

Journal of
• Virtual Worlds Research

jvwrsearch.org ISSN: 1941-8477

Volume 3, Number 1
October 2010
The Researcher's Toolbox



Volume 3, Number 1

The Researcher's Toolbox

November 2010

Editor-in-Chief

Jeremiah Spence

Guest Editors

Tom Boellstorff, University of California, Irvine, USA

Celia Pearce, Georgia Tech University, USA

Dmitri Williams, University of Southern California, USA

Thomas Malaby, University of Wisconsin, Milwaukee, USA

Elizabeth Dean, RTI, USA

Tracy Tuten, East Carolina University, USA

Technical Staff

John Brengle
Sil Emerson



The Journal of Virtual Worlds Research is owned and published by the Virtual Worlds Institute, Inc. – Austin, Texas, USA. The JVWR is an academic journal. As such, it is dedicated to the open exchange of information. For this reason, JVWR is freely available to individuals and institutions. Copies of this journal or articles in this journal may be distributed for research or educational purposes only free of charge and without permission. However, the JVWR does not grant permission for use of any content in advertisements or advertising supplements or in any manner that would imply an endorsement of any product or service. All uses beyond research or educational purposes require the written permission of the JVWR. Authors who publish in the Journal of Virtual Worlds Research will release their articles under the Creative Commons Attribution No Derivative Works 3.0 United States (cc-by-nd) license. The Journal of Virtual Worlds Research is funded by its sponsors and contributions from readers. If this material is useful.

Volume 3, Number 1

The Researcher's Toolbox

November 2010

Applying Constant Comparative and Discourse Analyses to Virtual Worlds Research

Peter Leong

University of Hawaii at Manoa, United States

Samuel R. H. Joseph

University of Hawaii at Manoa, United States

Rachel Boulay

University of Hawaii at Manoa, United States

Abstract

This paper presents the basics of the constant comparative analysis and discourse analysis methods to research in virtual worlds. Our data sources include video recordings of in-world class interactions; artifacts and documents such as students' blog, and asynchronous discussion postings. For data analysis, we use the constant comparative method as a tool for inductive analysis, and discourse analysis as a tool to discover patterns in discursive practices. The constant comparative method was originally developed for the use in grounded theory methodology, but is now more widely applied as a method of analysis in qualitative research. It requires the researcher to take one piece of data and compare it to all other pieces of data that are either similar or different, gradually identifying the salient differences. In contrast, discourse analysis examines the way in which sentences are combined in larger linguistic units, such as conversational exchanges or written texts. The critical analysis of discourse helps us extend and specify themes generated during constant comparative analysis.

Keywords: virtual worlds; comparative analysis; discourse analysis

Applying Constant Comparative and Discourse Analyses to Virtual Worlds Research

Virtual worlds are online environments, usually understood to provide a 3D environment with representations of multiple users. They are also referred to as three-dimensional Multi-User Virtual Environments (3-D MUVE), and examples include Second Life, World of Warcraft, Star Wars Galaxies and Blue Mars to name a few. Virtual worlds provide opportunities for many types of interaction that are not possible in purely text based or 2D environments. Virtual worlds are commonly used for recreation, commerce, education, and collaboration. While this is true of other online environments, it takes a 3D environment to allow multiple users to interact with multiple other 3D objects, each user perceiving the sets of available artifacts from their own unique perspective. In particular, virtual worlds support a form of deixis that is often absent from other environments. In a virtual world a user can pick up an object, display it to other users and refer to it in text and audio chat. This can have a powerful grounding effect that makes virtual worlds attractive for many pursuits. The fact that virtual worlds are used at all suggests that some individuals are deriving some sort of benefit from their online 3D pursuits, but the question remains whether the goals of those pursuits are being achieved as effectively in a virtual world as they would be in real life or in some other form of online environment. For example, given that educators use virtual worlds to deliver instruction, a natural question arising is how adding a virtual world component to a course affects the learning outcomes of the students.

A critical research question for the field is: What analytical methods are best suited to answering the different domain specific research questions we might have about virtual worlds? Examples of domain specific research questions would include the following: What is the pedagogical effectiveness of virtual worlds when used for educational purposes? How effective are virtual worlds for use in supporting online research and collaboration? or What are the psychological consequences of extended interaction in virtual worlds? While this is a critical endeavor, much of the nitty gritty specifics of how to conduct rigorous data collection in virtual worlds still being understood, a goal this particular issue of the journal of virtual worlds' research is aiming to address.

This study considered two different methods, those of constant comparative analysis and discourse analysis. There are, of course, many other methods that could be applied, but here the investigators hope to provide insight into the practical considerations and relative effectiveness

of these two methods with regards to different research questions. In particular the case study itself is focused on the following research questions:

1. What were student reactions to an experimental course taught online in Second Life?

Using constant comparative method to determine student reactions, frustrations emerged as a salient theme. Therefore, the researchers employed discourse analysis to further investigate:

2. How the frequency of student frustrations changed throughout the course? and
3. What discourse patterns of response were typical when a student expressed a frustration?

Background

The case study described in this paper concerns Second Life, a virtual world where residents can explore, socialize, participate in individual and group activities, and create and trade virtual property and services with one another. SL includes three-dimensional modeling tools that allow residents to build scriptable virtual objects, which can be bought and sold in the SL currency, Linden dollars. As of October 2009, there were just over 16 million registered SL users and although there are no reliable figures for actual long term consistent usage, on average, 38,000 residents were logged in at any particular moment (Second Life, 2009).

Due to the popularity of SL, a large number of colleges and universities, such as Cornell University, Harvard, Duke, Ohio State, University of California, Davis, and Berkley, Virginia Tech, and MIT have created virtual campuses and are offering courses in SL. For example, Harvard began offering a law course on SL in fall of 2006 (Foster, 2006). At least 300 universities around the world now teach courses or conduct research in SL (Michels, 2008).

The case study concerns online courses taught using the University of Hawaii (UH) SL island, modeled as a replica of part of the UH Manoa campus and created in 2008. The island is available for use by all UH staff student and faculty for use as a home base, for virtual world projects and as a teaching space. Courses are being taught in Psychology, Library Science, Second Language Studies, Education and Music while research is being conducted in each of these areas, and also Computer Science and Aquaculture. Space is made available on UH SL

Island for any staff, student or faculty of Hawaii-based educational institutions interested in conducting research, teaching or presenting themselves and their work to their peers.

While a considerable amount of research has been done on the sociology of virtual communities and virtual worlds, the body of knowledge on educational studies in virtual worlds is still at a relatively early stage (Campbell & Jones, 2008). Moreover, existing research tends to be descriptive in nature. For example, Johnson and Levine (2008) described their experiences and studies in virtual learning offered through the New Media Consortium's (NMC) Second Life campus. The NMC provides an immersive virtual learning experience which includes the teaching of atomic models by an Einstein avatar, teaching of Steinbeck's *Mice and Men* through role play, role playing and reenacting of famous court cases, language learning, and cultural learning. They assert that SL provides excellent opportunities for immersive learning, such as role playing and case studies.

Other studies attempt to highlight the potential of SL for teaching. Jarmon, Traphagan, Mayrath and Trivedi (2009) demonstrated the effectiveness of the SL environment for a project-based experiential learning approach, particularly because students were able to learn by doing and used what they learned in real life. Specifically, the students collaborated with real and virtual groups to create a Second Life version of two low-income model homes using sustainable design features designed by a real world non-profit agency.

More recently, studies are beginning to address virtual world pedagogy. Twining (2009) contends that pedagogy in virtual worlds helps students be collaborative versus individualistic; learn about, by doing, and by becoming; and that avatars can be used as a reflective tool.

Warburton (2009) argues that SL impacts pedagogy by allowing students and instructors to opportunity to experience rich interactions, visualization, authentic content and culture, identity play, immersion, simulation, community presence, and content production. He cautions about several barriers inhibiting wider spread adoption of SL, which include: technical, identity, culture, collaboration, time, economic, standards, scaffolding persistence and social discovery. In addition, Warburton highlights the current trends in virtual world development, which includes the development of open source virtual worlds and portable avatars between various virtual world platforms.

Case Study

The case study presented in this paper is a six-week graduate educational technology elective summer course designed to provide students with the opportunity to explore the use of virtual worlds, primarily SL, for teaching and learning. Students identified and analyzed emerging research, as well as tools, pedagogy, SL teaching environments, content resources, and assessments for virtual world teaching. The course provided hands-on experiential learning and was designed to enable graduate students to design, develop, and evaluate instruction in SL.

In addition to leveraging SL as a distance learning delivery tool, the students researched the various ways that SL can be leveraged for instructional purposes, such as exploring other educational SL builds (virtual field trips) and evaluating the design of educational simulations in SL. The course also covered basic fundamentals of building in SL with a focus on building simple educational objects (how to deliver content), as well as on how to promote interactivity in SL. There is a strong research component with students being required to research and compile a list of SL educational resources (both in-world and online) as well as develop an annotated bibliography of research on virtual world teaching and learning.

There were also asynchronous components of this completely online course. UH's course management system Laulima (Sakai) provided a document repository, while weekly asynchronous online discussions took place on a Ning social networking site where students could also post photos and videos. Furthermore, students were required to blog their SL learning experience using blogging tools of their choice. The final project was the creation of a class module by student teams.

Data Collection

The current study used two data sources:

1. classroom observations or video recordings of SL in-world class sessions
2. student discourse in written text, including student blogs, chat box text and asynchronous discussion postings.

Requesting Human Subjects Approval

In order to get institutional approval for the study we submitted the usual documentation to request approval for the participation of human subjects in a research project. This type of study, including recording class sessions and examining student discussion board postings, blogs and

text box chats, would not usually raise concern. However, the Committee on Human Subjects (CHS) was sufficiently surprised by the request to record video in an online world that they phoned to confirm details of the study. Much explanation of what is a 3-D MUVE is and how a course can be taught in this environment was needed. The committee said that the request was the “most eye-opening that month” and approved the study. One concern was getting students signatures on the experimental participation forms, but the CHS indicated that manual signatures were not required as long as the experimental participation forms were distributed. These forms were distributed via Second Life note card at the start of the course.

Learning to Record Classroom Observations in SL

Classroom observation is a common approach used to investigate what transpires during a class session. The training of individuals in conducting classroom observations may be covered in research methodology courses at many universities (see Patton, 1990, chapter 6, for a good introduction); but how to conduct classroom observations in courses being conducted entirely in 3-D MUVEs is far from well understood. We embarked and piloted different recording techniques in this 3-D MUVE. The desire was to record class sessions in SL in their entirety. In real life, class sessions are often video-taped because of the richness of data collected that can be reviewed later. As research in classroom behavior in 3-D MUVEs is still very exploratory, we wanted the option to return to any class session and re-examine the data, including the interaction of avatars, individual utterances of students and their relationship to spatial features in the 3-D MUVE, to name a couple of examples. In order to study students’ interactions and experiences in SL, we embarked on recording the class sessions initially by using a “non-participant” observer. At the beginning of the 6-week long course an avatar was introduced to students as an “observer” who would be recording the class sessions with their permission. In this same session students met an avatar who was the course instructor and another avatar who was the teaching assistant for the course.

The SL in-world class sessions, totaling approximately 30 hours, were videotaped from a computer screen using the video-capturing software ScreenFlow. Various issues arose in the process of trying to video capture the online action. These challenges are shared in some depth as we hope our experience can inform others wishing to adapt common methodological approaches, such as classroom observations, to research within 3-D MUVEs. We wrestled with

understanding how these classroom observations in-world were similar and distinct from our prior expertise in using these strategies in real-world settings and share our practical steps to improve future recording attempts.

Video-capturing Software

While recording both the video and audio was challenging, success was achieved with ScreenFlow, after several other software products were tried. The Second Life client had originally included a “Movie to Disk” video recording option, but this was removed in 2008 due to technical problems. As an alternative Linden Labs provided a list of third party screen capture products (Second Life, 2010) for use in recording video of Second Life. A number of these (CamStudio, Snapz Pro X) were tried and led to only partial success in capturing classroom activity. In general the software would capture the screen activity well, but the main problem encountered was simultaneously capturing the audio. Initial recordings on both Windows Vista and XP appeared to suffer from software/soundcard incompatibilities, so that video was recorded but not audio. This problem was circumvented by playing the audio from the speakers and recording directly through an external microphone, but this led to the problem that other ambient noises were recorded. However other problems were encountered such as windows crashing after recording sessions of over an hour. Similar problems were not encountered when recording on the OSX platform, and ScreenFlow gave immediate options for recording screen, external audio and computer audio, making it the clear winner in terms of simplicity and reliability.

The creation of large video files was always a storage issue, but the simple solution was a large capacity external storage drive. Nonetheless manipulating these files with other software to extract clips, or simply for transcription could lead to long file-processing wait times. A single two-hour class could easily generate to a multi-gigabyte ScreenFlow file. The general practice followed was to generate a half size .mov file from the ScreenFlow file (export function built into ScreenFlow) which would get the file size down to under a gigabyte with only an acceptable loss of quality. This file could then be used for transcription purposes, manipulated with QuickTime to extract clips, and the original multi-gigabyte ScreenFlow archived on the external drive.

While ScreenFlow was successful for our needs, there were limitations imposed by the nature of the 3D-MUVE setup and the resources available to us. Ideally we would have been

recording not just from a single observer computer, but from all of the participants' computers, capturing the interface views of instructors and students. However this would have required installing video recording software on all of the participants' computers, which was impractical in the case study, largely because of the additional burden this would have placed on student's already coping with the SL client software, but also because ScreenFlow is OSX only, and does place a non-trivial processing burden on the recording machine. Several students' computers were already struggling with the SL client, making the running of additional software impractical.

Practical Challenges While Recording in SL

Starting the recording software was a trivial operation (ScreenFlow starts up asking the user what they would like to record), however since ScreenFlow and the SL client would both be running for a couple of hours it quickly became clear that it was expedient to restart the recording computer before attempting to record a session in order to maximize the available computer processing and memory resources, as well as checking the presence of sufficient disk capacity to store the initial multi-gigabyte ScreenFlow file. While being used for recording it was generally impractical to use the recording computer for much else other than making sure that the Second Life "camera person" was in the correct place. The "camera person" looked just like a normal, albeit inactive, SL avatar, and there was no particular indication that the particular avatar was videotaping or what they were recording.

Both the computer recording the action and the Second Life client itself had timeouts that had to be disabled. In particular after a short period a Second Life avatar will slump over (see Figure 1a) in Away From Keyboard (AFK) mode which may suggest to the viewers that the "camera person" has gone to sleep. Further inactivity causes the Second Life client to log out. The solution was to use a camping setting in a Heads Up Display (HUD) called MystiHUD purchased within Second Life which prevents SL AFK status, and using Caffeine software on OSX to prevent the computer from going to sleep. While students seemed very comfortable with the recording of their class in SL, but the main challenge was the non-participant observer or "camera person" being "left behind." Leaving the computer to record locks the view in SL, so if the focus of attention moves, for example, the students or instructor go somewhere else then they go out of shot, even if their audio is still recorded. In other words, if the instructor took students on a field trip where they left the class space and traveled to another island in SL, the "camera

person” was not traveling with the class or if the instructor walked to another area or the student avatar traveled out of the view of the observer, the field of view of the observer could be easily obstructed.



Figure 1(a,b). Screen shots of basic challenges while recording classroom observations in SL. a) Avatar slumping in AFK status, b) recording focused on empty classroom when participants had moved to another area.

This main challenge may be overcome through training and practice by those who wish to act in the traditional role of a non-participant observer recording class sessions in SL environments. However, we trialed another approach and had the camera person sit in a follow chair attached to the teaching assistant. In essence we converted the non-participant observer into a participant observer. Participant observation is when the observation is conducted by a participating member of the course. In real life, participant observation often reduces bias related to unnaturalness created by the presence of the non-member of the class. While the comfortableness of the students was not at issue, the non-participant was frequently “left behind” as the class traveled or shifted their physical space. A special chair, also available as part of the MystiHUD system, was set to follow the class teaching assistant and thus the view recorded was at least partially controlled by the teaching assistant. This allows situations like those shown in figure 1b above to be avoided, although other issues were now encountered. The main time that the class participants would move would be when the class took a field trip to another SL location. This generally involved teleporting and it seemed that the MystiHUD follow chair would generally not make it through the teleport process. In general field trips lasted between 10 and 30 minutes, and so the teaching assistant and the person responsible for recording the class session coordinated to check if a field trip would take place, and if so arrange for the follow chair to be set up once the field trip teleport had been completed. Overall this improved the data

collection so that fewer empty classrooms were recorded, and more fieldtrips were captured; however it became clear that ideally the camera person would be actively focused on the recording process for the entire duration of class movement or field trips. The teaching assistant pulling the follow chair could not see the recording view and so the class’s focus of activity might be missed if the camera person was not actively engaged to focus the recording SL client on whatever happened to be the center of attention (see Figure 2).



Figure 2. Screen shots of follow chair challenges while recording classroom observations in SL, here the camera person is capturing a view of some participants who are focused on activity taking place to the right that is not captured by this view, which had been set up and left as the optimal view for an earlier activity.

Transcribing Class Sessions

The video-recorded class sessions were transcribed by two graduate students. One graduate student participated in the course as a teaching assistant. The other graduate student was from the University’s College of Language, Linguistics, and Literature and therefore had substantial training in transcription and provided an alternative outside perspective. The lead researcher met weekly with the graduate students to discuss progress and arising questions. The graduate students encountered several interesting issues as they began transcribing. One initial challenge was the difficulty in ascribing the audio to the correct avatar. The non-participant transcriber had difficulty identifying which avatars were speaking because they were either out of the view of the camera or the “talk” green icon flashing above their head was not easily visible. The non-

participant transcriber also had issues with many SL jargon used in the conversations. All of these points to the need for some training for non-participant transcribers.

A recurring issue faced by both the participant and non-participant transcriber was the difficulty in following both the audio and text chat conversations. Very often the audio and text chat conversations were out of sync. In general, text chat comments or questions were addressed later in the audio conversations. Interestingly, although SL is voice-enabled, the majority of student participants preferred using the text chat feature instead of the voice feature.

A decision was made to produce one transcript of all class sessions that marked the audio from the course in one color and marked the text from the public text chat in another color. Therefore, a mixed audio and chat transcript was created for all class sessions. It was felt this type of transcript of class sessions would provide a better base for investigating switches from audio to chat for different types of issues.

Student Discourse in Written Text

In addition to classroom observation data, student discourse in written text was used as a secondary data source. In this study, student discourse in written text consisted of student blogs, the public chat box text and asynchronous discussion postings. One of the assignments throughout the course was the student learning blog where students were required to blog about their SL learning experience using blogging tools of their choice. In addition, students participated in weekly asynchronous online discussions. Logs of public text chat were captured during the classroom sessions and incorporated into the transcriptions of the class sessions as described previously. The individual blogging assignment was designed to help students reflect upon their individual SL learning experience. Students were required to post weekly blogs of their SL learning experience (at least six blog postings in total). The blog postings took the form of free writing, i.e. students were given the freedom to write anything that related to their experience in SL, e.g. their perceptions, successes, problems, and insights. These various components produced student reactions about the course that could be compared to in-class discussions.

Data Analysis

Two methods of data analysis were utilized in this study. Constant comparative analysis was used as an inductive data-driven analysis intended to find recurring patterns. Then discourse analysis was used to look more specifically at discursive practices surrounding a common pattern identified in the constant comparative analysis.

Constant Comparative Analysis

Data analysis for this qualitative research study was approached through multiple strategies. The researchers and two graduate students examined and reexamined some of the narrative transcriptions of the course sessions and student discourses, including blogs, text chats, and discussion postings to identify patterns and themes. Since the intent of the study was to identify some initial interesting student reactions to a course taught online in SL, only comments related to general student reactions were categorized. The constant comparative method was originally developed for the use in a grounded theory methodology and is now applied more widely as a method of analysis in qualitative research. It requires the researcher to take one piece of data and compare it to all other pieces of data. The qualitative comparative method of data analysis (Ragin, 1987) was used to construct categories and themes that captured the recurring patterns that emerged from the data. The analysis of the data was cyclical, consisting of initial coding, reflecting, and re-reading, then sorting and sifting through the codes to discover patterns and themes. These methods were used to triangulate the evidence of the data (Lincoln & Guba, 1985).

Triangulation is a strategy commonly employed to strengthen the robustness of a qualitative study. Four kinds of triangulation contribute to verification and validation of qualitative analysis. Multiple investigators, multiple data sources, multiple theories, and multiple data collection methods to confirm findings are all strategies for reducing systematic bias in the data. In each case the strategy involves checking findings against other sources and perspectives. Triangulation is a process by which the researcher can guard against the possibility that a study's findings are simply an artifact of a single method, a single source, or a single investigator's biases (Patton, 1999). In this study, multiple investigators, data sources and data collection methods were used to triangulate the findings.

Discourse Analysis

The same sources of data were analyzed through a different data analysis approach. Constant comparative analysis was used with an inductive approach to determine initial salient themes of student reactions. Then discourse analysis was used to focus in on one prominent theme and investigate that particular theme in more detail. The investigators felt discourse analysis provided a more fine-tuned approach to understanding a specific issue; whereas constant comparative method was more useful for exploratory research. The investigators hope that sharing these steps of using constant comparative method followed by discourse analysis will provide a useful methodological example to others who are interested in how to sequentially use different methodologies in virtual world research to investigate issues that arise in their experimentation with teaching in 3-D MUVES.

According to Wikipedia, discourse analysis is

“... a general term for a number of approaches to analyzing written, spoken or signed language use ... The objects of discourse analysis—discourse, writing, talk, conversation, communicative event, etc.—are variously defined in terms of coherent sequences of sentences, propositions, speech acts or turns-at-talk. Contrary to much of traditional linguistics, discourse analysts not only study language use 'beyond the sentence boundary', but also prefer to analyze 'naturally occurring' language use, and not invented examples.” (Discourse Analysis, 2009)

Gumperz (1982) contends “that to understand the role of language in education and in social processes in general, we need to begin with a closer understanding of how linguistic signs interact with social knowledge in discourse” (p. 29). The approach in this study mirrors conversation analysis.

Having created categories and identified common patterns using the constant comparative method, the next step was to select “frustrations” as a salient theme. The coders then reviewed the entire set of transcripts for all instances related to the category frustrations. The number of references to *frustrations* were counted over the 6-week course duration. Frequency data over the entire course encourages a more longitudinal look that can help answer whether the frequency of these occurrences is maintained, decreases or increases. Further, the video transcripts reveal which individuals were involved in exchanges allowing one to explore whether individuals are taking on certain roles within the discourse. Specific instances of frustrations were examined for

the subsequent discursive response to determine the patterns common in how frustrations are responded to in a course setting in SL.

Results & Discussion from Constant Comparative Analysis

While the preliminary analysis of the data indicates that students' perceptions and learning experiences were very diverse, three common themes emerged from the data collected and initial analyses. Similarities were found among the students' experience concerning a) frustrations with technical issues and learning functionalities of SL, b) need for socialization and sense of presence, and c) appreciation for the potential of SL for teaching and learning.

Technical Issues and Steep Learning Curve.

One major recurring theme in the data sources was about students' frustration with technical issues and the steep learning curve of learning the functionalities of SL:

[Blog posting]:

I restarted the computer, tried to log back in the SL – SL crashed again. I tried again, and got an error message saying the region was logging out – something like that... What I took away from this were the potential problems associated with a SL technical failure.

[Video transcript]:

I see [avatar's name] has come online again. So it is pretty common I guess people will drop in and drop out [of SL] because of lack of bandwidth.

[Blog posting]:

For something I want to learn so badly, it certainly has me in a state of constant frustration! One thing I realized this week is that the speakeasy HUD that includes directions for building we are doing... is completely distracting! Whatever it is I am building gets lost behind the text. Trying to read the notecards, with text flying by... ugh!

[Blog posting]:

But it does take a lot of time and effort to build materials that could be used in a classroom. I am sure it gets easier with more practice, but it does take a lot of time and effort to build one object because I would either forget a step or think of a better way to make it.

Sanchez (2009) interviewed a focus group of students to understand their experience in a Fall 2006 world literature course that had some activities during the semester in SL. The majority of students registered negative emotions with their experience, ranging from boredom to frustration and anger. Sanchez grouped these negative experiences into four categories: technical, interface, user expectations, and time. The counter intuitiveness of the SL controls was a predominant complaint in this area. To the extent students were familiar with computer games such as the Sims or Grand Theft Auto, the expectations that SL would have a similarly easy interface and goals contributed to their frustration. The time-consuming nature of SL also alienated some students. One thing generally agreed upon by students interviewed was the high learning curve that exists for new users of SL. However, Sanchez identified three components that help to create a positive student learning experience: creating and customizing ones avatar; challenging students to think visually and creatively; and opportunities to play.

Similarly, Skiba (2009) presented three main challenges of using SL: mastering the SL environment, by learning how to build, how to purchase, how to find scripts, and gaining additional skills; securing an appropriate level of hardware and access; and lastly, enabling the students to master the skills necessary to use SL. According to Skiba, students' reaction to using SL was described as mixed initially, with students registering a more positive experience over time. This was also reflected in data:

[Blog posting]:

I just re-read my first blog that I wrote during the first week of this course, and I remember how discouraged I felt because I fell so behind while building the objects. However, now at the end of the course, although I am no where near to being an expert builder, I feel confident in using prims, scripts, and the other building elements to construct objects in Second Life. As I mentioned in my very first blog, "I cannot wait to look back on this blog at the conclusion of this course, and think, "ACCOMPLISHED!"

well, six weeks later, I honestly do feel accomplished as I was able to create a virtual learning environments in Second Life with my partner... a task that I once thought was a very, very, very far-fetched goal finally became a reality.

Socialization & Social Presence

Another theme that emerged from our preliminary analyses is of the need for socialization in SL and the ability of SL to provide learners with a sense of presence:

[Blog posting]:

It seemed to me that SL was one big social wasteland, good for elaborate but lifeless buildings and sites. My community in SL started to take root with this class. In addition to meeting class members, I began to get acquainted with others in SL, such as [avatar's name], who took me on a tour of the UH site, and [avatar's name], a librarian whose RL lecture I attended. Some of my friends from Twitter are also in SL. As my community grew, so did my interest in SL.

[Blog posting]:

A couple of observations...co-presence or ambient awareness – the sense of being there and connected, is really evident when we're in Second Life. I mean it literally seems we're meeting face-to-face when we're in class and meeting with our groups. I wonder if it's because, subconsciously, we know that someone is controlling each avatar we see in class? It was funny when Mark, Cheryl and I met a few nights ago in Second Life. At the end of our meeting both Mark and I complemented Cheryl on the dress she was wearing – her Second Life dress. It was a beautiful dress! The lines are getting blurred.

Edirisingha, Nie, Pluciennik, and Young (2009) contend that the SL environment creates a sense of immediacy and social presence, reducing the sense of distance through the use of high-bandwidth technology. This in-world socialization could be extended to network building in real life among the participants and a positive learning experience overall. They argue that their research supports the notion that the ability of a medium to engender social presence is

dependent on its bandwidth. The availability of high bandwidth networks creates the potential for socialization to occur at a distance in 3-D MUVE.

Appreciation of SL's Educational Potential

Additionally, many students expressed their appreciation and enthusiasm for SL as an educational innovation with tremendous educational potential:

[Blog posting]:

How valuable do I think SL can be for education? Well, I've been looking to buy some land and start establishing my space where I can further explore how best to incorporate SL into what I do at work. More than that, I want to look at how I can begin doing new things in new ways. Only time will tell where that leads – I sure am excited about the journey.

[Blog posting]:

The in-class experiences with building objects has taught me to be appreciative of the objects in Second Life environments. A simple 3D tree takes skill and time to create, so I can imagine how much effort and time it takes to build an entire environment or sim. Nevertheless, the power of sims for educational purposes is significant. Sims allow participants to experience and to be immersed in settings and situations that may be difficult to achieve in real life, if not impossible. It also adds convenience as participants can visit these virtual locations any time of day and anywhere they may physically be, as long as a computer with Internet connection and Second Life is accessible. Furthermore, participants do not need to worry about crowds, expensive costs, and even dangers that would be related to performing certain activities in real life. Second Life can take educational opportunities above and beyond!

The constant comparative analysis highlights the importance of addressing the issues of students' frustrations with technical problems, the steep learning curve of SL and the need for socialization in order to get students engaged in SL. More importantly, this analysis has implications on the

changing roles of instructors in virtual worlds (Berge, 2008). With the change in how students learn in virtual worlds, the instructor's role needs to change as well.

Results & Discussion from Discourse Analysis

Figure 3 provides a graph of the number of frustrations that student participants in this study experienced over the duration of their six-week course as reflected in their weekly blog postings.

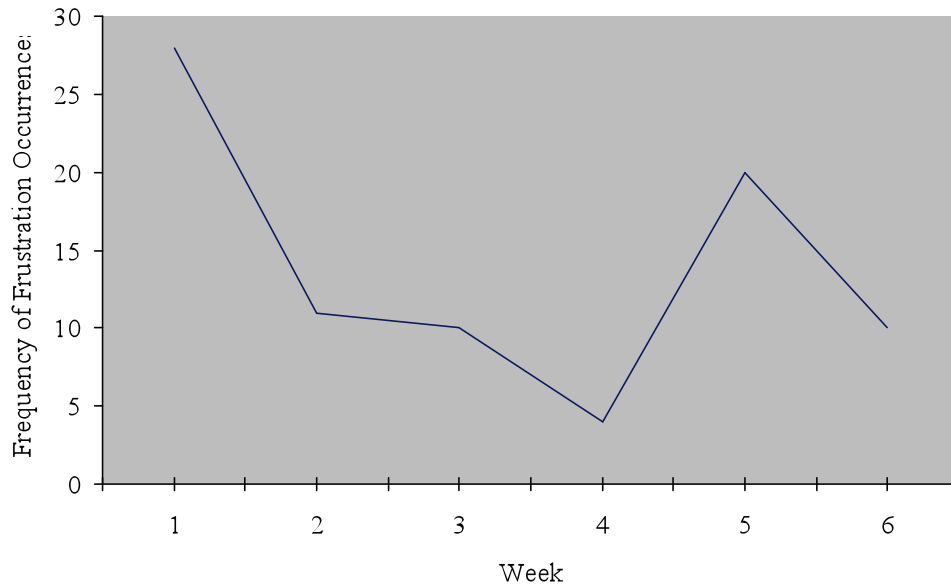


Figure 3. Frequency of frustration occurrence over the six-week course duration as reflected in students' weekly blog postings.

As one can see the majority of concerns was apparent at the beginning of the new course and rapidly decreased as the course progressed. There was a spike in week 5 because a specific problem occurring. During one of the in-world sessions in week 5, SL experienced a lost of its voice capability. Fortunately, the instructor had access to an audio conferencing system and by getting the students to log into the audio conferencing system, the instructor and students were able to conduct audio conversations. However, running two band-width intensive software (SL and an audio conferencing system) simultaneously created numerous technical problems for many students.

In addition to numbers of instances, patterns of discourse were examined in the video transcripts. When a frustration was expressed, what happened? Did the instructor address it or

comment on it? Did peers respond? Firstly, frustrations or concerns were typically expressed using the text chat rather than voice. As mentioned earlier, students seemed more comfortable communicating using text chat and that text chat comments or questions were typically addressed later in the audio conversations. The delay is due to the fact that attention was focused on the more prominent audio conversations.

Secondly, when frustration or concern was expressed (typically through text chat), the first person to respond was usually either the teaching assistant or a fellow student. The instructor was usually preoccupied with leading the class through a build exercise or a lecture and would only become aware of the situation later because of the text chat interactions. Here is an exchange from the video transcripts (red text indicates text chat conversation while audio conversation is in black text):

Instructor: So today, I just want to give you a quick introduction...all that you have experienced in the second life environment so far, okay.

Student A: [argh... I can't sit...

Instructor: I am sure all of you know what the second life is, but I just want to clarify that it is technically known as a multi-user virtual

Teaching Asst: [then choose relax

Instructor: environment, m-u-v-e-,

Student B: [choose "relax."

Teaching Asst: [there we go :)

This exchange illustrates a typically response to an expressed frustration where Student A was unable to "sit" on a floor cushion in SL. While the instructor is preoccupied with presenting an overview lecture, the teaching assistant and Student B were quick to respond to Student A's frustration.

Another interesting observation was the occurrence of students using the instant messaging (IM) feature in SL to help troubleshoot their peer's technical problems. Students who are more comfortable in SL tended to use IM to reduce the local text chat "clutter." These private IMs are not captured in the video recording. However, detailed analysis of the video transcripts revealed that there are probably instances of such occurrences:

Student C: [I still don't have it...

Instructor: ... educational purposes. It's not building a building, per se...

Student C: [I think...

Instructor: ... although you can though once you have the ability...

Student C: [...I have a grey dialog box

Instructor: Do you get the idea? Yeah, you now need to think in three dimensions, we are no longer thinking in just two dimensions. So going...

Student C: [Is there another box?

Instructor: ...forward, you are thinking in three dimensions, and then you will be able to see things all from 360 degree view, ok? I know you are not familiar with this and I can't emphasize enough, and I will repeat over and over again, how important it is for you to get used to using the alt zoom feature

Student C: [Got it

Student C: [Thanks

This exchange seems to indicate that Student C was talking to himself. Student C was having problems with a build exercise but his problems seemed to be “miraculously” solved. Although we are unable to see the private IMs, it is highly probable that Student C obtained some help from another student via IM as indicated by subsequent interactions with the teaching assistant and instructor.

The presence of the instances described above is indicative of the relative ease with which the users of this virtual environment make use of the different media available to them, integrating information from text, audio and visual channels. The challenge in terms of trying to address individual research questions is to develop a theoretical framework that connects the frequency of certain interactions with higher level concepts such as learning outcomes. Arguably peer interactions are excellent opportunities for generation and resolution of cognitive conflict (Tudge & Rogoff, 1999). The process of repair observed in the discourse can be seen as an indication of learning opportunities. Too much conflict and the learner becomes demotivated and gives up in despair (Wlodowski, 2008). Tracking the instances of peer interaction, particularly

those that involve repair will likely provide insight into how the virtual environment supports effective learning, and perhaps provide prescriptions for increasing their effectiveness.

Conclusion

A graduate education course was taught in Second Life as an experimental course and served as a case study for investigation. While the goal was to investigate students' reactions to their course experience, the researchers learned many valuable lessons about the practical steps to recording in-world class sessions, transcribing those classroom dialogues, and utilizing them as one source of data. From using ScreenFlow as the video-capturing software to disabling timeout features of SL or Mac OS systems, the researchers believed it was important to share the many tips and tricks learned with the community of individuals interested in research in virtual worlds to improve logistical data collection in future studies.

As much of the research in virtual worlds is still developmental, the investigators of this study chose to combine multiple data sources and multiple data analysis methods to triangulate findings. Classroom observations were conducted in the in-world SL classroom space originally by a non-participant "camera person." Similar to observation methods recommended in real world settings, converting the "camera person" to a participant observer proved more fruitful in the capturing of the action in-world of the instructor and students.

Using multiple data analyses allowed the researchers to best target different types of research questions. Constant comparative analysis proved very useful in identifying salient themes from a broad exploratory approach. Using multiple coders and data sources addressed common concerns with this approach with regards to rigor of data collection and analysis (Patton, 1999). With student reactions as the focus, the three most salient themes emerged as: frustrations with technical issues and learning curve in SL, socialization and social presence, and appreciation of SL's educational potential. The researchers then choose to select one of those themes and explore it from a different perspective using discourse analysis. Student *frustrations* was investigated as it is likely to be common in any course taught in SL and most broadly useful to a larger audience. Frequency findings indicate that frustrations are much higher at the beginning of a course and, in general, decrease over the duration of a course. However, new frequency spikes of frustrations are likely to emerge when a new technology pitfall is encountered. In the particular example in this study, the audio was very troublesome during a

particular class session. Using discourse analysis, the investigators also began to explore roles and sequence of responders to student frustrations. Student frustrations were predominantly expressed in text box chat versus a student making a verbal comment in classroom discussion. The particular course examined was fortunate enough to have a teaching assistant. This individual was the primary responder to student frustrations. However, instances were found of peers assisting peers. The roles of responders to frustrations discovered in this study, strongly suggest the utility of a teaching assistant in a SL course, especially one in which students and instructor may have less experience with courses in SL. The investigators found the sequential pairing of constant comparative method followed by discourse analysis a useful combination.

References

- Berge, Z.L. (2008). Changing instructor's roles in virtual worlds. *Quarterly Review of Distance Education*, 9(4), 407–414.
- Campbell, C. & Jones, S. (2008). Using second life as an educational instructional tool with pre-service education students: A work in progress. In Proceedings of *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2008* (pp. 3638-3642). Chesapeake, VA: AACE.
- Discourse Analysis. (2009). In *Wikipedia, the free encyclopedia*. Retrieved November 15, 2009, from http://en.wikipedia.org/wiki/Discourse_analysis.
- Edirisingha, P., Nie, M., Pluciennik, M., & Young, R. (2009). Socialization for learning at a distance in a 3-D multi-user virtual environment. *British Journal of Educational Technology*, 40(3), 458-479.
- Foster, A. L. (2006). Harvard to offer law course in 'virtual world'. *The Chronicle of Higher Education*, 53(3), A.29.
- Glaser, B. (1965). The constant comparative method of qualitative analysis. *Social Problems*, 12(4). California: University of California Press.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine Degruyter.
- Gumperz, J. J. (1982). *Language and social identity*. Cambridge: Cambridge University Press.
- Jarmon, L., Traphagan, T., Mayrath, M., & Trivedi, A. (2009). Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life. *Computers & Education*, 53, 169-182.
- Johnson, L. F., & Levine, A. H. (2008). Virtual worlds: Inherently immersive, highly social learning spaces. *Theory Into Practice*, 47(2), 161-170.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.
- Michels, P. (2008). Universities Use Second Life to Teach Complex Concepts. *Government Technology*. Retrieved from <http://www.govtech.com/gt/252550>.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

- Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Service Research*, 34(5), 1189–1208.
- Ragin, C. (1987). *The comparative method: Moving beyond qualitative and quantitative strategies*. CA: University of California Press.
- Sanchez, J. (2009). Barriers to student learning in second life. *Library Technology Reports*, 45(2), 29-34.
- Second Life. (2009). In *Wikipedia, the free encyclopedia*. Retrieved from Wikipedia November 15, 2009: http://en.wikipedia.org/wiki/Second_Life.
- Second Life. (2010). *Video resources*. Retrieved from Second Life Wiki January 4, 2010: http://wiki.SecondLife.com/wiki/Movie_Recording
- Skiba, D. J. (2009). Nursing education 2.0: A second look at second life. *Nursing Education Perspectives*, 30(2), 3.
- Tudge, J., & Rogoff, B. (1999). Peer influences on cognitive development: Piagetian and Vygotskian influences. In P. Lloyd & C. Fernyhough (Eds.), *Lev Vygotsky: Critical Assessments, Vol. 3: The zone of proximal development*. London: Routledge. [Reprinted from Bornstein & Bruner (Eds.), *Interaction in human development*.]
- Twining, P. (2009). Exploring the educational potential of virtual worlds, Some reflections from the SPP. *British Journal of Educational Technology*, 40, 496-514.
- Warburton, S. (2009). Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British Journal of Educational Technology*, 40(3), 414-426.
- Wlodkowski R. J. (2008) *Enhancing adult motivation to learn: A comprehensive guide for teaching all adults, 3rd edition*. Jodsey-Bass, Wiley.