Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life

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ABSTRACT

While many reports espouse the potential impact that 3-D virtual worlds are expected to have on teaching and learning in higher education in a few years, there are few empirical studies that inform instructional design and learning assessment in virtual worlds. This study explores the nature and process of learning in Second Life in a graduate interdisciplinary communication course in fall 2007. Literature suggests that 3-D virtual worlds can be well suited for experiential learning environments. In this study, the actual instructional effectiveness of Second Life as an experiential learning environment for interdisciplinary communication is empirically examined using mixed research methods of journal content analysis, surveys, focus group, and virtual world snapshots and video.

1. Introduction

Gartner, Inc. (2007), a technology-related research and consulting firm, estimates that by 2012, 80% of active Internet users, including Fortune 500 enterprises, will have a "Second Life" in some form of 3-D virtual world environment. Although Gartner cautions companies regarding security issues and risk management, these virtual worlds are expected to have a large impact on teaching and learning in the very near future with pedagogical as well as brick-and-mortar implications (New Media Consortium and EDUCAUSE Learning Initiative, 2007). There has been a growing demand for empirical research studies that inform instructional design and practices in 3-D virtual worlds. This paper presents a study on how we utilized the computer-supported online 3-D virtual world environment of Second Life (SL) for an experiential project-based graduate course on interdisciplinary communication offered at the University of Texas at Austin in 2007. The purpose of our study was to answer four research questions:

(1) How (when, how often and in what kinds of social situations) does learning occur in Second Life?
(2) What types of learning do students experience often in Second Life?
(3) Does learning in Second Life transfer to real life?
(4) Do students perceive Second Life as instrumental in learning?

We first briefly summarize the research that suggests that using SL can be well suited for project-based experiential learning of interdisciplinary communication. We then describe the course itself and the SL project assignment. Next, we describe the research methods. Finally, we present our results and provide evidence indicating that students in the study received strong experiential learning benefits when SL was used to teach interdisciplinary communication strategies complemented by classroom activities. We conclude the paper by recommending two approaches for the instructional application of SL: project-based SL activities and a systematic team approach. This paper adds to the emerging knowledge base informing educators about how online 3-D virtual environments such as SL can be used effectively for teaching and learning.

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2. Background and theoretical framework

Experiential learning theory places the *experience* at the center of the learning process and is based on the work of Dewey, Lewin, and Piaget (Kolb, Boyatzis, & Mainemelis, 2002). Kolb stated that experiential learning theory defines learning as "the process whereby knowledge is created through the transformation of experience" (1984, p. 41). Learners build deep understanding and expertise by cycling through the four steps of the experiential learning cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb et al., 2002). Project-based instructional activities have been found to provide an effective setting for such experiential cycles (Leifer, 1996), and with the growing use of virtual worlds in higher education, researchers are exploring the potential of such environments for project-based instruction and online collaboration.

The literature examining the general characteristics of virtual worlds and their potential benefits for teaching and learning has collectively yielded a long list of positive capabilities. Kalyuga (2007) found that virtual worlds are highly interactive in that they provide dynamic feedback, learner experimentation, real-time personalized task selection, and exploration. Virtual worlds are also often purported to have other instructional benefits, such as allowing for creativity within a rich media environment, providing opportunities for social interaction and community creation, facilitating collaboration, increasing a sense of shared presence, dissolving social boundaries, lowering social anxiety, enhancing student motivation and engagement, and accommodating millennial generation learning preferences (Amichai-Hamburger & McKenna, 2006; Barab, Thomas, Dodge, Carteaux, & Tuzan, 2005; Craig, 2007; Dede, Clarke, Ketelhut, Nelson, & Bowman, 2005; FitzGerald, 2007; Gee, 2003; Kirriemuir & McFarlane, 2003; Lamb, 2006; McGee, 2007; Prensky 2006; Soukup, 2004). Open virtual worlds like SL provide an environment supportive of learning activities such as experimentation, exploration, task selection, creation, and dynamic feedback; and this supportive platform suggests that virtual worlds are likely to accommodate project-based experiential learning.

The use of virtual worlds for experiential learning is increasingly being examined by researchers (Chittaro & Ranon, 2007). Furthermore, built-in support within the SL virtual platform, especially the array of communication tools, provides opportunities for social interaction, collaboration, an increased sense of shared presence, partially dissolved social boundaries, and lowered social anxiety. Such an interactive environment suggests that a project team's internal and external communication is also likely to be fostered (Hamalainen, 2008; Monahan, McArdle, & Bertolotto, 2008). Similarly, as Jonathan Richter, research associate at the University of Oregon's Center for Advanced Technology in Education (CATE), has observed:

> Therapists, soldiers, pilots, lawyers, business people, doctors, nurses, and teachers all normally engage in real life role play while learning the contexts and conditions particular to their professions during their days at the university or in training. Multi-User Virtual Environments (MUVEs) like Second Life are uniquely suited media for developing role playing scenarios to engage learning, if we provide the right mix of opportunity and structure. Indeed, role playing in Second Life and other MUVEs may represent perhaps one of the single most compelling educational opportunities for adults in the 21st Century. (SL transcript, Special Speaker Series in Second Life, International Society for Technology and Education, March 27, 2007).

As we focus on experiential learning, we find further support for the effectiveness of virtual worlds. Performative elements such as narrative, role play, improvisation, and other action-based activities that build on progressive steps or scaffolding activities have been found to foster experiential learning (Bateson, 1993; Taussig, 1993; Wertsch, 1985) and are also being utilized within SL and other virtual world environments. Monahan et al. (2008) asserted that the advent of 3-D virtual reality environments represents a shift from text-based online learning environments to more immersive platforms. Virtual reality is a 3-D computer simulation of a more natural environment than convention online learning contexts, and collaboration can be fostered more effectively. To investigate this, Monahan's research group developed a Collaborative Learning Environment with Virtual Reality (CLEV-R) where students can go to learn, collaborate, and interact with each other. In particular, Monahan et al. examined the design and usability of CLEV-R for supporting various learning tasks by providing virtual university spaces, such as a lecture room, but also informal areas for students to interact and develop relationships. In an evaluation of CLEV-R, a small number graduate students and educators carried out various tasks such as uploading a PowerPoint slide and using communication tools for a presentation. All subjects responded favorably to CLEV-R and agreed that it had potential for online education. Navigation in the virtual setting was found to be difficult for users with no experience in 3D computer games; however, 78% of the subjects felt a sense a community, and 100% reported being engaged and interested while using CLEV-R.

As an open virtual environment, SL has the capacity to include such experiential performative elements in salient ways. Burke argued that in playing everyday social roles and in imitating others' social roles, "the distinction between acting and play-acting, between real and make-believe, becomes obliterated" (1954, p. 254); and it can be anticipated that the experiences in avatar interactions in an immersive virtual world can have a direct relationship to challenges met outside of the virtual world itself (De Castell & Jensen, 2007) including, for example, vocational learning (Hamalainen, 2008). Project-based classes are currently being taught in SL that involve essential course content as well as "softer" types of learning, both of which will be discussed in the specific case presented here, interdisciplinary communication. A few classes that demonstrate the diversity of educational activities in SL and that offer core content include cultural anthropology, Spanish, library science, professional development, history, training for emergency personnel, literature, human reproduction, ecology, genetics, educational informatics, English, algebra, toxicology, music, and Japanese culture (SL transcript, Campfire Discussion for Experiential Learning, International Society for Technology and Education, March 27, 2008).

Real world, project-based learning activities provide opportunities for building bridges between education and experience (Barab et al., 2005) and demand an interdisciplinary approach to collaboration (Leifer, 1996). Virtual worlds may provide an effective environment for building such skills because of social and technological capabilities for engagement in social interactions with people from various fields across geographical distances. These capabilities suggest that SL may be an optimal environment for experiential learning and a potentially effective environment to use in a project-based interdisciplinary communication course where students must demonstrate their learning by creating a real life product through collaboration in a virtual world.

At the 2006 Second Life Education Workshop, Mason and Moutahir (2006) presented *The Global Outreach Model* for such collaborative activities. According to the authors, "The global outreach model is a service learning, project-based, educational experience where the stu-

dent team identifies a social issue and develops a technological solution" (Mason & Moutahir, 2006, p. 31), and the solution that the student team works toward is intended to help solve a real world problem. The researchers used this model and SL specifically to teach online collaboration and how to use technology to solve a social problem. The first implementation of the Global Outreach model was called *G.O. Morocco* and used 10 volunteer students at Johnson & Wales University to create a virtual Morocco with the intention of using SL for tourism marketing to help increasing the country's economic development. Mason and Moutahir found that collaboration between students increases when students have diverse as opposed to similar backgrounds and that G.O. Morocco increased students' cultural awareness and understanding of the social impacts of business and technology. The researchers did not use a formal assessment method for the model, but concluded that using SL for interdisciplinary team-based projects that develop socially relevant products has promise for the educational community.

Moreover, Steinkuehler and Williams (2006) found that interacting within virtual worlds not only helps people build communities but also exposes them to a "diversity of world views" through the development of these virtual social relationships (p. 21). The findings of Steinkuehler and Williams provide further support for the potential effectiveness of virtual world environments for learning strategies to communicate effectively across different academic disciplines, and that is the overall goal of the course examined in this paper. While SL has been shown to foster experiential learning, diligent planning and consideration must be given to integrating SL into the classroom (Boulos, Hetherington, & Wheeler, 2007; Martinez, Martinez, & Warkentin, 2007; Mayrath, Sanchez, Traphagan, Heikes, & Trivedi, 2007; Sanchez, 2007). Further emphasizing the importance of instructional planning, Hobbs, Brown, and Gordon (2006) studied students' interactions with SL while completing a series of complex, open-ended tasks and found that "with careful planning the intrinsic properties of the virtual world can inform transferable skills and provide a rich case study for learning" (p. 9). In summary, the literature to date suggests that when the SL instructional activities have been well-planned and integrated into the core course content, using SL can be conducive for project-based experiential learning of interdisciplinary communication, and that is the case that we empirically examine in the current study.

2.1. Course description and objectives

The course's theoretical underpinnings are grounded in the findings of the National Academy of Sciences Committee to Facilitate Interdisciplinary Research (2004). A top recommendation of the Academy is to encourage "institutions, project leaders, principal investigators, educators, postdoctoral scholars, and students *focused on enhancing communication between researchers*" (Committee on Facilitating Interdisciplinary Research (CFIR), 2004, 190). In this spirit, the overall goals of the syllabus focus on developing mental flexibility and a deep understanding of diverse audiences with different disciplinary worldviews. Students must demonstrate their ability to communicate effectively among different disciplines by applying appropriate communication strategies examined during the course. The specific objectives of the course are for students to be able to demonstrate their understanding of course concepts through completion of the class assignments, of the built-in continuous reflection tasks, and especially through the realization of a semester-long team Project.

Course concepts include understanding academic disciplines as communities of practice, exploring and analyzing systematically different ways scholars construct new knowledge, discovering and practicing greater flexibility of outlook, and using communication strategies to enhance their ability as scientists and scholars to work and learn across disciplines more effectively. The class process is not to discover a single unifying answer, but rather to understand and to apply the notion of *communication adaptability* itself. Developing greater flexibility to understand and to move across academic perspectives complements the academy's more traditional and necessarily narrow disciplinary foci, especially in graduate education. Practicing effective communication involves applying new understandings of multiple communities of practice, societies, scientific disciplines, and the material artifacts of each of these, including technology and virtual space in particular.

Contributing to the interdisciplinary design of the course, weekly class discussions include nine sessions led by expert graduate faculty from different academic disciplines. Course activities include reading 25 articles and one text, preparing for critical class discussions, writing short essay responses ("fragments") to the readings, actively maintaining on-going reflection through a worldview journal, presenting an in-class show-and-tell on diverse disciplinary methods, presenting an Exploratorium where students have to apply an unfamiliar research method to a common problem in their own disciplines, and writing a final 10-page auto-ethnography report.

Most pertinent to this paper, the course features a project-based learning design requiring students to demonstrate their grasp of interdisciplinary communication by completing a semester-long team Project in SL (20% of final grade). As a complement to in-class activities, SL provides a virtual simulation wherein students are able to apply, test, fail, repeat, adapt, and improve their demonstrated use of communication strategies, individually and in teams, in ways that are beyond the reach of our physical classroom (over 200 universities and colleges are in SL, as well as libraries and museums). In order to complete course assignments and the team Project, students take frequent field trips in SL, engage other communities in SL, and interact extensively with educational and non-academic participants via SL.

There were five graduate students in the course and they formed an interdisciplinary team. The identification, planning, and execution of the Project were all left to the team, although the instructor facilitated the process as necessary. The Project process required students to apply interdisciplinary communication concepts from the class curriculum, devise appropriate communication strategies, and practice their strategies in authentic communication contexts to accomplish their Project tasks.

Before the semester, and as a requirement for permission to register, students had to (1) have an individual interview with the instructor to determine their discipline and research focus, (2) agree to meet all pre-class SL requirements, (3) set up their SL accounts and create their avatars, and (4) complete the SL Orientation tutorials on-line in SL. At the beginning of the semester, they also received two 1 h training sessions and online tutorials to cover basic SL skills such as managing inventory, customizing avatars, communicating, and exploring SL. Furthermore, the SL trainer held weekly office hours although these were rarely attended after the first two weeks of class. Very early in the process, the instructor and the pilot support staff decided to take a systematic *team approach* to insure that our pilot integrated the assessment, research, and training components into the core instructional design to complement but not interfere with the course.

3. Research methods and design

The study was conducted using four data collection and analysis methods: (a) content analysis of student world view journals, (b) student surveys, (c) a focus group discussion, and (d) analyses of the students' final public presentation statements in SL, snapshots from SL,

and SL video of the final ribbon-cutting ceremony. As evidence of enduring learning, a fifth component of the data included the 54-page SL grant proposal the same student team wrote on their own during the semester *after* the course was over. Finally, SL-related feedback written on the Course Instructor Surveys at the end of the semester was also included.

3.1. Content analysis of student worldview journals (JOURNAL Data)

One of the required assignments throughout the semester for the course was the Worldview Journal wherein students documented their reflections on communication experiences in SL and in real life and their emerging views on interdisciplinary communication. We used the journal data to understand what kinds of learning were reported by the students in SL (addressing research questions 2 and 3), and we used their written journal sections that *specifically mentioned* SL to create six categories of learning events (Appendix A). One section could be coded with more than one category, if appropriate. Two researchers conducted content analysis of journal entry sections from two students, which resulted in an inter-rater reliability of 0.85, and analysis differences were resolved through discussion by all four members of the research team. However, the students' worldview journals contained extensive information related to the class and to their personal lives but not relevant to SL, and therefore a quantitative content analysis was not conducted. The data from the journals included for our study were only those reflections where the students explicitly made reference to SL. This final data set from the journals of relevant instances was too small for a significant quantitative analysis to be meaningful.

3.2. Surveys

Two surveys were conducted, one before the SL activity and another after the activity. The surveys contained five-point-scale Likert items and open-ended items, and they collectively addressed research questions 1 and 4 (Appendix B). The survey results from the Likert-type items were summarized as descriptive statistics. The responses to the open-ended questions were analyzed for recursively emerging themes and particularly informative comments in relation to the research questions. One of the open-ended items asked participants to provide examples of learning incidents, addressing research question 2 and 3. All students responded to the first survey and four out of five students responded to the second survey for a response rate of 80%.

3.3. Focus group discussion (FOCUS GROUP Data)

A semi-structured focus group session was conducted with all five students at the end of the semester and it addressed learning in SL from various perspectives (research questions 2, 3, and 4). The initial focus group protocol included seven questions (Appendix C), but the interviewer probed participants' responses with follow-up questions. The recorded discussion was transcribed and coded by two researchers. The coding schemes were developed based on the research questions and focus group questions, but were modified or added as analysis was performed. The coding differences were resolved by discussion with the whole research team.

3.4. Final public presentation speeches, Second Life snapshots, and Second Life video (FINAL SPEECHES Data)

In order to capture the students' actions and experiences in SL, the final presentations were videotaped live in a computer lab with a video camera and also from a computer screen using a screen-casting software to capture the activity in SL. Additionally, during the semester, a researcher took snapshot images of the students' working in SL. Most importantly, the students' final public speeches in SL were included in the data set, as were public comments by the instructor and by the lead architect of the Alley Flats Initiative. The student team's press release announcing the virtual ribbon-cutting ceremony was also included (Appendix D).

3.5. Student team's SL grant proposal (post-course) (GRANT PROPOSAL Data)

After their class together, on their own initiative, the student team maintained a close working relationship and wrote an extensive 54-page grant proposal for funding to create a non-profit with an SL focus. Their New Mornings organization was specifically designed to help non-profits around the world successfully make use of SL. As evidence of enduring learning (post-course), we included brief sections from their grant proposal in the analyses.

3.6. SL-related written feedback on course instructor surveys (COURSE Feedback Data)

As is customary at the end of a semester, the students were invited to hand write additional feedback about the course on their Course Instructor Surveys (CIS). Their comments were not seen by the instructor until final grades have been submitted and so their feedback could not influence the performance evaluations. Their SL-related written feedback on the CIS forms was included in the overall data set.

All data from the six sources mentioned above have been triangulated to yield in-depth understanding of the four research questions and thus of some of the effects of using SL on learning.

4. Research results and analysis

4.1. Experiential project results

The student team chose to collaborate with various groups in real life and virtually to create a 3-D presence in SL of two low-income, sustainable urban model homes designed by the Alley Flats Initiative, a real world non-profit housing project in Austin, Texas. To better understand and to manage their project, over the semester the students communicated with educators, with members of the non-profit Basic Initiative, and with the Alley Flat architects and architecture students. The students forged collaborations with volunteer expert

builders in SL who are members of the Educators Coop, the first virtual long term residential community for educators and researchers in SL. The builders then used the actual architectural drawings to render the two virtual houses, and students added interactive information components. After a brief but intensive PR campaign (see Appendix D), the student team's project culminated with a formal ribbon-cutting ceremony in SL in which the students, the instructor, the architects, multiple collaborators, and guests from all over the world participated in a 90 min virtual presentation and walk-through of the virtual Alley Flat model homes (see Fig. 1).

Fig. 1 shows the interdisciplinary graduate student team and instructor (upper left), the lead architect showing design models to students (upper right), the students, builders, and architects laying out the virtual design drawings in SL (lower left), and the model homes and guests attending the public ribbon-cutting ceremony opening the Alley Flats virtual presence in SL.

In comparing the new version of the course and its SL-component with former versions of the course (with no SL-component), the students' team Projects and their final presentations were markedly different. In past semesters, the student teams presented the results of their semester-long Projects during a typical 15 min PowerPoint presentation *in the classroom*. Each team member would speak during the presentation and then the team as a whole would briefly entertain questions. No one other than class members were ever present to hear their presentations, and no teams continued working together on their projects after the course ended.

In contrast, for our SL pilot, the graduate student team demonstrated their understanding and application of interdisciplinary strategies by creating something that had never existed before and that could not exist in our classroom: the Alley Flats virtual presence in SL.

The team's original plan was within the scope anticipated by the instructor; that is, the students connected with a non-profit organization and planned to do something for them in SL. However, the expanded global nature of the SL virtual world itself had a powerful impact on the students' evolving plan. Finally, the team's decision to "go public" in SL and to include a ribbon-cutting ceremony generated unanticipated and greatly expanded reach compared to students' projects in past semesters.

Far from being limited to a classroom presentation, the students' project became both local and global in that (1) the two virtual model homes created in SL are actually being built in a low-income neighborhood in Austin, Texas, and (2) the persistent presence of the two virtual homes in SL provides people around the world the opportunity to walk (or fly) through the Alley Flats in SL. Since the students made the virtual homes interactive, visitors from around the world could learn about sustainable design features, see architectural drawings, and access the network of collaborating organizations simply by clicking on parts of the models. The students demonstrated a concrete understanding of the fundamentals of experiential learning when they applied the "learning by doing" educational features to their interactive design of the virtual model homes. The students greeted guests, explained features of the virtual model homes, led the guests on tours through the models, and answered questions about the models and their Project. Furthermore, the virtual presence of the model homes allowed anyone interested in the sustainable designs to see and experience them via avatars in SL without the expense associated with actually traveling to visit to the homes in Austin. The course instructor's comments at the final virtual ceremony in SL illustrate her overall assessment of the students' performance.

Fig. 1. The alley flats project in Second Life.

[Final Speeches]:

Intellectual understanding of the theoretical foundations of interdisciplinary communication is one objective of my course. But being able to synthesize and apply complex communication strategies through the creation of an interdisciplinary project that extends over time and that includes many players demonstrates a higher level of learning. Using this course model, my graduate students have enlarged the domain of the work into this 3-D virtual space and, in so doing, have extended the reach of their interdisciplinary communication project from the local to the global. These special graduate students have far exceeded the already high standards of this course. It is a very exciting time.

Finally, unlike any students from past semesters, and perhaps most importantly as a concrete measure of their enduring learning and of the relevance of this course to their real lives, after the semester ended the student team decided to *continue* their work in SL and to create a non-profit (New Mornings) to help other organizations develop a virtual presence for their own community service efforts. The students' rationale for forming New Mornings reveals in part the students' assessment of the SL environment:

[Grant Proposal Social Mission Statement]:

The mission of New Mornings is to facilitate the entry, continued presence and productivity of non-profit organizations (NPOs) in 3-D virtual world environments. These environments can benefit NPOs by drastically cutting communication and overhead costs associated with brick and mortar operations and *by increasing important collaborative, creative and networking possibilities*. (italics added for emphasis).

Next, in Sections 4.2–4.5, the research results of this study are organized under each of the four research questions to facilitate a clearer understanding our findings from the multiple-source data. However, several limitations of the data set must be noted, including the small number of subjects. No data were available regarding the students' levels of technical ability in SL prior to the course. Furthermore, the study did not attempt to measure what impact the background of a student may have had on their final assessment of learning in SL. However, in this interdisciplinary communication course, the students were, in fact, from different backgrounds, and the results reported here – particularly the high level of collaboration – suggest support for the findings of Mason and Moutahir (2006) who indicated that collaboration between students increases when students have diverse as opposed to similar backgrounds.

4.2. Research question #1: How does learning occur in SL?

Does the SL environment facilitate learning? If so, how? Focus group participants reported that learning in the course was facilitated by various supportive characteristics of SL. One of the major affordances that students commonly mentioned was that the 3-D virtual environment in SL fostered real life applications of the theories and strategies studied in the course curriculum, a key indicator of successful experiential learning. One student, for example, described SL as a playground to put what has been learned into practice:

[Focus Group]:

[SL] seems to put in some of the feelings that we studied in the books. It gave us a venue in which to practice them. Because in order to communicate across disciplines it's difficult in the real world to go up to someone in the street and just start communicating with them. You have no reason, and you have no motivation to do that. But in SL, not only do we have a purpose but all these people from different disciplines where there so it made it tangible. It was a playground where you practice the things you're learning. Basketball players practice their free throws in their minds and on the court.

Students explained that the active, project-based experiential approach of the course design rather than a more passive context affected learning, and that working in SL was a key factor to that learning.

[Focus Group]:

I think that having to do a project in SL rather than just going around and taking a tour, or being present for the talks. Actually having to *do* something with it certainly increased my understanding of how you could apply it in other world contexts.

Similarly, in response to the follow-up question ("So, how did your learning change either positively or negatively as a result of using SL?"), students explained that working in SL and having to perform real life work even impacted how they learned.

[Focus Group]:

I think how SL expanded the notion of education or learning. It's highly atypical of any graduate course or course in fact. Normally, you have your textbook and/or lecturers. And to be involved in the real world working with a real context on a project – that is visionary. In a lot of ways it really pushes the boundary of what it means to be learning. What it means to be a student. You can actually be performing while you are learning. And yeah, SL increases your imagination and creativity and god-given possibilities.

[Course Feedback]:

My favorite assignments were the show-and-tell, the Exploratorium, and the *SL project*. They were valuable tools to learn cross-discipline techniques, methods, constructs, and communication. (italics added for emphasis).

Keep the SL project! It was essential in helping us put the theories into practice.

These students' final course observations suggest that SL offered them some atypical ways of learning such as putting theoretical knowledge into practice in a safe, playful environment, allowing students to try out their plans or hypotheses by "doing," and increasing the use of one's own creativity by working in SL on a project that was grounded in the real world. Furthermore, another student noted that the virtual environment allowed students to engage multiple skills and learning styles in a highly concrete and engaging way.

[Focus Group]:

The Project itself. In most courses, when you learn you read something and you spit back. I mean a lot of courses are that way – you read and spit back. How do you memorize this stuff? Courses that teach more critical thinking are asking you to read stuff and criticize and apply those concepts to a new thing, right? *But it still remains theoretical.* I think this kind of combines all different things – you have to read the books, then you have to think about the theories, and then you have to actually create something that has nothing to do with any of those other things. And that's new, I think, and it's good. I think the idea of multiple intelligence intelligences really gets applied here: that learning doesn't need to be this standard. (italics added for emphasis).

According to some students, the type and extent of learning in SL is limited only by the users' imagination, and in reply to the prompt, "In your learning, what was enhanced because of SL?" several students discussed the expansion of the notion of learning, where learning involves imagination, exploration and creativity.

[Focus Group]:

Part of learning, part of constructing knowledge, is being able to see possibilities, possible connections. To be able to take something that you, you know, know for granted and be able to apply it in a new way but that might not have been applied before. Sort of original thinking. So with SL, I think that it was a venue for us all to kind of exercise our imaginations. To really think about what is possible here. Not just with the project that we are doing, but I think all of us maybe have taken some time to think about how it [SL] is applicable to other fields. And just possibilities. So in that sense, I think we learned a little bit about how our learning has been enhanced because we have thought about innovations and possibilities and imagined worlds in our own industries.

Interestingly, some students reported that the three-dimensionality of the SL environment facilitated the sense of personal presence and tangible experiences as factors that enhanced learning.

[Focus Group]:

Yeah, the embodiment of it [SL]. You generally somehow do feel more like a human being.

The other thing about SL is that I think it can enhance learning, is that it's very evocative. Like, if you had to build the model of those *Alley Flats* [in the real world] you never would have been able to capture the alley with like those pigeons, the papers blowing in the wind and everything. And especially with those big screens [virtual images of Austin skyline]. *I just felt I was there. And so I had a very visceral connection to what was being built.* I don't think you can get that in a model or anywhere except real life or virtual reality. (italics added for emphasis).

The public speeches made by the students at the virtual ribbon-cutting ceremony that opened the official presence in SL of the housing models revealed some of the depth of engagement and explicit learning that they directly attribute to the inclusion of SL in the overall course design. For example, in their speeches, students asserted that they felt very *actively* engaged in an innovative and collaborative project that has real life impacts.

[Final Speeches excerpts]:

I've really enjoyed working on this project. And there's something extremely *right* about having to *do* the Alley Flats Initiative on SL. Alley Flats was developed within the community through great design and the clever use of technology. And that's what SL is about.

Everyone working on this project has accepted graciously and wholeheartedly the responsibility that great visions require. Opportunities to work on projects this revolutionary and pioneering are rare. Equally as rare is the chance to work with a group of talented and creative individuals to make all sorts of moving parts come together to form a sum much greater than those parts.

In summary, students suggested that the SL environment used in this course facilitated their learning in various ways. The major characteristic of the learning that occurred in SL was the application of learning into real life practice. Learning was enhanced by several of SL's features combined with the project-based instructional design and included (a) the capacity to host social interactions and collaborations, (b) the capacity to allow users to test hypotheses actively, (c) the relevance of their project to the real world, (d) the opportunity for students to use multiple abilities and skills, (e) the stimulation of imagination, exploration and creativity, and (f) an increased sense of personal presence and tangible experiences.

4.3. Research question #2: What types of learning do students experience often in SL?

If student learning is facilitated by the SL environment as indicated in the previous section, what types of learning occur? In order to answer this question, we looked into the traces of learning that the students left in their worldview journals, the focus group, and in their final presentation speeches. The worldview journals vividly revealed many instances of learning in SL from the learners' perspectives. According to the journals and the focus group discussion, the type of learning that occurred most often in SL was an increased general awareness of one's own and others' perspectives, and this type of learning happened in the context of interactions with other avatars in SL, as shown in these data excerpts.

[Journal]:

Today during our class meeting in SL, I was constantly aware that the reason I made certain suggestions or asked particular questions was because of the particular perspective I have. I even felt like I had to frame it. Excuse my COP (Community of Practice)! So I guess now that I am more aware of my perspective perhaps I can further analyze myself. Before, I didn't feel like I had any awareness.

[Focus Group]:

And it was interesting [how] we all met… One of the biggest learning events for me – We all met each other in virtual reality before we met each other in real life. You know, I descend from the sky with my black wings [laughter]. Well, I guess what I am saying is that it's a learning event for me. You learn something that people kind of forget in real life and that is that we all sort of portray, we wear certain masks, we play certain roles, we play in different situations. And in SL, it's sort of out there in a real tangible kind of way… I just would have never guessed. It was interesting to put the avatar with the real people.

This student's observations about how SL provided him with a very tangible and unexpected reminder that we all "play roles" in real life echoes a key construct from the core reading materials in the syllabus and suggests a reinforcement of class learning through lived experiences in SL.

A second type of learning that resulted from SL activities was the development and implementation of collaboration strategies with others belonging to different academic disciplines. Two students described some of their realizations and collaboration strategies.
[Journal]:

[In SL, discussing the Alley Flats and my connection to the project] I had to figure out how to explain as simply as possible what the concept of SL was. The two people I did explain the project to seemed to understand and thought it sounded like a great idea so I must have done an okay job. I am getting to be a better communicator.
Staying calm within a cool and collected WV [worldview] ended up being the catalyst that helped move this project into a healthy and constructive orbit.

Importantly, in the focus group, two students explicitly noted the role played by the project-based instructional design and its impact on their learning in SL.
[Focus Group]:

I've messed around SL before and I thought it was all right. I thought that the controls were a little clunky, the user interface was a little cumbersome. But I'd never done any sort of project, or really even really understood how SL can be used in a really real way, you know, life, real consequences, a marketable way. So just being able to be part of a project that did something, that made movement, to be pioneers in a way, that kind of really helped me understand the power of SL in a commercial market or in a non-profit market.
In the beginning of [using] SL, I kind of thought that this is playful, you can create little blue boxes and then destroy them. But I went from an attitude of "it's kind of playful, a little sandbox" to this is potentially really serious tool… It depends on how much structure there is. *I mean we were involved in a project that it gradually helped us realize… It sort of pulled back these blinds and like how powerful this could be.* (italics added for emphasis).

Another excerpt from the journals identified the development of interdisciplinary worldview awareness as a result using SL. A student recognized changes in perspective regarding perceptions of his own discipline and of others' disciplines.
[Journal]:

I understood quickly what a delicate situation this was and that in order to avoid mutiny and potential cataclysmic stall of the project, I changed my WV [worldview] such that my own emotions would not interfere with the sudden stream of information that was coming my way [from someone not from my discipline].

In their final presentation speeches, students described similar types of learning that they experienced in SL. For example, a graduate student from cellular and molecular biology mentioned about acquiring understanding and new skills for collaborating with others from different disciplines.
[Final Speech]:

It was an enjoyable process to collaborate across disciplines such as English, Nursing, and Educational Psychology. Working on this project has provided many opportunities to engage and adapt my communication skills. And because of this, I have gained new perspectives on diversity and teamwork.

In summary, evidence from their worldview journals, the focus group, and their final presentation speeches revealed that students' interdisciplinary communication awareness and knowledge increased through their experiences in SL in addition to their experiences in class. Particular types of learning found in these data include general or interdisciplinary communication-specific awareness of one's own and others perspectives and development and implementation of collaboration strategies with others.

4.4. Research question #3: Does learning in SL transfer to real life?

The resemblance of aspects of the SL environment to real life led to our early expectation that learning and experiences in SL might transfer to real life in different ways. Indeed, several focus group participants stated that their SL learning experiences transferred into their real lives in the form of broadened and fresh perspectives.
[Focus Group]:

SL opens your perspective up a little bit and what's possible…
Even the enlargement in perspective. If, say, I spent two hours walking around in SL, my frame of mind now is more open to new ideas than when I go to a book. I think I'm going to perceive that book in a slightly more open way than if I haven't spent the previous two hours in the library.
Right, like you go to a museum, walk around and see paintings, and then go out into the street. I think you are going to look at things – at least for a little while – a little more visually, a little more creatively.

Also, in her worldview journal, one student realized that for her, SL was an arena that could easily transfer to real life and vice versa. She discovered the value of learning in both spaces and realized how that learning is interrelated. She asked herself:
[Journal]:

Why did I think some of the techniques that I have learned wouldn't work in SL?

Furthermore, as mentioned earlier, students valued learning that was integrated into and had an impact on real life.
[Focus Group]:

What happens when you have a project and realize that you have to collaborate on it? What hinders those collaborations? Not only speaking a different language perhaps,… But physical space limits you, time limits you, trying to get on someone's schedule limits you. And I just see the possibilities of using this avenue [SL] in healthcare, especially in the administration … So what I'm looking at this tool for myself and my discipline is how it can enhance the collaboration ….

The importance of the transfer of learning, knowledge, and information to real life activity was also illustrated in the observations from witnesses to the students' virtual Alley Flats Project in SL. In fact, the lead architect of the actual model homes in Austin made a speech at the formal virtual ribbon-cutting ceremony to the crowd of guests in SL:
[Final Speech, excerpt from architect]:

I never thought I'd end up building in a virtual world. I've been teaching students in the classroom for over 20 years, and ending up in a virtual world was not part of my plans, but [your instructor] led me to this new type of education. Though skeptical at first, I'm becoming a believer. I identify with the idea that we share aspirations and ideals and we're able to come together in Second Life and show how people can change and build a city and how it can be. We can teach people what the future can look like. I propose SL is not the mundane world but the future, and how we can begin to dream about the future … I thank you all for making this possible. So many people in different cities are looking to us to see what we are doing and how they can follow in our footsteps.

Additionally, as had been noted, long after the end of the course, the student team continued working together with SL to connect with real world non-profit efforts, and that connection with the real world has been found to be a key indicator of motivation in learning (Moreno, Mayer, Spires, & Lester 2001). One observation that could be drawn from the students' extended efforts is that the students' engagement in learning in the virtual world, as well as their practicing new communication strategies studied in the course, were connected to some degree to the highly motivating experience of actually making a significant social impact in the real world. The ideas of *pioneering* and *revolutionary* appear throughout much of the data set. The following brief excerpt from their New Mornings grant proposal to a diverse funding board illustrates the transfer of learning through the kinds of claims they are making about SL and its benefits.
[Grant Proposal, Product/Service Description]:

Virtual environments offer NPOs [non-profit organizations] the ability to create an online presence that closely simulates or improves upon real-life communication and collaboration between people. Many real world organizations across a range of fields such as education, healthcare, engineering, architecture, urban planning and economic development currently use the popular virtual world platform, Second Life, to reduce the brick and mortar expenses of running a venture. New Mornings will extend this advantage to NPOs, and showing our customers how to reduce overhead will result in an increased percentage of NPO funding being channeled into activities with quantifiable, worldwide impact. Using virtual environments, NPOs will be able to hold meetings in virtual offices, make presentations to clients and donors, and build complex virtual models.

Sometimes the transfer of learning into real life was reflected by students linking their experience directly back to their own academic discipline and their ideas about learning practices within their discipline. Frequently their ideas illustrate creative ways to adapt pedagogical practices to this new virtual tool.
[Focus Group]:

Well it [SL] certainly got me to think about what I want to do with my research. I have been in the English department and we have kind of played by this, "You do this research, which is an entirely English audience" – a bit like most academic research work. But there is something about SL where you can sort of maybe think about presenting interesting material to the world that is not… that gets outside the boring discourse of academic language *because SL automatically forces you into a different way of presenting the world. So, that is the single, most fundamental thing that SL offers. It offers a way out of kind of tired ways of describing things.* (italics added for emphasis).

You could creatively ask them [students] to in some way represent some character… create a character say, Ahab, Captain Ahab. Well, what would you… and obviously it wouldn't just be what the avatar looks like, but what kind of… I mean, those kinds of questions. If you have to create Captain Ahab, out of this book, how would you create him? So it's kind of really like the next movie making… I mean, that's what people that adapt movies, books into movies do. But here's a tool that everyone could use. Students could, right? So you're taking data and you've been forced to think about that data. Select what the most important idea is, actually synthesize, and then create.

The above excerpts illustrate the students' different beliefs about the transferability of learning in SL to real life. When these results are combined with the students' descriptions of the different types of learning they experienced in SL and how learning occurred for them in SL, the critical role played by the project-based nature of their task emerges more clearly. Their Project engaged them experientially, led to various kinds of learning, and transferred in different ways to real life.

4.5. Research question #4: Do students perceive SL as instrumental in learning?

Students' expectations about the effectiveness of SL for enhancing their learning were positive before they participated in any SL activity according to the pre-activity survey, and the post-activity survey indicated that students' expectations were met and that they had positive learning experiences. Our survey data showed that most students agreed that their engagement and learning would increase or increased

because of SL, and that it was a good idea to use SL in the course.[1] All students agreed that, even given the frequent technological difficulties (such as glitches, lags, frequent updates, and crashes), SL is worth using for some courses; and this result particularly demonstrates the students' perception of SL as a potentially strong pedagogical tool. Students' motivation to learn with SL increased during the course of the semester, and their responses to the post-activity survey suggest that their desire to use SL on their own increased. Finally, the amount of time the students spent in SL increased over the course of the semester.

As has been noted, a significant indication that the students found SL to be instrumental in learning was their *independent* continuation of their project and its conversion into a non-profit organization to offer other non-profits around the world a smoother entry into SL. Their grant proposal for continued educational work in SL provides further evidence that the students valued learning and working in virtual worlds and that they may be more highly motivated to do so when the learning activity is perceived as relevant in the real world.

The focus group data substantiate the results of the survey and offer students' own voices regarding their perspective on SL's positive impact on their learning (and see Section 4.2 above). Students proposed various ideas for other ways that SL could be instrumental in learning, including foreign language conversation practice, practice for mental and social skills development, field trips, simulations for professional practitioner work situations, and literary and cultural reenactments.

[Focus Group excerpts]:

I challenge you to even come up with a discipline where you can't have some applicability. I think that the problem is that professors are closed designers, not being creative enough, to see how this is being used for their field. I think there is utility in pretty much every field. I really do.

Simulation. That's where I see it [SL] in Nursing. Especially, they're already doing it, but like how to simulate the hardest thing for a new doctor or a new nurse to do is to walk into a patient's room and start talking to the patient. Engaging them. [They] could practice that. How do you say it? Where do I need to stand? What would I need to say? And practice that... I think that would be a really, really good use in SL is simulation and communication.

Being part of this class has really taught me that, and I think I'm going to fold it [SL] into my own research more often now, actually using Second Life.

I focus more in SL than I do in real life because there is more movement, more color, and because I can... I'm so restless a little bit... But I can get up, fly around, or maybe turn around and do something without disturbing the class. Where in real life I have to sit there and be still... and I don't think that is a natural way for people... I kind of think SL is like a Montessori school. You can get up you can move around the classroom, and you can play with this, or "Oohh, those look cool. I'm going to go play at that station." A take-the-initiative to kind of guide your own journey for education. Instead, in our school system, you're expected to sit down, be still, face the front, raise your hand.

It's the playfulness. If there is a singular element that really kind of taps into the way I like to learn, which I don't see often in graduate school...it's playfulness. It's just being able... Oh I can go in and tinker and playfulness, and the spatial relationships, and the color... It's very core, kind of like psychological stimuli that, particularly in the humanities disciplines, is just like text.

Foreign language classes would have a ball with this [SL]. In the Spanish course, half an hour every so often people that speak Spanish could meet at round tables... Or people who have social anxiety can practice social skills... Because, you know, people who have social anxiety have intense phobias around interacting with people. So, when you embody them in [SL] a very real like environment...

In anthropology you might reconstruct a ritualistic dance in New Guinea or something, so people can watch the ritualistic dance and see, you know... Set the time at midnight or whatever it else, get a big fire or whatever... In psychology, my work is in trying to use *reality* to create a personality assessment tool. So instead of doing paper and pen assessments, you actually go through a simulation [in SL] and make decisions.

I think it's like we are at the beginning of the Internet. That's it just like, "Ohhh, hyperlinks!" You know what I mean? It's got that feeling like, "Ten years down the line, if you get on this now, this is the future." This is definitely the future of online communication. I think there is no doubt about that. No doubt about that at all.

In summary, overall, the students did perceive SL as instrumental in learning. Furthermore, the students generally reported that they had positive ideas about future uses of SL for not only education but also across a wide array of disciplinary and real life activities.

The results pertaining to the four research questions presented above have indicated that the SL learning environment used for the project-based approach in this particular course fostered development of interdisciplinary communication awareness and strategies effectively. Examples of the instances of experiential learning were vividly illustrated in students' journals, the focus group data, their speeches, and other reflections. Also, the students' positive responses to the effectiveness of SL as an educational environment further support the use of SL for project-based experiential learning.

5. Discussion

The results of this study first and foremost demonstrate the effectiveness of the SL environment for a project-based experiential learning approach, particularly as students were able to learn by doing and by applying learned concepts to the real world. In this section, we will describe the interactions among the SL environment, the project-based approach, student learning activities in SL, the role of the on-going self-reflection tasks, and real life applications of that learning, as shown in Fig. 2. In so doing, the limitations of the study should be reiterated, including the small number of subjects. The study did not attempt to measure what impact the background of a student may have had on their final assessment of learning in SL. Nor were data were available indicating the students' levels of technical ability in SL prior to the course. Nevertheless, within these constraints, certain findings can be provided.

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[1] The post-activity survey and its results are viewable at: http://www.surveymonkey.com/sr.aspx?sm=_2fzAKup_2bizuk7hZwXmEByKlXYNkxmyvCbHa424cHEozY_3d.
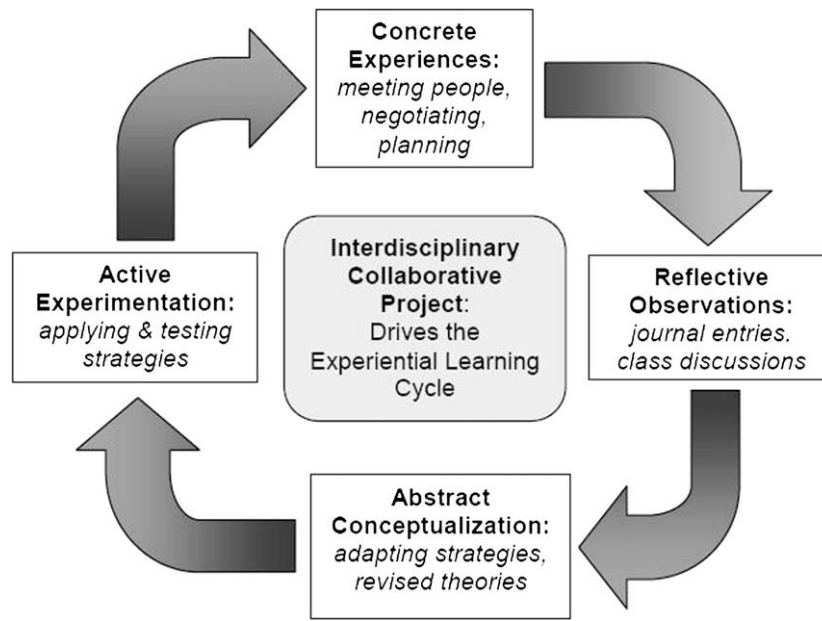
Fig. 2. Dynamic project-based Second Life/real life experiential learning cycle.

The learning that occurred in the course can be best described as experiential learning (Kolb, 1984). Fig. 2 shows the relationship among the factors operating in the SL learning environment in the current study and depicts the project-based assignment, the iterative, on-going cycles of experiential learning, and specific class tasks (Kolb, 1984).

For example, as shown in Fig. 2, the entire dynamic cycle is driven by the interdisciplinary collaborative project required by the course syllabus and comprising a substantial portion of the students' final grades. This "driver" of the cycle was their Alley Flats project. While the course content taken as a whole provides scaffolding for the students in terms of overall course concepts, the assigned collaborative project drives their experiential learning. To accomplish the project, the students engaged in multiple concrete experiences, such as meeting and planning with people in SL and in real life. In fact, as far as the experiential learning cycle is concerned, the students' experiences could fluctuate between SL and real life; the distinction became less a factor than did the work they were trying to accomplish. SL provided additional communication contexts, alongside real life contexts, where students could experience concrete, authentic communication.

Next, as shown in the figure, several of the assigned class tasks in this course, such as the World View Journals and the weekly class discussions, created both scaffolding and opportunities for the students to reflect on their concrete experiences. Although reflection can occur during any of Kolb's steps in the experiential learning cycle, these explicit class tasks insured that the students would engage in reflection concerning at least some of their concrete experiences, as evidenced in the students' journal entries. Third, the students abstracted new knowledge, adapting previously learned communication strategies and revising their theories about what communication methods might be more effective or useful. The World View Journals and the weekly class discussions also facilitated this process, providing contexts where students could consciously create structured understandings of their experience and could consider ways to improve their communicative outcomes by adapting strategies to new situations. Fourth, in the on-going iterative cycle, the students reported that they were able to test and practice these new strategies and theories by actively experimenting, for example, at a follow-up negotiation meeting. Thus, as a component of their project-driven activities, the SL environment provided a virtual space that complemented their work in real life space and within which students could engage experientially to build their project over time.

According to data collected from the students themselves, the six characteristics of the SL environment that facilitated experiential learning through concrete experiences and active experimentation included (a) the capacity to host virtual social interactions and collaborations, (b) the capacity to allow users to test hypotheses by applying them to an actual project and doing something active (Kalyuga, 2007) without some of the risk and cost of the real world, (c) the possibilities for relevance of their virtual actions to the real world, (d) the capacity to allow for various types of abilities to be practiced and demonstrated virtually, (e) the stimulation of imagination, exploration, and creativity, and (f) an increased sense of personal presence and tangible experience in the virtual world. The project-based approach using SL helped students make the connection between education and experience and, as several students observed, between theory and practice.

The characteristics of the SL software that seem to be able to effectively support project-based experiential learning are primarily the outcomes of its rich three-dimensional environment that, according to the students, create an enhanced sense of tangible and personal experiences. The sense of embodiment in SL helped to make their experiences in the virtual environment real and fostered their sense of concrete experiences. This sense of embodied social presence initiated and enhanced the experiential learning cycle.

However, as we have seen, the students' initial survey responses on the effectiveness of SL environments for facilitating communication and collaboration among peers were mixed. Mentioned as possible reasons for this initial mixed assessment were, first, SL's "steep learning curve" (Au, 2006; Sanchez, 2007). New users have to navigate the registration process and then learn how to use the SL software user inter-

face, learn how to search for a place or an experience or a group, and then learn how to find their target destination (Reuters 2007). While training and support were provided to the students, it was optional and few took advantage of the training early on. Also mentioned was the fact that SL was tangential to the main focus of the course, interdisciplinary communication, although SL was required for their collaborative project. Future research would benefit from gathering data about the students' levels of technical ability in SL prior to the educational activity under study.

Later, however, the students' assessment of the effectiveness of SL environments for facilitating communication and collaboration appears to have shifted by the time the course ended. As has been described earlier, and perhaps suggesting a more important concrete measure of their enduring learning and of the relevance of this course to their real lives, the student team decided to *continue* their work in SL to help organizations develop a virtual presence for their own community service efforts. At this later date, in their non-profit New Mornings grant proposal, their assessment of SL stated that virtual environments could benefit non-profits "by increasing important collaborative, creative and networking possibilities." SL was, in effect, a world where, through experiential learning (Fig. 2), students could exercise their imaginations, create projects that had never existed in the real world, and apply their innovative thinking (see the student team press release, Appendix D) in ways that mattered to them and to others in the real world.

6. Conclusion

While online 3-D virtual worlds are expected to have a large impact on teaching and learning in the near future, our understanding of their instructional use is still limited. This study attempts to begin filling that gap. The current study indicated that the SL learning environment used with the project-based approach in this particular course effectively fostered experiential development of interdisciplinary communication awareness and strategies. Some of SL's special characteristics contribute to its suitability for project-based experiential learning as discussed above.

As one student in the study observed, many educational practices continue to replicate the knowledge transmission model of learning and thus lack the opportunities for students to experiment with what they learn and with their creative ideas in real world and out-of-class contexts. This can often be the case in spite of the potential of such experiential learning to make a significant impact that endures in students' lives and in their professional careers. This gap is perhaps due largely to the fact that creation of such experiential learning environments can be frequently inhibited by real world constraints. For example, creating sustainable housing models accessible by the general public would have been impossible in a regular university course due to the prohibitive cost, time, insurance factors, and the physical distance between the collaborators and general public audience. The virtual world provides alternative spaces and contexts where project-based experiential learning can, in some cases, be conducted more easily. With the use of virtual worlds, experiential learning opportunities can be vastly expanded. While one may question the effectiveness of virtual world experiences for learning in comparison with real world experiences, the current study demonstrated that a significant level of experiential learning can occur in the 3-D virtual world environment. Therefore, we would suggest that those educators who are interested in facilitating enduring knowledge/skills acquisition though experiential learning might consider using the virtual world environment as an playground for student learning. That is, we encourage educators to utilize the unique technological affordances of virtual worlds by creating experiential instructional designs that give students the opportunity to work on real world projects while exploring and communicating across geographic boundaries.

The limitations of this initial report include the fact that it is a single case study: one graduate course, one semester in length, and five graduate students from different academic disciplines. However, we believe that the current study contribute significantly to our understanding of the nature of project-based experiential learning in virtual worlds.

In future research, we will conduct a post-semester follow-up focus group session with the student team to learn about their longer-term perceptions of learning in SL three months after the end of the course. More research is needed to understand how experiential project-based collaborative activity may apply to other instructional contexts using SL. For example, using SL for undergraduate and high school courses and shorter term student projects needs to be examined. In addition, whether or not the project-based design is scalable to groups of 30 or 60 in SL has yet to be determined.

Appendix A

Categories for content analysis of SL-Relevant materials in worldview journals

1. Interdisciplinary worldview awareness	Students identify moments of awareness and/or perspective change regarding their understanding of their own worldviews *in terms of interdisciplinary communication* such as a previously unrecognized bias towards other disciplines than their own
2. Judgment of others/tolerance	Students identify moments when they realize they were *judging another person* based on their own worldview assumptions in their life in general (*not in terms of interdisciplinary communication*)
3. Worldview awareness	Students identify moments when they realize certain characteristics of *their own and/or others' worldviews* (*not in terms of interdisciplinary communication*)
4. Collaboration/transforming learning experiences	Students identify *collaborations across academic disciplines* and describe the *communication strategies* used. (The fact that students are collaborating suggests that their understanding is transforming into real life practices)
5. Unexpected learning	Students *explicitly* identify realizations that were *unexpected*
6. Transfer of SL experiences into real life	Students identify moments when SL informed real life experiences, such as real life relationships and collaborations, and physical or visceral feelings that were a result of being in SL

Appendix B. Student surveys

First survey:

Part I: How do students expect the use of Second Life to affect student learning?				
1. My engagement in this course will increase because of Second Life				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2. My learning in this course will increase because of Second Life				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
3. My ideas for my own research will expand because of Second Life				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4. Please describe what you expect to learn because of Second Life. (Open-ended Question)				
Part II: How do students feel about using Second Life in the course?				
5. I will enjoy using Second Life in this course				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
6. It is a good idea to use Second Life in this course				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
7. The use of Second Life will help me communicate with my fellow students				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
8. The use of Second Life will help me collaborate with my fellow students				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
9. Please provide any additional comments about the use of Second Life in this course. (Open-ended Question)				

Second survey:

The survey questions and the results are viewable at: http://www.surveymonkey.com/sr.aspx?sm=_2fzAKup_2bizuk7hZwXmEBy-KlXYNkxmyvCbHa424cHEozY_3d.

Appendix C. Focus group questions

Addressing research question 1:

1. What do you think you learned because of the Second Life component that you could not have learned without a Second Life component?
2. How did your learning change (either positively or negatively) because of the use of Second Life in this course? What were some differences in learning in this course compared to other courses that do not use Second Life?
3. What were your most significant learning events in Second Life and how did they happen?
   Addressing the research question 2:
4. Do you think learning in Second Life transfers to real life? Can you provide some examples? Probe carefully… ask "why" "how" and "examples"
   Addressing the research question 3:
5. For what other types of learning activities do you think SL could be potentially effective?*Other topics*
6. What was the experience like of learning how to use Second Life?
7. Did you see any shift in your or others' attitudes towards working in SL at some point during the semester? How did they change? Why did they change?

Appendix D. Student team press release announcing virtual ribbon-cutting ceremony

Austin Texas – History will be made on Thursday December 6 (2007) when an exciting collaboration between the University of Texas and a community in East Austin is unveiled in Second Life, the popular virtual reality environment.

The Alley Flat Initiative is a real world project that combines cutting-edge architectural designs, sustainable development technology, and community development in East Austin. With the help of a UT graduate interdisciplinary communication class, this exciting collaboration will officially unveil specially designed three-dimensional representations of the architectural plans in the online virtual reality environment, Second Life.

The Alley Flats are small structures of 850 square feet or less that home owners can build as a separate, secondary structure on their lot and that can be accessed by alleys at the rear of the property. As communities in East Austin come under pressure because of rising property prices, alley flats can provide an extra source of income for East Austin homeowners that are affordable to build, cheap to maintain, and are sensitive to the environment and local communities.

The flats are designed by UT Architecture graduate students under the guiding hand of Professor of Architecture professor Sergio Palleroni, co-founder of the nationally recognized BaSiC Initiative. Professor Palleroni has worked closely with the Guadalupe Neighborhood Development Corporation to find two suitable sites on Lydia and East Second Streets in East Austin.

The virtual presence of the project is designed to give audiences a more realistic "feel" for the proposed real world alley flats. Second Life users will be able to walk-through the buildings, see how they blend in with other buildings in the area, and find out about the sustainable technologies and innovative building materials that are the basis of the designs.

The Second Life presence is a result of a collaboration between Professor Palleroni's team and the students of Professor Leslie Jarmon's "Communicating Across the Disciplines" graduate course. Students in that course worked with Professor Palleroni's team and expert Sec-

ond Life builders from the Educators Coop to bring to life this exciting virtual reality dimension of the Alley Flats Initiative. Everyone involved in the project is confident that the Second Life alley flats will be of interest to both local and global audiences interested in community development and sustainable architecture.

On Thursday December 6, 2PM Central (12 Noon Second Life Time), the Second Life Alley Flats will be officially opened with a talk by Prof. Palleroni. Anyone interested in the Alley Flat initiative is invited to attend. Please contact Sean McCarthy for details on how to access to this unique Second Life event.

References

Alley Flats Initiative. Retrieved February 29, 2008 from <http://www.basicinitiative.org/programs/housing/alley_flat_initiative.htm>.
Amichai-Hamburger, Y., & McKenna, K. (2006). The contact hypothesis reconsidered: Interacting via the Internet. *Journal of Computer-Mediated Communication, 11*(3), 825–843.
Au, Wagner J. (2006). *New world notes: New world numbers: The trouble with two million.* Retrieved September 23, 2008, from New World notes web site: <http://nwn.blogs.com/nwn/2006/11/new_world_numbe.html>.
Barab, S., Thomas, M., Dodge, T., Carteaux, R., & Tuzan, H. (2005). Making learning fun: Quest Atlantis, a game without guns. *Educational Technology Research and Development, 53*(1), 86–107.
Bateson, M. C. (1993). Joint performance across cultures: Improvisation in a Persian garden. *Text and Performance Quarterly, 13*, 113–121.
Boulos, K., Hetherington, L., & Wheeler, S. (2007). Second Life: An overview of the potential of 3-D virtual worlds in medical and health education. *Health Information and Libraries Journal, 24*(4), 233–245.
Chittaro, L., & Ranon, R. (2007). Web3D technologies in learning, education, and training: Motivations, issues, and opportunities. *Computers and Education, 49*(1), 3–18.
Committee on Facilitating Interdisciplinary Research (CFIR) (2004). *Facilitating interdisciplinary research.* Washington, DC: National Academies Press. Retrieved December 20, 2007 from <http://www.nap.edu/catalog.php?record_id=11153>.
Craig, E. (2007). Meta-perspectives on the metaverse: A blogsphere debate on the significance of Second Life. *Paper contributed to the ED-MEDIA World Conference on Educational Multimedia, Hypermedia and Telecommunications,* Vancouver, Canada.
De Castell, S., & Jensen, J. (2007). *Worlds in play: International perspectives on digital games research.* New York, NY: Basic Initiative, Peter Lang Publishing.
Dede, C. J., Clarke, D., Ketelhut, B., Nelson, B., & Bowman, C., (2005). Fostering motivation, learning, and transfer in multi-user virtual environments. *Paper contributed to the American educational research association conference,* Montreal, Canada.
FitzGerald, S. (2007). Virtual worlds: What are they and why do educators need to pay attention to them? *Paper contributed to the e-learning networks June online event.* Retrieved July 13, 2007 from <http://seanfitz.wikispaces.com/virtualworldsenetworks07>.
Gartner, Inc. (2007). *Gartner says 80 percent of active Internet users will have a "Second Life" in the virtual world by the end of 2011.* Business Wire. Retrieved December 15, 2007 from <http://www.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20070424006287&newsLang=en>.
Gee, J. P. (2003). *What video games have to teach us about learning and literacy.* New York: Palgrave Macmillan.
Hamalainen, R. (2008). Designing and evaluating collaboration in a virtual game environment for vocational learning. *Computers and Education, 50*, 98–109.
Hobbs, M., Brown, E., & Gordon, M. (2006). Using a virtual world for transferable skills in gaming education: The higher education academy. *ITALICS* 5(3). Retrieved August, 28, 2008 from <http://www.ics.heacademy.ac.uk/italics/vol5iss3/hobbsbrowngordon.pdf>.
Kalyuga, S. (2007). Enhancing instructional efficiency of interactive e-learning environments: A cognitive load perspective. *Educational Psychology Review, 19*(3), 387–399.
Kirriemuir, J., & McFarlane, A. (2003). *Literature review in games and learning.* Retrieved January 5, 2008 from <http://www.futurelab.org.uk/resources/documents/lit_reviews/Games_Review.pdf>.
Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* New Jersey: Prentice-Hall.
Kolb, D. A., Boyatzis, R. E., & Mainemelis, C. (2002). Experiential learning: Previous research and new directions. In R. J. Sternberg & L. F. Zhang (Eds.), *Perspectives learning theory: Previous research and new directions* (pp. 227–248). Mahwah, NJ: Lawrence Erlbaum.
Lamb, G. M. (2006). *Real learning in a virtual world. The Christian science monitor,* October 5. Retrieved January 3, 2007 from <http://www.csmonitor.com/2006/1005/p13s02-legn.html>.
Leifer, L. (1996). Evaluating product-based learning education. *White Paper, Center for Design Research,* Stanford University, Palo Alto, CA. Retrieved February 29, 2008 from <http://cdr.stanford.edu/~leifer/publications/Osaka95/Osaka95.ps>.
Martinez, L. M., Martinez, P., & Warkentin, G. (2007). A first experience on implementing a lecture on Second Life. In *Proceeding from Second Life education workshop* (pp. 52–55), Chicago, IL. Retrieved August 28, 2008 from <http://www.simteach.com/slccedu07proceedings.pdf#page=60>.
Mason, H. & Moutahir, M. (2006). Multidisciplinary experiential education in Second Life: A global approach. In *Proceedings of the Second Life education workshop* (pp. 30–35), San Francisco, CA, Retrieved from <http://www.simteach.com/SLCC06/slcc2006-proceedings.pdf>.
Mayrath, M. C., Sanchez, J., Traphagan, T., Heikes, J., & Trivedi, A. (2007). Using Second Life in an English course: Designing class activities to address learning objectives. *Paper contributed to the ED-MEDIA World Conference on Educational Multimedia, Hypermedia and Telecommunications,* Vancouver, Canada.
McGee, P. (2007, June). Extreme learning in a virtual (world) learning environment: Who needs pedagogy anyway? *Paper contributed to the ED-MEDIA World Conference on Educational Multimedia, Hypermedia and Telecommunications,* Vancouver, Canada.
Monahan, T., McArdle, G., & Bertolotto, M. (2008). Virtual reality for collaborative e-learning. *Computers and Education, 50*(4), 1339–1353.
Moreno, R., Mayer, R., Spires, H., & Lester, J. (2001). The case for social agency in computer-based teaching: Do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction, 19*(2), 177–213.
New Media Consortium and EDUCAUSE Learning Initiative (2007). *The horizon report.* Retrieved March 20, 2007 from <http://www.nmc.org/pdf/2007_Horizon_Report.pdf>.
Prensky, M. (2006). *Don't bother me, Mom, I'm learning!: How computer and video games are preparing your kids for 21st century success and how you can help!* St. Paul: Paragon House.
Reuters, E. (2007). *Linden to outsource Second Life orientation.* Reuters Online. Retrieved September 23, 2008 from <http://secondlife.reuters.com/stories/2007/05/04/new-orientation-islands-take-off/>.
Sanchez, J. (2007a). A Sociotechnical Systems Analysis of Second Life in an Undergraduate English Course. *Paper contributed to the ED-MEDIA World Conference on Educational Multimedia,* Hypermedia, & Telecommunications, Vancouver, Canada.
Sanchez, J. (2007b). Second Life: An interactive qualitative analysis. In C. Crawford, D. A. Willis, R. Carlsen, I. Gibson, K. McFerrin, J. Price, & R. Weber (Eds.), *Proceedings of society for information technology and teacher education international conference 2007* (pp. 1240–1243). Chesapeake, VA: AACE.
Soukup, C. (2004). Multimedia performance in a computer-mediated community: Communication as a virtual drama. *Journal of Computer-Mediated Communication, 9*(4), Article 3. Retrived July 24, 2007, from <http://jcmc.indiana.edu/vol9/issue4/soukup.html>.
Steinkuehler, C., & Williams, D. (2006). Where everybody knows your (screen) name: Online games as "third places." *Journal of Computer-Mediated Communication, 11*(4), Article 1. Retrived July 24, 2007, from <http://jcmc.indiana.edu/vol11/issue4/steinkuehler.html>.
Taussig, M. (1993). *Mimesis and alterity: A particular history of the senses.* NY: Routledge. The New Media Consortium and the EDUCAUSE Learning.
Wertsch, J. V. (1985). *Vygotsky and the social formation of mind.* Cambridge, MA: Harvard University Press.