multiple synchronous sessions for each group made it difficult to schedule longer times or repeat sessions giving students an opportunity to change roles in the scenario. Designing the role-playing scenario to allow for increased time for each student to play all three roles would provide this opportunity for more hands-on practice.

2. Schedule additional immersive in-world experiences/activities. Student interviews also revealed that they wanted to have more in-world experiences inside SL. Students commented on the social aspect of the environment where they felt comfortable, and able to learn from each other. Some students had identified initial anxiety about coming inside SL and trying to perform in front of other students. As they felt comfortable with the expectations and the support they received, they identified positive feelings about the in-world experience and wanted to repeat it. Providing some additional in-world experiences such as a place for live class discussions (as an optional offering in a real course) or for group work or for a guest speaker coming to present in the virtual amphitheater would address their requests.

3. Ensure sufficient knowledge preparation. Student interviews revealed that students needed more preparatory sessions prior to the role-playing activity. Some commented that more

orientation sessions or maybe a whole class for mastering skills in SL would be a plus. The learning management system, Moodle could be used for posting preparation material and presentations, stuff that students could access at any time before or during the role-playing experience.

4. Ensure the same competency level in technology among group participants. Student interviews revealed there were differences in technological competencey between the various participants, fact that affected the quality of collaboration during in the role-playing scenario. This is not confined only to virtual worlds technology which has a steep learning curve and was otherwise new to the majority of participants, but almost to evey new technology or tool that is planned to get introduced in an educational context. In some cases or activities it may be useful to assess participants' level of completency with technology before group formation, so as to ensure that there will be no major differences between group members, that may in turn disrupt the quality of collaboration in the group.

Recommendations for Further Research

Based on the findings of this study, the following are recommendations for additional research that would build on both the design specifications of 3D Collaborative Virtual Environments and the collaborative learning techniques that could be efficiently supported inside them:

1. Evaluate other 3D VWs. This study examined only the VW of SL and investigated the user interface of the environment as well as its main collaborative and learning capabilities based on a role-playing scenario. Based on the outcomes of this study, a set of design principles was generated in order to help educators and designers evaluate the suitability of a 3D environment

before adoption and design instruction according to certain criteria. Future research may address the evaluation of other 3D VWs for education, as SL is only one of the many available. It is recommended that results of future evaluations be validated according to the proposed design principles of this study.

2. Apply other collaborative techniques. While the analysis of this study indicated that role-playing can be efficiently supported in a 3D WV and has a positive impact on learning engagement, further research using other collaborative techniques (e.g., Fishbowl, Pairs check, Jigsaw) would provide further insight into the instructional effectiveness of 3D worlds and their ability to support collaborative learning techniques for DE students. Through the application of different collaborative techniques and scenarios, other problematic areas may be uncovered and additional design requirements may be collected.

3. Explore role-playing activities in other disciplines. The results of this study are significant for guiding distance educators to prepare and deliver collaborative role-playing activities in a 3D virtual environment. Further research should address the use of role-playing activities and scenarios in a variety of disciplines in social science delivered by distance education, such as communication studies, psychology, history, law and linguistics. Moreover, the design of a role-playing scenario that is in alignment with the learning objectives of a course would provide further insights on the instructional effectiveness of the method.

4. Examine ways to develop learning community environments. As mentioned extensively in the findings of this study, SL provided students with a sense of community and a positive feeling of working with their classmates toward a common goal. The idea of learning as a collaborative process is very important when students are separated by distance. The social aspect of SL environment is an important and unique finding that adds to the body of

knowledge in both virtual worlds and distance education research. Further research should investigate the use of distance technologies (e.g., video conferencing, web-cameras, computer conferencing) to create real-time interaction and collaboration that connect DE students who are physically separated from each other and cultivate a sense of community between them.

5. Explore the effect of social and cultural differences on learning in a 3D world. One of the key elements for the success and effectiveness of an e-learning technology is the wide acceptance, in terms of use, of the users it targets. Students' interviews revealed that social factors such as age and gender may affect the quality of their learning experience inside the VW and more specifically their interactions in collaborative virtual teams through avatars. Further research could explore a set of social and cultural factors such as gender, race, class or age, values, beliefs and examine how these factors that influence individuals' diversity, may affect their behavior and consequently their learning experience in the 3D world. This is crucial in DE because virtual teams may be scattered in different countries or even continents. Even though, the profile of the users that will use an e-learning technology such as SL may vary, each application could be specialized based on some common characteristics of the majority of the users it aims to support. These characteristics involve, among others (IT skills, educational level), the age of the target group, their social and cultural background and their orientation to learning.

Closing Remarks

The significance of this study has been addressed at various points within this thesis, and a final review of this significance is provided below. The results of this study attempted to contribute to the current research on the design of collaborative virtual learning environments

by investigating and defining design principles that educators and instructional designers should follow in order to design effective virtual spaces for e-learning and collaboration. Thus, this thesis provides a list of design principles for virtual spaces that focus on supporting collaborative e-learning. These design principles could be useful for software designers in order to enhance current Collaborative Virtual Environments by integrating supportive communication and collaboration tools and services, as well as tools for effective manipulation of both the learning content and the users' roles and rights. In conclusion, this study has contributed to the scholarly research and literature in the fields of virtual worlds and distance education research. Further research will continue to investigate the instructional effectiveness of VWs by examining other VWs that are available, as well as other methods than can be used to promote collaboration in a DE program.

Concluding Thoughts

Virtual worlds and 3D virtual environments more broadly, present a bounteous and untapped future for education. Learning will morph into something that becomes a full sensory experience available to all students, regardless of background. Real and virtual realities will melt together to offer high-impact experiences that immerse students in a way that no other educational resource previously has.

However, there remains a great deal that we still do not know about how best to design VWs and use them to maximize learning effectiveness and outcomes. The current study tried to shed light on a range of research topics related to the use of virtual worlds in education. Topics spanned human–computer interaction issues related to navigation, communication, identity formation, and authentic learning; leading-edge technologies that have the potential to take

learning in virtual worlds forward in new directions, and considerations and frameworks for designing and implementing learning in virtual worlds.

Virtual worlds as well as other disruptive technologies will shape future educational ecosystems and therefore it is unfortunate to be deemed as a kind of technology-application in education rather than as an exciting space/place for co-creation, or as an open sandbox to test new theories and educational activities, or as a way to step into our collective and individual knowledge in a way that we have never been able to do before.

In a time when our modern educational systems are accused for being disconnected from the real world, many educators see virtual worlds as a tool that might help them to connect students to the real-life education through the technology of the metaverse. Part of this enthusiastic approach comes from the unique characteristic of virtual worlds: they give students the ability to play, to practice, to be creative and imaginative, and to do things that they don't or can't or can't yet do in real life. Virtual worlds move beyond authentic real-life learning.

The added value of teaching in a virtual world points towards cultural, linguistic, interpersonal and motivational. The experiential learning process involves a high level of interaction, which evolves as students and teachers participate in online activities such as discussions, collaborations and content sharing.

Virtual worlds, embedded in an appropriate pedagogical approach, seem to contribute to enhance collaborative learning, learning by reflecting and learning by doing approach as well as learner autonomy and social empathy. The combination of this positive attitude, together with the educational potential of virtual worlds, can lead to very motivating, enriching and satisfying learning and teaching experience.

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APPENDICES

APPENDIX A

Core Skills Competency Framework

We are suggesting that to be an effective educator in Second Life requires the acquisition of three sets of core competencies related to membership as (a) a resident, (b) a learner, (c) a practitioner.

1. Core competencies / skills to become an effective SL resident.

1.1. Users can enter and navigate the Second Life Environment

1.1.1. Users are able to install updates, log in to the Second Life environment, and maintain security of their password and personal details.

- Which registration portal
- Types of membership
- Orientation
- Log in
- Change password
- Find technical support when needed

1.1.2. Users are able to move their avatar around the Second Life environment, and control the Second Life camera.

- Walking
- Turning around
- Flying
- Landing
- Sitting
- Teleporting
- Camera controls
- Map with zoom and mini map
- Gestures

1.1.3. Users are able to effectively search, locate, retrieve, store and manage information on locations within Second Life.

- Use SL search functions
- Create landmarks
- Create SLurls
- Give landmark locations
- Find and retrieve
- Use advanced map and mini map functionality

1.2. Users can make effective use of personalization features

1.2.1. Users are able to make effective and appropriate use of preferences

- Preference settings

- Profile settings

1.2.2. Users are able to personalize their avatar

- Appearance settings
- Attach and detach items
- Locate, put on, change and remove clothing

1.2.3. Users are able to effectively catalogue and store items through good inventory Management.

- Create, rename, edit and delete folders
- Move objects between folders
- Rename folders
- Effective use of inventory search functionality
- Setting properties on objects
- Managing objects and other materials
- Deleting, transferring and creating backup files / folders

1.3. Users can make effective use of social networking tools and have an understanding on when and how to use them.

1.3.1. Users have an understanding of, and can make effective use of the 'Friends' facility.

1.3.2. Users understand the appropriate use of in-world text chat, instant messaging, and the use of gestures.

1.3.3. Users have an understanding of the use of real voice technologies

1.4. Users are aware of the safety issues of using virtual worlds, and they are able to manage their own personal safety.

1.4.1. An awareness of the issues relating to giving out personal information to other inworld residents or groups, or through other means such as profiles

1.4.2. Users are aware of how to report abuse

1.4.3. Users are aware of techniques and tools available to combat in-world abuse or harassment.

1.5. Users understand what constitutes appropriate behavior in-world - SLetiquette

1.5.1. How and when it is acceptable to approach others

1.5.2. Recording other people's conversations or taking photographs without prior consent

1.5.3. Asking for personal information

1.5.4. Users have an understanding of the strengths, challenges and differences of working within a diverse international environment

2. To be an effective learner requires the resident core skills, plus a further set of skills /competencies which would enable the use of tools and functionality to support their learning within Second Life.

2.1. Practicalities of learning in virtual worlds

2.1.1. An understanding of when to use of virtual worlds to support learning outcomes
2.1.2. An understanding of the technical constraints

2.2. Building and using appropriate learning tools and scripts

2.2.1. Ability to build basic objects to support learning
2.2.2. Setting up and using appropriate tools and scripts to support learning interaction with peers and teachers

2.3. How to transfer and utilize learning

2.3.1. Utilizing skills learnt in Second Life to first Life
2.3.2. Utilizing skills learnt in first life to Second Life

2.4. Communicating in learning groups

2.4.1. How to ask questions
2.4.2. How to share an idea
2.4.3. How to 'network'

3. To become an effective practitioner requires both resident and learner core skills, plus a further set of skills to enable them to identify and setup tools, as well as using appropriate and pedagogically sound approaches to learning and teaching, which support the personalization of learning.

3.1 Building and using a virtual learning space

3.1.1. Practitioners are able to plan an effective and appropriate learning space to accommodate learner group**s**? and different approaches to learning styles.

- Effective use of prims

3.1.2. Practitioners are able to identify the appropriate tools, scripts and functionality requirements to deliver effective in-world learning and teaching.
3.1.3. Practitioners are aware of, and can devise, build in and implement appropriate learner/ peer induction

3.2. Limitations of Second Life

3.2.1. Practitioners have a good understanding of the pedagogical and/or technical limitations of Second Life and when to devise and use a blended approach.
3.2.2. Practitioners are able to carry out appropriate audits to ensure that all learners within their group are able to effectively use Second Life as part of their learning episode.

3.3. Make effective use of communication tools to support learning and teaching.

3.3.1. Able to identify and make appropriate use of communications tools to support effective learning and teaching, including the use of a blended approach.

3.4. Personal safety and responsibility.

3.4.1. Appropriate organizational, learner group and where necessary individual measures are negotiated and put in place to minimize risks associated with learner and practitioner safety.
3.4.2. Appropriate acceptable behavior guidelines are negotiated with peers and individual learner groups.
3.4.3. Risks associated with health and safety are clearly identified.
3.4.4. Practitioners are aware of techniques and tools available to combat in-world abuse or harassment.

3.5. Effective use of assessment techniques

3.5.1. Practitioners are able to identify, setup and implement different in-world approaches to support effective formative and summative assessment.

APPENDIX B

APPENDIX B1

MDDE Students - Information Letter and Consent Form

Using Virtual Worlds in Distance Education courses: A case study

Dear MDDE Student,

This letter is to invite you to participate in a research study associated with the use of Virtual Worlds (VWs) in Distance Education courses. The purpose of this research, which is being undertaken as part of my graduate studies at Athabasca University, is to:

1. Set the design specifications for a suitable evaluation framework for 3D virtual collaborative learning environments.
2. Determine how 3D virtual worlds can (efficiently or inefficiently) support collaborative learning techniques for distance education students.

I am seeking your participation in this study because you are engaged in the advanced study of DE. I will be offering you the opportunity to participate in a specially organized set of online Second Life (SL) activities this semester that will include an asynchronous SL Orientation session and three synchronous sessions (see a more detailed description about the SL activities at the end of this document). The total amount of time that the SL activities involve is estimated to four hours (one hour per session).This is completely optional offering and your participation or non participation will by no means affect your performance in the M.Ed. program.

If you are interested in volunteering for this study, in addition to the 2nd Life activities, I will ask you to:

a. complete a demographic questionnaire and a Familiarization survey at the beginning of study. The questionnaire and the survey should take about 10 minutes to complete.
b. complete a Collaboration and a Learning survey at the end of the study. The Collaboration and the Learning survey should take about 10 minutes to complete.
c. potentially participate in one Skype interview of approximately 15 – 20 minutes at the end of the study. A selection of up to 4-6 participants will be asked for interviews in order to allow the researcher to follow up on survey results.

(Please note that the questionnaire and the surveys will be conducted online.)

Your participation in this research study will also provide you with a chance to win $300 in a draw. The draw will be made automatically after all participants have completed the research tasks. Participants who will complete the above will be automatically entered into the draw and the winner will be notified by E-mail. E-mail addresses will be stored separately from the research study data and destroyed after the winner has been contacted.

Please be assured that your involvement in this research is completely voluntary and there are no known or anticipated risks to participation in this study. You have the right to refuse to participate and to withdraw at any time during this research, without prejudice. In this case you can simply email the researcher and inform her that you wish to withdraw from the research. You may also skip questions or refuse to answer any question posed to you in an interview or in a survey simply by exiting a survey and choosing not to complete it.
All information collected from you will be stored in a secure location that can be accessed by the researcher only and all information will be held confidential. The data collected will be coded so that no identifying information remains, and it will be retained for 5 years after which it will be destroyed. As a researcher, I am aware of all ethical issues of my research. I will fully take responsibility to protect at all time the confidentiality and anonymity of participants and use the research data ethically under the Athabasca University Research Ethics Policy. On completion of the data analysis, a summary of the results of this research will be made available to all interested participants upon request. The existence of the research will be listed as an abstract, available online through the Athabasca University Digital Thesis and Project Room (DTPR), and the final research paper will be publicly available.

If you have any questions about this study or would like additional information to assist you in reaching a decision about participation, please feel free to contact Sofia Nteliopoulou by email at s.deliopoulou@gmail.com, or my thesis supervisors, Dr. Avgoustos Tsinakos at tsinakos@athabascau.ca or Dr. Bob Heller at bobh@athabascau.ca.

The Athabasca University Research Ethics Board has reviewed this research study and may be reached by e-mailing rebsec@athabascau.ca or calling 1-780-675-6718 if you have questions or comments about your treatment as a participant.

Thank you in advance for your interest in this project.
Yours sincerely,
Sofia Nteliopoulou

If you are interested in volunteering for this study, please email Sofia Nteliopoulou at {s.deliopoulou@gmail.com**}**.

Please include EITHER one or the other of the following statements in the body of your email:

1. I _____ (first and last name) agree to participate in the survey part of this research to evaluate the virtual world of Second Life in terms of its usability, collaboration and learning features.

OR

2. I _____ (first and last name) agree to participate in the survey part of this research to evaluate the virtual world of Second Life in terms of its usability, collaboration and learning features and I would like to be contacted to take part in an interview after the completion of SL activities.

   My contact information for the interview is:
   Preferred e-mail address _____.
   Skype ID where I can be reached between the hours of _____ and _____ on _____ (day of the week) is _____.

   Your e-mail will serve as your consent to participate in the interview.
   Volunteers will be notified by e-mail with a time and date for the interview.

Information about the Second Life Activities

Dear MDDE Student

During the spring semester of 2013, you are invited to participate in a series of educational activities that are going to be conducted in the 3D virtual world of Second Life (SL). This is a special offering for the MDDE students that are currently enrolled in MEd program and your participation is completely optional.

What to expect...

If you decide to participate in this offering you are expected:

1. **To complete an online Orientation** for the virtual world of Second Life, so as to familiarize yourself with the 3D environment and then create your own Avatar. Avatar is your digital representation inside Second Life. This activity will be asynchronous and you are expected to complete this task in a one-week period.
2. **To participate in three synchronous sessions**. These sessions will be conducted in the virtual world of Second Life and each session will last ***1 hour***.

   The first session will be an in-world conference that will be conducted in the Athabasca University amphitheater. The purpose of this conference is to provide students the chance to visit Athabasca University Island in SL and also to inform them about the learning activities that will follow inside SL. Furthermore, during this session students will be arranged in groups, of four or five (this depends on the number of the participants.

   The second session will be a group session. Each group will be encouraged to visit the location where a learning task has been designed inside SL and explore the surroundings to find information relevant to the task of the activity. This will be a role-playing activity. When the student group log into SL, they will be faced with a situation and their role will be to gather evidence and make suggestions on that situation. After thirty minutes of exploration the group will re-gather and develop a strategy for their work (15 min duration). Each group will decide the date and time of this session.

   In **the third session**, all groups will meet again in-world and present their findings. Each group will be asked to prepare a short presentation with their recommendations on the task they studied.

Schedule for the educational activities that will be conducted

in the virtual world of Second Life

<table>
<tr><th colspan="2">Phases</th><th>In-world activities</th><th>When</th></tr>
<tr><td>Phase 1
Pre-analysis phase</td><td></td><td>1) Students create their accounts in SL
2) Students visit SL orientation site and familiarize themselves with the environment.</td><td>This activity should be completed in a one-week period</td></tr>
<tr><td rowspan="4">Phase 2
Implementation</td><td>1st session in SL</td><td>1) Students attend an in-world web conference conducted by the researcher. In this session students will be informed about the learning activities that will follow.
2) Students will be arranged in groups of four or five.</td><td>One hour session</td></tr>
<tr><td>2nd session in SL</td><td>1) Each group visits the place where the learning activities have been designed and explores the surroundings to find relevant information about the activities. Then, the groups re-gather and develop a strategy for their work.</td><td>One hour session
(Each group will decide the date and time of this session in discussion with the researcher.</td></tr>
<tr><td></td><td colspan="2">After the end of the 2nd session, students continue to work on their tasks in order to prepare a short report with their suggestions.</td></tr>
<tr><td>3rd session in SL</td><td>1) All groups meet in-world to present their findings.</td><td>One hour session</td></tr>
</table>

APPENDIX B2

PSYC Students - Information Letter and Consent Form

Using Virtual Worlds in Distance Education courses: A case study

Dear PSYC Student,

This letter is to invite you to participate in a research study associated with the use of Virtual Worlds (VWs) in Distance Education courses. The purpose of this research, which is being undertaken as part of my graduate studies at Athabasca University, is to:

1. Set the design specifications for a suitable evaluation framework for 3D virtual collaborative learning environments.
2. Determine how 3D virtual worlds can (efficiently or inefficiently) support collaborative learning techniques for distance education students.

I am seeking your participation in this study because you are studying at a distance. I will be offering you the opportunity to participate in a specially organized set of online Second Life (SL) activities this semester that will include an asynchronous SL Orientation session and three synchronous sessions (see a more detailed description about the SL activities at the end of this document). The total amount of time that the SL activities involve is estimated to four hours (one hour per session).This is completely optional offering and your participation or non participation will by no means affect your performance in the Psychology program.

If you are interested in volunteering for this study, in addition to the 2nd Life activities, I will ask you to:

a. complete a demographic questionnaire and a Familiarization survey at the beginning of study. The questionnaire and the survey should take about 10 minutes to complete.
b. complete a Collaboration and a Learning survey at the end of the study. The Collaboration and the Learning survey should take about 10 minutes to complete.
c. potentially participate in one Skype interview of approximately 15 – 20 minutes at the end of the study. A selection of up to 4-6 participants will be asked for interviews in order to allow the researcher to follow up on survey results.

(Please note that the questionnaire and the surveys will be conducted online.)

Your participation in this research study will also provide you with a chance to win $300 in a draw. The draw will be made automatically after all participants have completed the research tasks. Participants who will complete the above will be automatically entered into the draw and the winner will be notified by E-mail. E-mail addresses will be stored separately from the research study data and destroyed after the winner has been contacted.

Please be assured that your involvement in this research is completely voluntary and there are no known or anticipated risks to participation in this study. You have the right to refuse to participate and to withdraw at any time during this research, without prejudice. In this case you can simply email the researcher and inform her that you wish to withdraw from the research. You may also skip questions or refuse to answer any question posed to you in an interview or in a survey simply by exiting a survey and choosing not to complete it.
All information collected from you will be stored in a secure location that can be accessed by the researcher only and all information will be held confidential. The data collected will be coded so that no identifying information remains, and it will be retained for 5 years after which it will be destroyed. As a researcher, I am aware of all ethical issues of my research. I will fully take responsibility to protect at all time the confidentiality and anonymity of participants and use the research data ethically under the Athabasca University Research Ethics Policy. On completion of the data analysis, a summary of the results of this research will be made available to all interested participants upon request. The existence of the research will be listed as an abstract, available online through the Athabasca University Digital Thesis and Project Room (DTPR), and the final research paper will be publicly available.

If you have any questions about this study or would like additional information to assist you in reaching a decision about participation, please feel free to contact Sofia Nteliopoulou by email at s.deliopoulou@gmail.com, or my thesis supervisors, Dr. Bob Heller at bobh@athabascau.ca or Dr. Avgoustos Tsinakos at tsinakos@athabascau.ca

The Athabasca University Research Ethics Board has reviewed this research study and may be reached by e-mailing rebsec@athabascau.ca or calling 1-780-675-6718 if you have questions or comments about your treatment as a participant.

Thank you in advance for your interest in this project.
Yours sincerely,
Sofia Nteliopoulou

If you are interested in volunteering for this study, please email Sofia Nteliopoulou at {s.deliopoulou@gmail.com**}**.

Please include EITHER one or the other of the following statements in the body of your email:

2. I _____ (first and last name) agree to participate in the survey part of this research to evaluate the virtual world of Second Life in terms of its usability, collaboration and learning features.

OR

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My contact information for the interview is:
Preferred e-mail address _____.
Skype ID where I can be reached between the hours of _____ and _____ on _____ (day of the week) is _____.

Your e-mail will serve as your consent to participate in the interview.
Volunteers will be notified by e-mail with a time and date for the interview.

Information about the Second Life Activities

Dear PSYC Student,

During the spring semester of 2013, you are invited to participate in a series of educational activities that are going to be conducted in the 3D virtual world of Second Life (SL). This is a special offering for the PSYC students that are currently enrolled in the Psyc 228, Pscy 355, & Psyc 381 and your participation is completely optional.

What to expect...

If you decide to participate in this offering you are expected:

1. **To complete an online Orientation** for the virtual world of Second Life, so as to familiarize yourself with the 3D environment and then create your own Avatar. Avatar is your digital representation inside Second Life. This activity will be asynchronous and you are expected to complete this task in a one-week period.
2. **To participate in three synchronous sessions**. These sessions will be conducted in the virtual world of Second Life and each session will last ***1 hour***.

   The first session will be an in-world conference that will be conducted in the Athabasca University amphitheater. The purpose of this conference is to provide students the chance to visit Athabasca University Island in SL and also to inform them about the learning activities that will follow inside SL. Furthermore, during this session students will be be arranged in groups of four or five (this depends on the number of the participants.

   The second session will be a group session. Each group will be encouraged to visit the location where a learning task has been designed inside SL and explore the surroundings to find information relevant to the task of the activity. This will be a role-playing activity. When the student group log into SL, they will be faced with a situation and their role will be to gather evidence and make suggestions on that situation. After thirty minutes of exploration the group will re-gather and develop a strategy for their work (15 min duration). Each group will decide the date and time of this session.

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Schedule for the educational activities that will be conducted

in the virtual world of Second Life

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</table>

APPENDIX C
GSDRF FULL APPROVAL

Athabasca University
Canada's Open University

MEMORANDUM

DATE: April 30, 2013

TO: Sofia Ntelliopoulou
(Program: Master of Education in Distance Education)

FROM: Dr. Jennifer Knopp-Sihota
Chair, Graduate Student Research Fund (GSRF) Committee

COPY: Dr. Bob Heller (Supervisor), Avgoustos Tsinakos (Supervisor)
Alice Tieulié, GSRF Committee Administrator

SUBJECT: GSRF Committee Meeting: March 4, 2013
Graduate Student Disciplinary Research Fund (GSDRF) Application: 2013-2014 Fiscal Year
FULL APPROVAL: Up to $823

As per the March 4, 2013 memo, the GSRF Committee requested that you provide additional information to support your 2013-2014 Graduate Student Disciplinary Research Fund (GSDRF) application for funding to cover costs to conduct your research entitled, **"Using Virtual Worlds for Distance Education courses: A case study"** with an anticipated start and end date of December 1, 2012 and October 15, 2013, respectively.

The GSRF Committee requested that you provide the following details:

1) Confirmation of ethics approval issued by the Athabasca University Research Ethics Board (AUREB).
2) Revised Budget that address the following:
   - Purchase of a Skype Recorder to conduct Skype interviews
   - Purchase of a Speech to Text Software (Dragon Speaking Naturally)
   - Incentives to increase participation
   - Hiring of an experienced user in Second Life

Thank you for providing the details to address the conditions (received April 29, 2013). The GSRF Committee is pleased to announce **FULL APPROVAL** of a Graduate Student Disciplinary Research Fund (GSDRF) Award **up to $823.** The award is to be used for the payment of **any combination of** the costs as outlined in the revised budget, up to the award amount of $823, which includes the following:

Scripting in Second Life	$103
Building in Second Life	$165
SL account to purchase virtual goods and services	$103
Hire an experienced Second Life Users (as a facilitator)	$124
Incentive to increase participation	$300
Bank charges – commission for each transaction ($14 per transaction)	$ 28
Total Expenses	**$823**
Total GSDRF Award	**$823**

Congratulations on this award and we look forward to the results of your research!

All awards are subject to the AU Research Fund guidelines including ethics considerations and the obligation to provide a formal report at the conclusion of the project.

- ***Please acknowledge Athabasca University funding on all presentations and papers related to this project.***

DURATION OF AWARD:
Your award is approved within the scheduled timeframe as indicated within your application. All aspects of the research outlined in the proposal must be completed by October 31, 2013.

To claim your GSDRF award,
Expenses are claimable by presenting original receipts along with a signed and completed Reimbursement Claim Form. We recommend that you keep copies of all your documents.

Complete and return the original signed Reimbursement Claim Form, along with the original receipts to:

Alice Tieulié
GSRF Committee Secretary
University Research Services
Athabasca University
1 University Drive
Athabasca, AB, T9S 3A3

Submission of Final Report:
In accordance with the funding guidelines, a GSDRF Final Report Form must be submitted within one month of the project's conclusion, of which funding was awarded, **(by October 31, 2013)**, along with a copy of the final research paper.

If you have any questions or require further assistance, contact the GSRF Committee Secretary, Alice Tieulié at alicet@athabascau.ca, or at (780) 675-6651.

Dr. Jennifer Knopp-Sihota
Acting Chair, GSRF Committee

APPENDIX D

Demographic Questionnaire

PART 1

Identifying Code: _____

1. What is your gender?
    - Male
    - Female

2. What is your age?

3. Which program do you currently attend?
    - Bachelor of Arts in Psychology
    - Master of Education in Distance Education
    - AU Graduate
    - Other

4. Have you used any virtual worlds before your participation in this project, such as Second Life, OpenSimulator, Croquet, Active Worlds, Quest Atlantis, There etc?
    - Yes
    - No

5. If yes, please choose the reason of using it. (Tick more than one options if applicable).
    - Socializing
    - Gaming
    - Education
    - Content Creation
    - Other

6. About how much time do you usually spend when you use a virtual world?
    - Less than 1 hour/week
    - 1 hour to 5 hours/week
    - 5hour to 10 hours/week
    - More than 10 hours/week

PART 2

Familiarization Session Survey

Interface Issues

Choose the answer you think/feel is the most suitable

a. My first impression of the environment was positive.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

b. 3D user interface was not difficult.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

c. 2D user interface was not difficult.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

d. I found the graphics of the environment satisfactory.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

e. Learning to use the functions of the environment was easy.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

f. It was not difficult to move my avatar.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

g. Virtual areas (spaces) of the environment were satisfactory.

Strongly	Disagree	Don't know	Agree	Strongly agree

disagree				

h. I had no problem to move or teleport from one virtual area to another.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

i. I found the feature "change view" useful inside the environment.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

j. I did not lose my direction inside the virtual environment.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

k. The system was fast enough.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

l. It was easy to learn how to interact with 3D objects

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

m. I could easily distinguish 2D from 3D windows

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

n. I was not sure when to right-click or left-click on the objects of the environment.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

o. The animation of the avatar was satisfactory.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

p. The avatar's appearance modification tool was satisfactory.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

PART 3

Collaboration Session Survey

Collaboration Issues

Choose the answer you think/feel is the most suitable

a. System features helped me to collaborate effectively with my partners satisfactory.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

If you disagree with the above statement, please describe the features that did not support you collaborate effectively.

……
……

b. I did not encounter any technical problem inside the environment.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

c. The system's feedback mechanisms were fast.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

d. I found useful to see the way my partner interacts with the environment.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

e. I would prefer to contact my partner though VoIP.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

f. I found useful the representation of the user's field of view/vision through the avatar's head movement.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

g. I found avatars gestures useful for the collaboration.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

h. I found the feature of being able to see other users interact with objects useful.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

i. The representation of the other user though an avatar helped me to collaborate effectively.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

j. Did you use any of the following features? Do you think these features boost the interaction process?

	Yes	**Don't know**	**No**
3D objects			
Insert icon			
Chat tool			

k. Did you encounter any problems while using some of the following features?

	Yes	**Don't know**	**No**
3D objects			
Insert icon			
Chat tool			

l. I consider I could collaborate more effectively with my partner in a 2D environment.

Strongly disagree	**Disagree**	**Don't know**	**Agree**	**Strongly agree**

1) Did you encounter any problems with any of the above features? If yes, please describe.

……
……

2) Please describe the top three features for the following questions.

a. In your opinion, which were the top three advantages of the environment?

……
……
……

b. In your opinion, which were the top three disadvantages of the environment?

……
……
……

3) Any other comments you want to add.

……
……

PART 4

Learning Session Survey

Issues for further development

Choose the answer you think/feel is the most suitable

1. I find the "save text" feature of the chat tool useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

2. I found the "bubble chat" feature overhead the avatar useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

3. I found the feature of editing my avatar's appearance useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

4. I would like to be able to distinguish the role of each avatar (instructors, students, facilitator) through its appearance.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

5. Which characteristic in the avatar's appearance could better distinguish the instructor from the students?

   ……
   ……

6. I think that a map of the AU island inside Second Life would be helpful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

7. I think that if avatars were less anthropoid, they would not cause any disturbance in the educational procedure.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

8. I found that the existence of "SL agents" useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

9. I consider that Second Life environment supported the educational scenario effectively.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

10. I think it would be helpful if an "SL educational agent" could provide information relevant to the educational scenario that is executed.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

11. I would like to be able to use and share audio and video files inside Second Life.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

12. I think it would be easy to organize and run a course through Second Life.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

13. I believe that Second Life could provide tools for assessment such as tests, quizzes etc.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

14. I think that the existence of a forum inside Second Life would be useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

15. I believe that I could easily attend a course through Second Life.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

16. I think that the existence of suitable objects relevant to the learning scenario that is executed could support user's immersion.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

17. I found avatars' facial expressions useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

18. I consider users' ability to create and share 3D objects would be useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

19. I consider users' ability to create and share simulations would be useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

20. I consider users' ability to record video inside Second Life would be useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

21. I consider that voting and decision making tools would be useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

22. I consider the interconnection of 3D with 2D environments (e.g via Sloodle) would be useful.

Strongly disagree	Disagree	Don't know	Agree	Strongly agree

23. Any other comments you want to add.

……
……

APPENDIX E

Interview Protocol

Interviewee:	
Date:	

1. How did you find your experience in Second Life project? How did it unfold?
Notes:

2. Did you encounter any problems with orienting and moving in SL? Please explain.
Notes:

3. Which were the most important issues or problems (if any) did you face in SL?
   Orientation issues (moving avatars, find resources in the virtual space etc)
   Communication issues (chat, talk, share resources)
   Learning issues (difficulties in learning e.g too many distractions etc)
   Other (please specify)
Notes:

4. How easy/difficult was it to communicate with other individuals in SL?
Notes:

5. Which were the most frequently used methods (SL features) did you use to communicate with other residents within SL itself?
   Chat feature
   Voice feature
   Notecards
   Other (please specify)
Notes:

6. How easy/difficult was it to collaborate with other individuals in SL?
Notes:

7. Did the presence of other students in SL (avatars) help you with your learning? If so, how?
Notes:

8. What were your positive experiences during the project?
Notes:

9. What were your negative experiences during the project?
Notes:

10. Did you feel you needed help/support during the process?
Notes:

11. What is different between 3D (Second Life) and 2D (Moodle) virtual environments?
Notes:

12. Do you have any suggestions for how to improve learning in Second Life? Please explain.
Notes:

13. Would you like to see it integrated into your courses at University? Please explain when/how do you think a 3D environment would be useful/ useless.
.
Notes:

14. How useful do you think is SL as a tool for distance education?
Notes:

15. What other observations or comments would you like to make about the use virtual worlds for learning?
Notes:

APPENDIX F

SL Pilot Invitation

---------- **Post**----------

Dear Class

For those students who incline to submit the Assig P as their final assignment and they would like to comment on the use of Second Life in DE, a pilot session in AU Second Life Island will be available for them. Participants will have the chance to collect some empirical data for their assigs instead of just reviewing related papers of similar projects in the Internet (or even make use of both resources).

This pilot session will unfold in two phases:

a. The first one will concern a Second Life Orientation which will take place from 18 to 22nd of March The purpose of this session is to familiarize with the most basic features of the SL environment.

b. The second session will be held from 23 to 29 of March where you are expected to read a short chunk of information available in the AU SL island and therefore to discuss the pros and cons of mobile learning

In order to be flexible with this discussions we can set up a doodle calendar in order to find the most appropriate dates.

If you are interested in volunteering for this pilot, please email me and cc Mrs Sofia Nteliopoulou (s.deliopoulou@gmail.com) who is going to help me in this pilot

Please note that your participation is totally on a voluntarily basis.

If you have any questions please feel free to contact me

Thank you in advance for your interest in this project.

---------- **END**----------

APPENDIX G

SL Orientation Instructions

Second Life

Week 1: First Steps
Activity: Second Life Orientation

The present document

- describes all the basic steps you need to know to join the virtual world of Second Life.
- is addressed to those who wish to participate voluntarily in a series of educational activities that will be conducted inside Second Life for research purposes.

Contents

Before you start

Important: You must install a standalone program, the *Second Life Viewer*, to enjoy the rich 3D content in Second Life. The installation process is quick and easy, but your computer must meet the System Requirements. Second Life will not run on systems that fail to meet these requirements.

Registering for and installing Second Life

Follow this quick five-step process to register for and install Second Life.

Go to http://secondlife.com/ and click **Join Now.**

1. Choose an avatar

This is how YOU will appear in Second Life. You can choose from a wide selection of avatars, including people, animals, robots, and even vehicles.

2. Create a username

Your username is the account name that you use to log in to Second Life. It has to be unique, so you may not get to choose a simple or common name.

Warning: Choose your username carefully! Once chosen, you can't change it. Although you can designate a "display name," your username will still be visible, and others may use it to refer to you.

3. Answer just a few more questions…

Complete all the required fields.

4. Select an account type

Choose a free basic account, or sign up for a premium account for

as little as $6 per month.

With a premium account, you get your own private Linden Home (if you are at least 18 years old), virtual currency rewards, exclusive virtual goods, and many other benefits. For more information on premium accounts, see Premium membership in the Second Life Knowledge Base.

If you choose a **basic account** now that is **adequate for your participation to this project**, you can always upgrade to premium membership later.

5. Download Second Life

To enjoy the rich 3D content in Second Life, you must download and install the *Second Life Viewer*, an application that runs on Windows, Mac OS, and Linux. Most web browsers will download the installer automatically; if that does not happen, just click **Download & Install Second Life**.

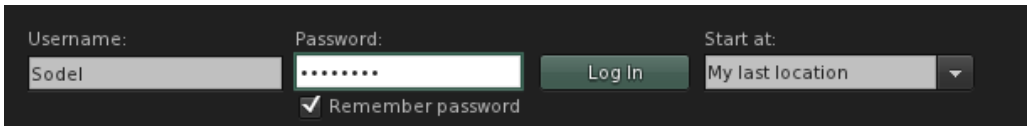
You may need to run the installer program explicitly.

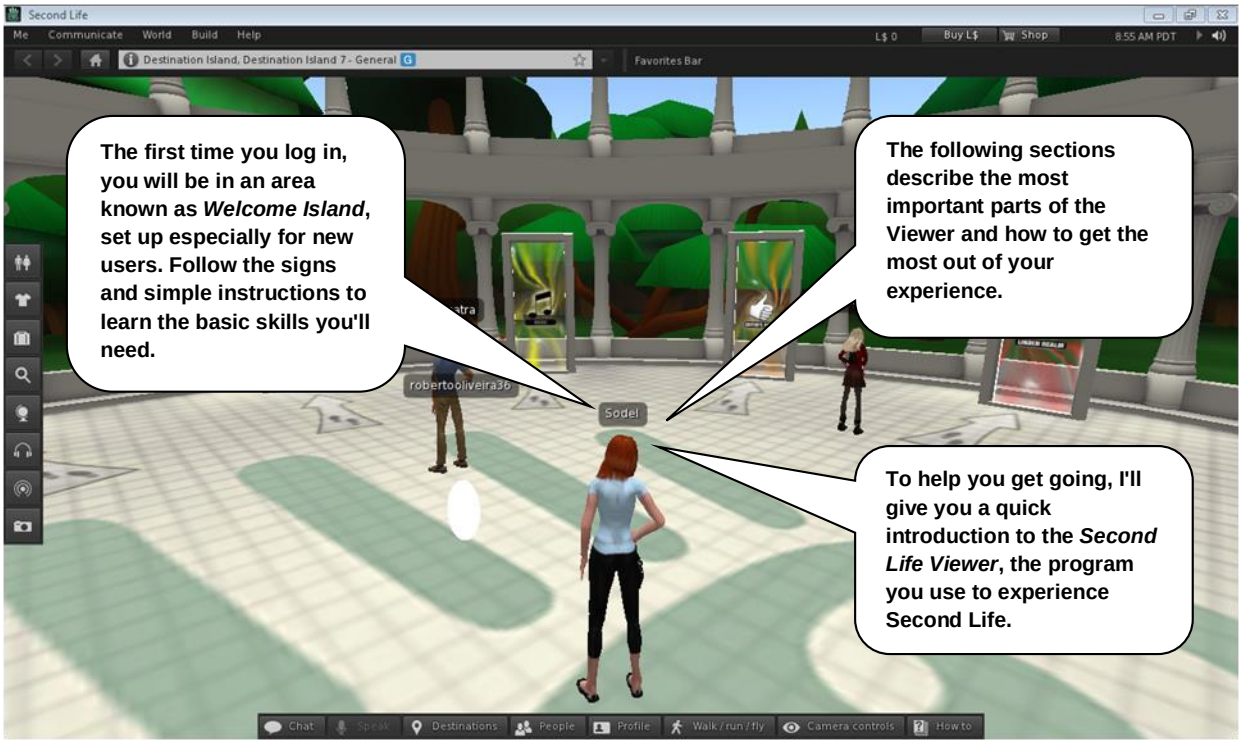
Your first steps in-world

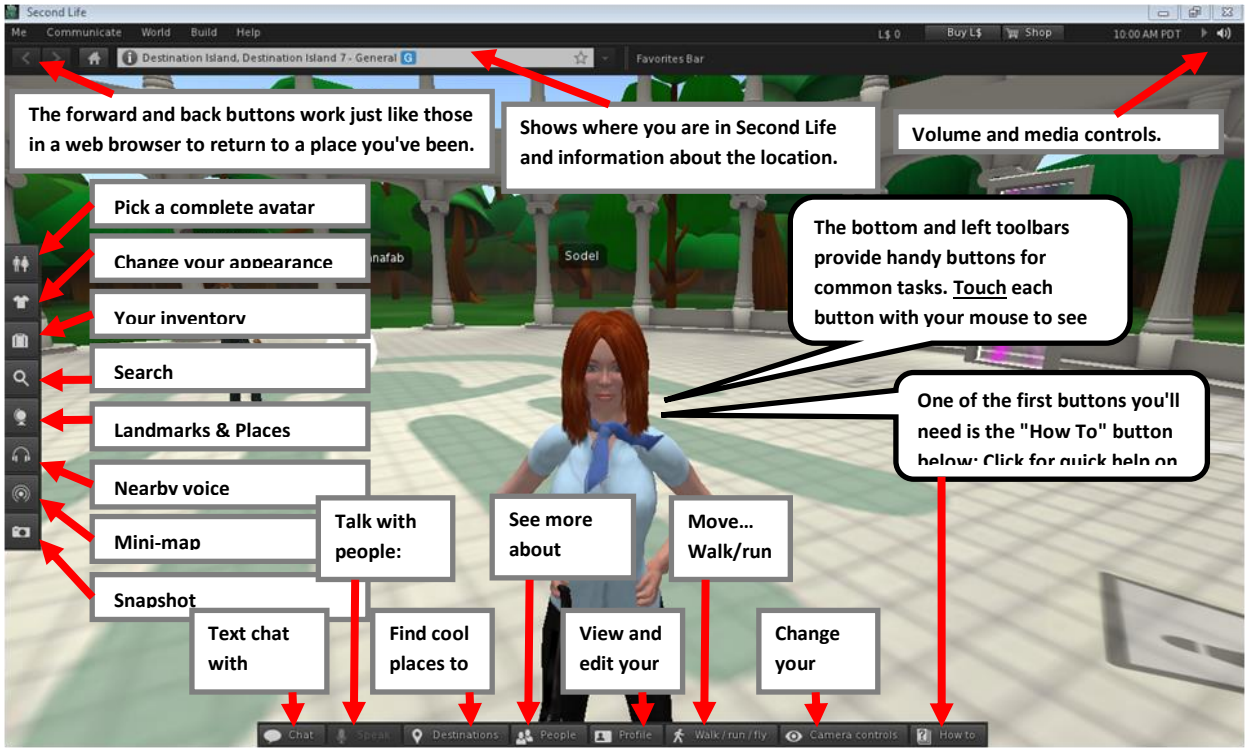
Now that you've registered for Second Life and installed the Second Life Viewer, you're ready to start your adventure in the virtual world—or "in-world," as we call it.

Logging in

Start the Second Life Viewer and then log in to Second Life by entering the username and password you selected when you registered. If you have problems logging in, see Login failure in the Second Life Knowledge Base.






The forward and back buttons work just like those in a web browser to return to a place you've been.
Shows where you are in Second Life and information about the location.
Volume and media controls.
Pick a complete avatar
Change your appearance
Your inventory
Search
Landmarks & Places
Nearby voice
Mini-map
Snapshot
The bottom and left toolbars provide handy buttons for common tasks. Touch each button with your mouse to see
One of the first buttons you'll need is the "How To" button
Talk with people:
See more about
Move... Walk/run
Text chat with
Find cool places to
View and edit your
Change your
Chat
Destinations
People
Profile
Walk / run / fly
Camera controls
How to

Basic skills

Some of the first things you'll want to learn how to do include:

- Walking
- Flying
- Changing your view
- Text chatting
- Changing your avatar
- Interacting with objects
- Finding out more about nearby people
- Controlling inworld media

Walking

There are three ways to make your avatar walk:

- **Click to walk**. Simply click on the ground at the point to which you want to go. If your mouse pointer turns into a hand instead of an arrow, you won't move but will instead interact with an object.
- **Use the arrow keys**. The up-arrow ↑ and down-arrow ↓ keys walk you forward and backward, respectively. The left-arrow ← and right-arrow → keys turn you left and right, respectively.
- **Use the W, S, A, and D keys**. The **W** and **S** keys make you walk forward and backward. The **A** and **D** keys turn you left and right, respectively. Make sure you click in-world first so that the chat field doesn't have focus. Otherwise, you'll be typing chat text instead of walking.

Running

To run forward, simply double-click the **W** or up-arrow ↑ key. To run backward, double-click **S** or the down-arrow ↓ key.

Flying

Flying in Second Life is really fun, and it lets you move around much faster than you can by walking or running.

To fly, press and hold the **Page Up** key or the **E** key. Press and hold the **Page Down** key or the **C** key to land.

Use the same keys to move through the air as you do to walk.

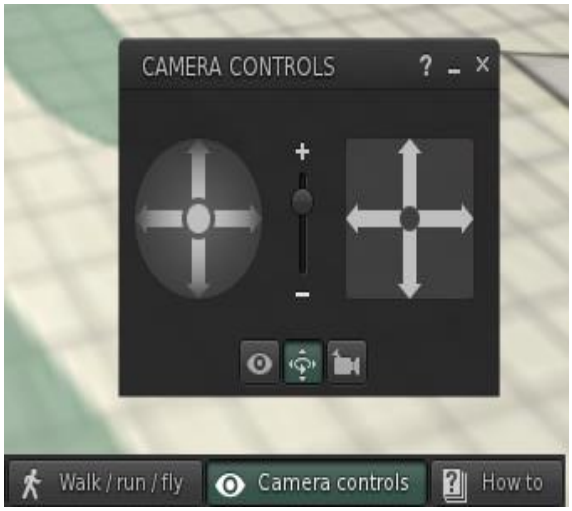
Note: Some regions don't allow flying. In these areas, you'll see this icon in the location bar  and you won't be able to fly.

Keyboard shortcuts

See Keyboard shortcuts for a quick reference guide.

Changing your view

By default, your view is from directly behind and slightly above your avatar. However, it's often useful to see things from a different viewpoint!

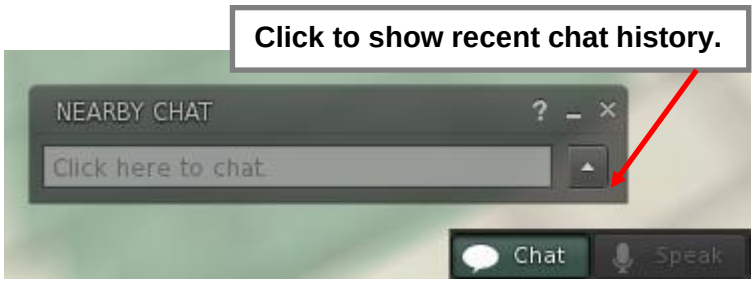


There are several ways to change your view:

- To rotate your view, click and drag anywhere on the world. **NOTE**: If your mouse pointer turns into a hand *before* you click, then you'll interact with the object instead of rotating your view.
- To zoom in, press and hold the **Alt** key, then click and drag your mouse; or use your mouse wheel.
- To orbit, press and hold the **Alt** and **Control** keys, then click and drag your mouse.
- Click the **View** button and use the controls, shown at left.

To return to the default view, press the **Esc** key.

Text chatting



Click the Chat button (by default in the bottom toolbar) to text chat with people nearby. Everyone within twenty meters of you will be able to see what you type.

To shout, press **Control-Enter** instead of **Enter** after typing your chat text. Everyone within 100 meters will be able to see what you type.

Click the triangle icon in the chat field to show recent chat history.

Mouse over names in chat history and then click on the icon for more options.

Changing your avatar

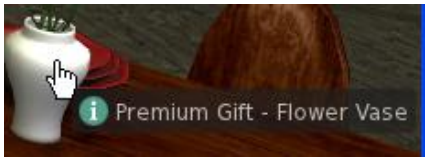
Click **Avatar** to change your avatar to one of the free provided avatars. You'll be able to choose from a wide variety of people, robots, animals, and even vehicles. For information on customizing your avatar, see Editing your appearance.

Interacting with objects

To interact with any object you encounter, right-click it and select from the menu of actions and tools, as shown for example at right.

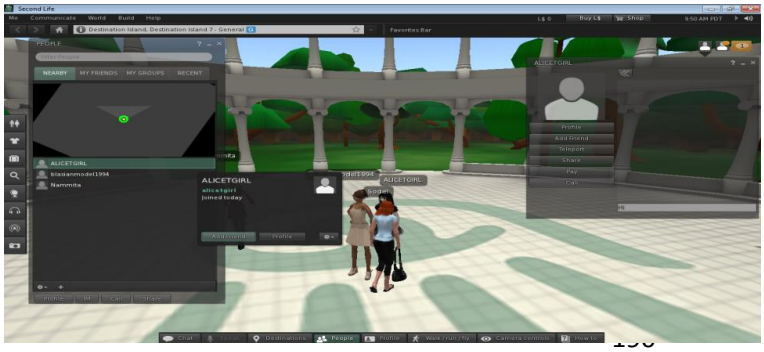
Some objects (such as furniture) automatically provide a "sit" icon when you mouse over them. Simply click on the object to sit on it. To stand up again, just click the **Stand** button that appears near the bottom of the window.

If your mouse cursor turns into a hand when over an object, you may be able to interact with the object by clicking on it. In some cases, clicking performs an action (such as turning on a light switch); sometimes, the object displays a special menu that lets you select from a variety of actions.



When you hover your mouse cursor over an object, you may also see an information box, for example as illustrated at left. Click on the icon for additional options.

Finding out more about nearby people



To find out about those nearby, mouse over their avatars and click the icon that appears.

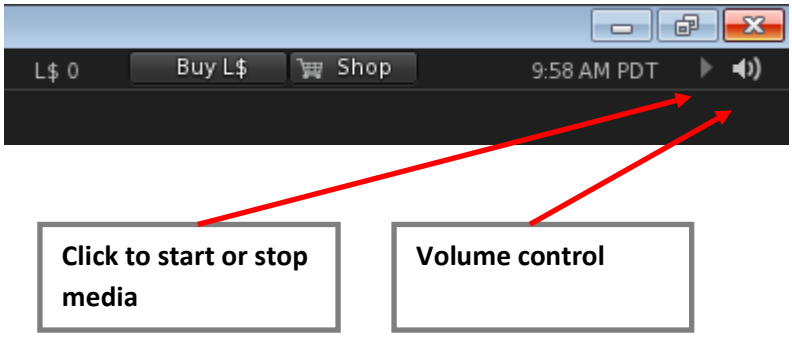
You'll get an information box with:

- Their avatar name and how long they've been in Second Life.

- Profile "biography" information (if they've added it).
- Voice chat volume control for that person only.
- **Add Friend** button, to send a friendship request. See Making friends.
- **Profile** button, to see the person's profile. See Using Profiles.

Click the  for additional options, as illustrated at left.

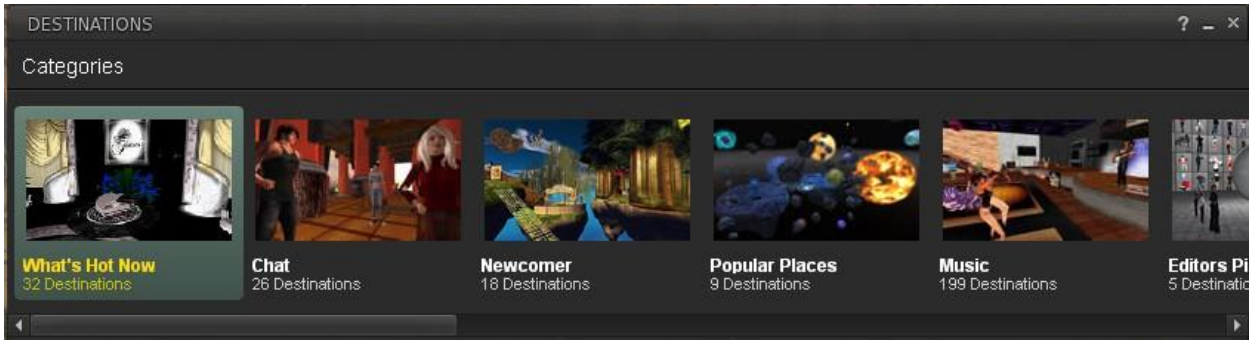
Controlling inworld media



Many areas in Second Life have music playing for ambience, or video displayed on an in-world surface. Use the controls in the upper right of the Viewer window to control the volume of the audio or, if you like, to turn it off entirely.

Mouse over any in-world surface displaying video or other media to show special media controls.

Finding cool stuff to see and do



Click **Destinations** to see the Second Life Destination Guide. Click on a category, then click on a destination in that category to teleport there immediately.

Go to http://secondlife.com/destinations/ to see more categories and destinations.

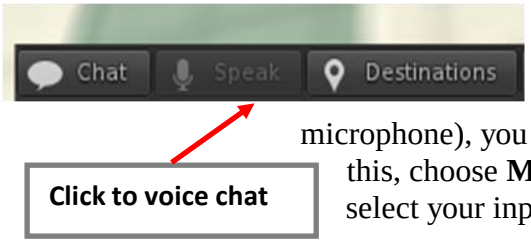
Doing more

Once you become familiar with walking, flying, and the other basic functions, you may want to try:

- Using voice chat
- Making friends
- Seeing nearby people and friends
- Using profiles

Using voice chat

Tired of typing? Use voice chat to talk to nearby people. You'll need to set up a headset or speakers and a microphone. Using a headset avoids annoying echoes of your own voice.



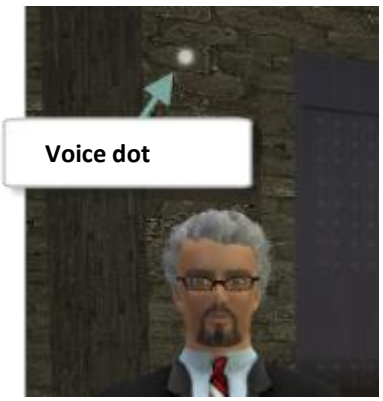
Generally, it's best to connect your audio devices before you start Second Life. After you have connected your headset (or speakers and microphone), you may need to configure your sound devices. To do this, choose **Me > Preferences > Sound & Media**. You'll be able to select your input and output devices and change your volume setting.

Once you have configured your sound devices, simply click **Speak** to speak to those nearby. Click it again to turn off your microphone.

Note: Some regions disable voice chat. In these areas, the **Speak** button will be dimmed, and you won't be able to use voice chat.

Voice dots

Voice dot



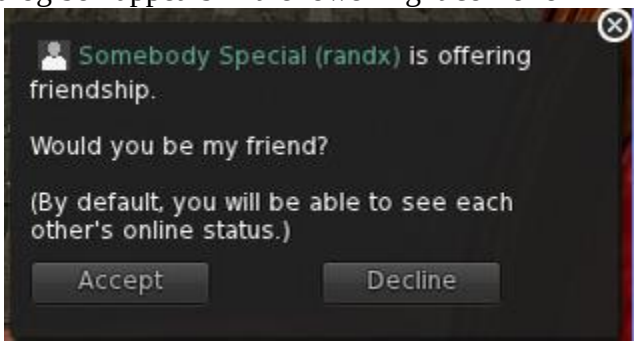
You can tell if voice is enabled and working properly because you'll see a small white dot floating above your name tag, as shown below. If other people have voice enabled, they will have voice dots as well.

Making friends

To make someone your friend, mouse over their avatar, click the  and choose **Add Friend**. This person will receive a friendship request: if they accept it, then they will be on your friends list, and you will be on theirs.

How to accept or decline a friendship offer

When someone else offers you friendship, a dialog box appears in the lower-right corner of your screen.

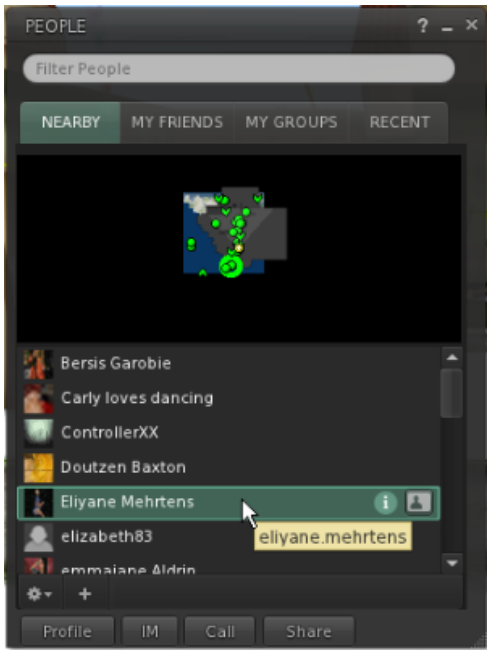


If you click **Accept**, your new friend receives onscreen notification that you have accepted the friendship offer.

Click **Decline** to cancel the offer. The other person receives onscreen notification that you declined the friendship offer.

Tip: Strike up a conversation or have some interaction before asking someone to be your friend—it's good manners!

Seeing nearby people and friends



Click the **People** button to open the People window, which has four tabs:

- **NEARBY** shows everyone within 100m of you.
- **MY FRIENDS** shows your *friends list*, with those currently online shown first.
- **MY GROUPS** shows information on your Second Life groups, which are like clubs.
- **RECENT** shows everyone with whom you recently communicated via instant message or group chat.

In all of these tabs, a person's name appears dimmed if they are not currently online.

Mouse over a person's name for additional options:

- Click  to see more information about the person; then click  for a menu with additional actions.
- Click  to view the person's profile.

The mini-map in the **NEARBY** tab shows a bird's eye view of the area you're in; the yellow dot shows your location, and the green dots represent other people.

Zoom in and out with your mouse wheel or right-click on the map for more options.

Using profiles

Click **Profile** to edit your profile. Use your profile to express your personality and interests. You can also share things with your friends and see things they share with you, similar to social networking sites. You can link your Second Life profile with your accounts on Facebook, Twitter, LinkedIn, and other popular social networks.

To view someone else's profile, mouse over their avatar, click  , then click **Profile**. You'll be able to see the things they have allowed based on their privacy settings.

To configure your privacy settings:

- Click **Profile**
- Click  to view your profile home page.
- Click **Privacy**.

Attend the in-world Orientation

Once you've mastered the basic skills covered in this article, you're ready to move on to attend the in-world Orientation so as to acquire a more authentic 3D experience.
Once you log in SL, click on the **Search button** from the left toolbar and in the search box, type "**Athabasca University**". From the results, select the second link *"Athabasca University Campus including our new ARC building and Psychology Lab"* and click **teleport**. Now, you are in Athabasca University Island in Second Life.
Walk around and find the nearest **Teleport station** (it looks like a big grey circle on the ground), **click** on it and from the menu choose **CDE-Orientation** building. Then simply **click to teleport**. Now you must be out of the **CDE-Orientation** building.
Get in to start the in-world Orientation.
Most importantly, have fun!

APPENDIX H

Invitation for the 1st synchronous session

Dear Participant,

You are invited to participate in the first synchronous session in Second Life (SL). This session features a presentation and discussion about the potentials of Virtual Worlds in Education.

Title: The Path from First to Second Life

When:
Monday, July 8, 2013 – 02 pm to 03 pm Mountain Time (Canada) OR
Tuesday, July 9, 2013 – 11 am to 12 pm Mountain Time (Canada)

*Local times for the SL session can be found in the following website:
http://www.timeanddate.com/worldclock/converter.html

Where: AU Island in Second Life (online) at:
http://maps.secondlife.com/secondlife/Athabasca%20University/178/63/22

Pre-configuration:
Please note that it is extremely important to get your system set up prior to the event. Make sure your Mac or PC is equipped with a microphone and speakers, so that you can use the audio functionality built into the virtual World of Second Life. Please arrive on the island at least 15-20 minutes prior to your live session so we can assist you in working out any issues.

Important:
The Second Life (SL) viewer does not run on tablets or mobile devices but it does run on most new computers and laptops. If you use a computer (as opposed to a laptop), you may need a USB headset in order to use voice communication. Headsets are strongly recommended in order to optimize voice communication.

Registration is not required; all avatars are welcome.

APPENDIX I

APPENDIX I1

Invitation for the 2st synchronous session

Dear Group 2 (*Similar invitations were sent to groups 1 & 3 respectively)

You are invited to participate in the second synchronous session in Second Life (SL). This session will be a group role-play collaborative activity.

What to expect...

You are expected to visit AU Island in Second Life as a group, visit the CDE-Orientation building and ''Enter the Courtyard'' where the activity will unfold. There, you will find all the relevant information and instructions about the activity.

When: Friday, July 19, 2013 – 4 PM to 5 PM Mountain Time (Canada)

*Local times for the SL session can be found in the following website:

http://www.timeanddate.com/worldclock/converter.html

Where: AU Island in Second Life (online) at:

http://maps.secondlife.com/secondlife/Athabasca%20University/178/63/22

Pre-configuration:

Please note that it is extremely important to get your system set up prior to the event. Make sure your Mac or PC is equipped with a microphone and speakers, so that you can use the audio functionality built into the virtual World of Second Life. Please arrive on the island at least 20-30 minutes prior to the live session so we can assist you in working out any issues.

Important:

The Second Life (SL) viewer does not run on tablets or mobile devices but it does run on most new computers and laptops. If you use a computer (as opposed to a laptop), you may need a USB headset in order to use voice communication. Headsets are strongly recommended in order to optimize voice communication.

APPENDIX I2

What is roleplay?

Roleplay is more than just make believe or play pretend, roleplaying is when you take on a role and immerse yourself in a different reality taking on situations and problems that are uncommon in your current day to day operations. Roleplaying is can be as simple as a math word problem (i.e. one train leaving Penn station moving at 78 mph and a second train left...) or as complex as a training routine going wrong and you have to re-route all the electrical currents before the reactor Meltdowns. Roleplaying is a regular occurrence in both the educational and corporate arenas by preparing the learner for a possible problem while testing out their working knowledge, handling pressure and thinking critically.

Role-playing refers to the changing of one's behavior to assume a role, either unconsciously to fill a social role, or consciously to act out an adopted role.

To refer to the playing of roles generally such as in a theater, or educational setting;
To refer to taking a role of an existing character or person and acting it out with a partner taking someone else's role, often involving different genres of practice;
To refer to a wide range of games including role-playing video game, play-by-mail games and more;
To refer specifically to role-playing games.

Here we have a roleplaying scenario for you to figure out, IMAGINE.

Scenario
You are an educational counselor coming to advise the university's Dean about a proposed educational change regarding the introduction of Mobile-learning in the university. You need to observe some of the university professors, see what are their thoughts and concerns on the issue and then report to the Dean your suggestions on what should be done.

Information
The professors are represented by four static avatars. You can choose your teams and visit the two teachers assigned for your team. Please keep in mind that Team Blue will be looking for support for Mobile Education to be used at the University while Team Orange will be looking for reasons against the usage of Mobile Education in the University.

Blue team will visit Offices 1 and 4, while Team Orange will visit Offices 2 and 3. You can visit them in the next room and see what they think by clicking on them. They will offer you a notecard in which you can read their thoughts about the integration of mobile devices in the curriculum. You should keep these as you'll be going back to the meeting space to discuss what you've seen in each office.

Decision

Starting this Scenario, You should first sit down at the table and discuss your roles and approach. You need to decide:

-Who will produce the group's report? You can receive a notecard from the top of the Paper tray on the desk in the Meeting Room for a formated Template Notecard that you can use to record the information. Submit this via notecard to the Paper tray at the end of the scenario. It should be a page in length.

-Who will work the note boards in the offices/meeting room? Designate a leader to help moderate the discussions and to help keep track of the boards' progression. Use these to make viewable notes about the discussions you have.

Action

Your task is to visit the relevant offices and find the professor inside and work out from what they are saying for the additional information of the following things:

-What does this professor believe about the proposed educational change?

-Is he/she a proponent or an opponent of this change?

-What are the main concepts about mobile-learning that you can recognize in the professor's sayings? (See the white boards in the courtyard to find relevant information)

- Depending on the concepts that you will recognize, draw Dean's attention on that issues and suggest what should be done before making his final decision.

APPENDIX J

Invitation for the 3rd synchronous session

Dear Participant,

You are invited to participate in the **third** synchronous session in Second Life (SL).This session will be a group role-play collaborative activity.

What to expect...

You are expected to visit AU Island in Second Life as a group, visit the CDE-Orientation building and **"Enter the Courtyard"** where the activity will unfold. There, you will find all the relevant information and instructions about the activity.

When: Saturday, August 3, 2013 – 11 AM Mountain Time (Canada)

*Local times for the SL session can be found in the following website:
http://www.timeanddate.com/worldclock/converter.html

Where: AU Island in Second Life (online) at:
http://maps.secondlife.com/secondlife/Athabasca%20University/178/63/22

Pre-configuration:
Please note that it is extremely important to get your system set up prior to the event. Make sure your Mac or PC is equipped with a microphone and speakers, so that you can use the audio functionality built into the virtual World of Second Life. Please arrive on the island at least 15-20 minutes prior to the session so we can assist you in working out any issues.

Important:

The Second Life (SL) viewer does not run on tablets or mobile devices but it does run on most new computers and laptops. If you use a computer (as opposed to a laptop), you may need a USB headset in order to use voice communication. Headsets are strongly recommended in order to optimize voice communication.

APPENDIX K

Athabasca University Research Ethics Board Approval

MEMORANDUM

DATE:	April 18, 2013
TO:	Sofia Nteliopoulou
COPY:	Dr. Rick Kenny, Dr. Bob Heller & Dr. Avgoustos Tsinakos (Research Co-Supervisors) Janice Green, Secretary, Athabasca University Research Ethics Board Dr. Simon Nuttgens, Chair, Athabasca University Research Ethics Board
FROM:	Dr. Debra Hoven, Acting Chair, CDE Research Ethics Review Committee
SUBJECT:	**Ethics Proposal #CDE-13-03: "Using Virtual Worlds in Distance Education Courses: A case study"**

Thank you for providing the revised application received March 20th in response to the Conditional Approval decision of February 19, 2013. The Centre for Distance Education (CDE) Research Ethics Review Committee, acting under authority of the Athabasca University Research Ethics Board to provide an expedited process of review for minimal risk student researcher projects, has reviewed the above-noted proposal and supporting documentation.

On behalf of the CDE Research Ethics Review Committee, I am pleased to confirm that this project has been granted **FULL APPROVAL** on ethical grounds, and you may **proceed with recruitment as soon as AU Institutional Permission has been received** (see below)**.**

> **AU Institutional Permission:** Prior to recruitment, **for file purposes only**, provide a copy of **Athabasca University Institutional Permission**, issued from Vice-President Academic, enabling access to AU systems and student or staff contact for research purposes.
> *The AU Research Ethics office will assist in requesting the institutional permission by forwarding a copy of the final revised/approved ethics application, along with a request on behalf of the researcher. The researcher will be cc'd on all correspondence in that regard.*

The approval for the study is **valid for a period of one year from the date of this memo.** If required, an extension must be sought in writing prior to the expiry of the existing approval. **A Final Report is to be submitted when the research project is completed.** The reporting form can be found online at http://www.athabascau.ca/research/ethics/ .

This approval of your application will be reported to the Athabasca University Research Ethics Board (REB) at their next monthly meeting. The REB retains the right to request further information, or to revoke approval at any time.

As implementation of the proposal progresses, if you need to make any **significant changes or modifications please consult with your supervisor to obtain their support for those changes, then forward** this information immediately to the CDE Research Ethics Review Committee via rebsec@athabascau.ca , for further review.

If you have any questions, please do not hesitate to contact Janice Green at janiceg@athabascau.ca or rebsec@athabascau.ca .