

DESIGNING FOR VIRTUAL LEARNING SPACES: A SECOND LIFE EXAMPLE

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This case describes the design of a virtual campus learning space using the *Second Life* platform. *Second Life* allows users to create spaces in which avatars can move about and interact in various environments using text, voice, or gestures to communicate. Several universities have reported utilizing *Second Life* spaces to enhance collaborative learning and problem solving as an extension of traditional face-to-face learning, while others are teaching entirely within these *Second Life* environments. This project reports the process and outcomes of the design of a virtual campus for Florida State University and focuses on two aspects of the project: the design of a virtual library, and the design of a virtual retail space. The process can be described in four phases that summarize the progress of the design from ideation through execution: 1) pre-design, 2) design-build, 3) evaluation, and 4) occupancy. The resulting design solutions were carefully evaluated and modified prior to occupancy and the final designs successfully met client needs and supported student learning outcomes. This design project, conceived and developed by an interdisciplinary design team, addressed project planning in the design of a virtual environment.

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INTRODUCTION

Life is experienced in many different types of environments, often created by designers who carefully consider the needs of those who will use these spaces. Designers must take into consideration both the function and aesthetics of the space and how the design will contribute to the overall user experience. These considerations are important in the real world of “bricks and mortar,” but they are equally important in the design of online virtual world environments. This design case describes the process used in the crafting of a virtual university campus and the creation of virtual learning environments within that campus. The project discussed herein involved the design of a virtual university and focuses on two aspects of the project: the design of a virtual library, and the design of a virtual retail space. This exploratory design project was conceived and developed by an interdisciplinary design team at Florida State University to assess the potential uses of the *Second Life* platform to create virtual learning environments. The authors, two participants in the design-build process, describe project goals, challenges, and lessons learned from the pre-design phase through a virtual evaluation.

Second Life is an online virtual world in which players navigate through and interact with three-dimensional environments from a first person perspective. Players are represented in these spaces as avatars. Often these avatars take the form of human or anthropomorphic figures, but there are no limits to the form an avatar can take.

Second Life was launched in 2003 by Linden Research, Inc. (Linden Labs, 2008). Unlike other online games, *Second Life* itself has no goals or objectives, no points to be earned, and there are no winners or losers. Like real life—one’s “first life”—*Second Life* is what the participants make of it. *Second Life* provides opportunities to interact in many different types of virtual environments including coffee shops, art galleries, retail stores, bars and restaurants, learning spaces, parks, and natural settings (Kirkpatrick, 2006).

Avatars can move freely through these *Second Life* virtual environments using the primary modes of transportation

which are walking/running, flying, or teleporting. While in these virtual spaces, avatars can socialize with one another, generally via voice, text, and gesture-based communication, and participate in individual and group activities (Ondrejka, 2004) by making use of scripted objects. Scripted objects are items embedded with Linden Scripting Language: code that causes the object, or the avatar using it, to behave in a certain way when the script is activated.

Many online games include movement, communication, and activities; these are not unique to *Second Life*. What makes *Second Life* different from other games is that the software is free and open source, allowing any player to create content for other players and trade items and services for a currency called the Linden Dollar. Many designers and builders in *Second Life* have no formal training; they have simply taught themselves to use the intuitive *Second Life* interface (Jones, 2006) along with step-by-step building and scripting tutorials (Linden Labs, 2008).

The freedom and versatility of *Second Life* led many major universities to develop virtual campuses and learning environments in *Second Life* during the mid-to-late 2000's (Linden Labs, 2008). Some universities actually hold classes in *Second Life*, while others simply use the environment as an extension of traditional classrooms. *Second Life's* ease of use also offers a new way for universities to teach design, along with building and scripting in virtual environments (Clark & Waxman, 2008). A study by Penn State University concluded that *Second Life* is a very effective venue for collaboration and problem-solving (Harris, 2008) and a team from Cornell University proposed strategies for effective leadership in virtual teams (Bell & Kozlowski, 2002). It is with this background information that the authors and their team decided to embark on a virtual design project of their own. The project that is described here was designed for the *Second Life* platform, but there are other, newer platforms available that might also be suited to this type of application, such as Cloud Party or OpenSimulator. It is important to note that *Second Life* was instrumental in the success of today's buildable virtual environments; both Cloud Party and OpenSimulator were created based on lessons learned from *Second Life's* pioneering efforts. The authors explored the strengths, weaknesses, and opportunities inherent in multiple platforms (e.g. *Second Life*, Cloud Party) during the pre-design phase.

THE PROJECT

Pre-Design Phase

The goal of the project was to create a virtual campus in *Second Life* that would serve as a recruitment, orientation, and teaching and learning resource for Florida State University. The project centered around the modeling of a well-recognized campus green that covers several acres in the heart of campus. To the north is the main campus library, to the east and west are classroom and administrative buildings, and to the south is the honors dormitory. In total, four of these buildings were to be included in the first phase of the virtual campus. These four buildings were to become an historic center, retail space, library, and classroom building. In the center of the campus there would be a teleportation hub and in the open green spaces would be a sandbox creative space and ecology learning center. This design case focuses on two areas of the project: the virtual library and virtual retail space. Grant funding for the project covered the cost of server space and some incidental design development costs. The interdisciplinary design-build team included faculty and student expertise from three departments—interior design, information science, and merchandising—as well as independent consultants for specific aspects of the project.

A map of the real life campus green was imported onto the virtual landscape, as shown in Figure 1, and each area was assigned to a subgroup within the project team.

Design Goals

The project planning meetings allowed the team to make some overall conceptual decisions and develop guidelines that would shape the project. These decisions were based on direction provided by the University to the project team,

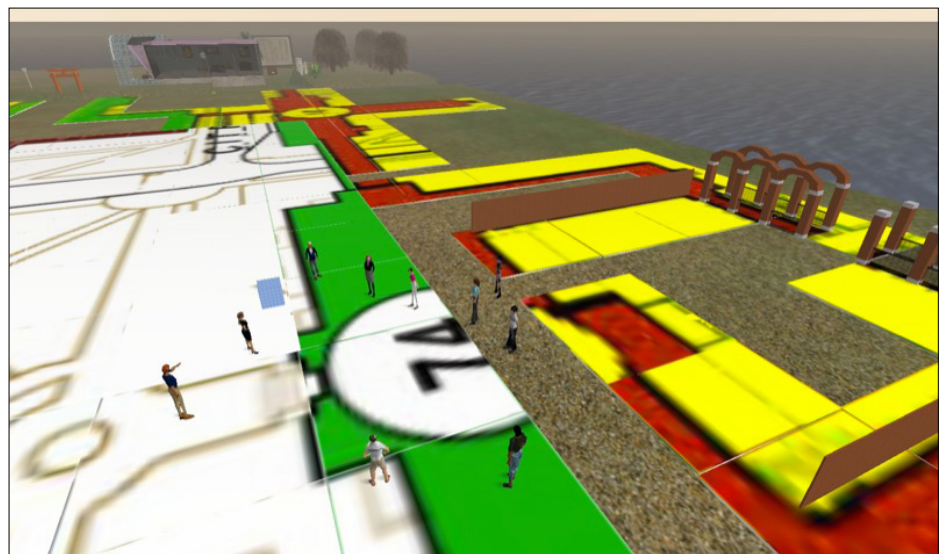


FIGURE 1. Map of the campus green superimposed over the virtual landscape.

meaning that not all design decisions were within the team's control. The first two design goals were: 1) to provide facilities for recruitment and orientation, and 2) to provide facilities for virtual classes and lectures.

First, the University wanted to be able to use the virtual campus as a recruitment and orientation center. That is, the administration wanted virtual campus visitors to feel as if they were visiting the physical campus. Therefore, the decision was made that all exterior spaces should be built as true-to-life as possible. This design goal became part of the overarching concept for the work, and influenced many later decisions throughout the project.

Second, the University wanted to be able to hold classes and lectures on the virtual campus. Therefore, the decision was made that all interior spaces should be designed to support teaching and learning experiences. This design goal influenced the size and space planning of interiors, as well as their functional requirements.

The third design goal was to ensure that the virtual campus was as accessible as possible to the largest number of prospective visitors. An unexpected result of this design goal was the need to conserve virtual resources throughout the process because the project was to be conducted on a parcel—a virtual building zone defined by *Second Life*—with limited resources. For example, the number of objects—called primitives—per parcel is limited both by the *Second Life* system and by the number of visitors expected. The more objects in a space, and the more visitors that are present, the slower the interface becomes. In extreme cases, this can lead to a total system crash that prevents users from accessing the space at all. The design goal of accessibility,

and the limitations of the parcel, meant that all designs would need to be constructed with as few objects (e.g., cube, cylinder) as possible to reduce the load on the parcel's designated server space.

These three design goals led to the development of an overarching design concept that led the team's decisions throughout the design process:

"The FSU virtual campus will be an open, accessible gathering space for learning and exploration. The design will feel intimately connected to the physical campus, giving visitors, students, and faculty an authentic on-campus experience through the virtual platform."

The main campus library on the north end of the green was to be developed as a virtual library to provide a way for students on the *Second Life* campus to access real online university resources and interact with real on-campus library staff. The design of the virtual library was assigned to a team consisting of an interior design student, an information science student, and a library consultant. The interior designer and librarian had previous experience building in *Second Life*, while the information science student learned as the project progressed.

One of the classroom buildings, located in the southeast corner of the green, was designated for development as a virtual retail store as part of an online component in a face-to-face merchandising course. The virtual retail store design was assigned to a team consisting of two information science students, two merchandising students, and one interior design student. In this group, only the interior design student had any previous experience building in *Second Life*.

The two information science students were both experienced in coding and scripting languages that enabled them to quickly learn Linden Scripting Language. The merchandising students were new to *Second Life* and developed their skills while working on the project.

During the project planning phase, team meetings were conducted in *Second Life* on the virtual site by team members using their avatars. In fact, most team members



FIGURE 2. Scale of building façade being discussed by two team member avatars.

have never met one another face-to-face. Interdisciplinary design teams of graduate students made regular reports via email to faculty supervisors who acted as project managers. Faculty also frequently visited the project site to inspect progress and make recommendations to the teams. Discussions were conducted largely via text-based chat, with a few avatars using voice chat. This virtual presence enabled the team to discuss the project while actually being immersed in the design, allowing enhanced communication regarding the project. However, this also posed certain challenges. Text-only communication was often slower than verbal communication might have been. Further, the inability to sketch ideas quickly or share reference books meant that all design decisions were communicated using written descriptions and virtual models within *Second Life*, and all resources were shared digitally.

In *Second Life*, the team used visuals such as color-coded maps, photos, and virtual scale mockups (Figure 2) to communicate the overall design goals and direction.

Meetings in *Second Life* were supplemented by site visits to the real life campus green, where reference photos helped the team define an appropriate materials palette and reference human scale in relation to key environmental features, such as the façade shown in Figure 2.

The pre-design phase for this *Second Life* virtual environment allowed the project team to define design goals, develop the concept, and determine participant responsibilities. This phase was in many ways similar to that of a real life physical environment. However, the virtual design process from this point forward was very different than the building phase of a real, tangible project.

Design-Build Phase

In a typical, real life design project the team would develop conceptual drawings and later construction documents before beginning the construction phase. In a virtual *Second Life* design project there was no need to represent three-dimensional space two-dimensionally (i.e., via pencil and paper) when the team could just as easily create a full scale three-dimensional mockup. Using *Second Life* mockups, feedback from the team could be given, and changes made, in real time. A full scale copy of each revision could be saved, and the design process could be documented *in situ* with a quick screen capture. The conceptual stage of development was communicated entirely with virtual models rather than hand or digital sketches. The team found this to be effective because not all team members were able to create or interpret conceptual design drawings, but all team members were able to participate in virtual mockups and thus communicate clearly about what was being proposed. For the purposes of this project, the team members referred to this process as the design-build phase because the team

concurrently designed and built the components of the project using the built-in tools within *Second Life*.

The built-in *Second Life* building tools are not the only way to create virtual environments for *Second Life*. Many software programs with which interior designers are better acquainted, such as Sketchup, AutoCAD, and Revit, can export files compatible with *Second Life* but these are not often used because objects created in programs such as these tend to be more complex requiring more space on the *Second Life* server, slowing down interactivity, and eventually overloading the system. There are other software programs that are more appropriate for building complex objects that take up little space, but these programs are not commonly used by interior designers.

Most objects in this project were constructed within *Second Life* by the team at little or no cost. Building new objects within *Second Life* is free. However, purchasing objects and textures to import into *Second Life* requires Linden Dollars, which can be purchased with a player's native currency. Where objects could not be constructed from scratch, they were purchased from freelance *Second Life* builders using the project's grant funds.

Objects built in *Second Life* are constructed of primitives, called prims, which tend to be much less complex in structure than most imported objects, even when they appear very detailed. Many of the components created by the project team were built in *Second Life* with prims. *Second Life* builders also use sculpted primitives, or "sculpties," to create organic forms. Sculpties can be created in *Second Life* but are more often developed in third party programs and imported. Many of the components purchased from freelance *Second Life* builders for this project were sculpties.

The Library

The first stage of design-build for this project was the development of the virtual library exterior. The real building was originally constructed in the 1950s and the exterior character is dominated by simple, rectangular forms. The footprint is rectangular in shape, with a protruding segment near the front (south) entrance that faces the green.

The librarian consultant worked with the team and with library staff to develop a way for students visiting the *Second Life* campus to access online university resources and interact with on-campus library staff. First, the librarian consultant established a schedule that would allow a library staff member to be present at a traditional reception desk in the virtual library during specific business hours.

The reception desk served as a point of contact for the university students visiting the *Second Life* library. It was designed so that the library staff member would be able to provide information and set up for scheduled events. Initially,



FIGURE 3. Library setup for an orientation session.

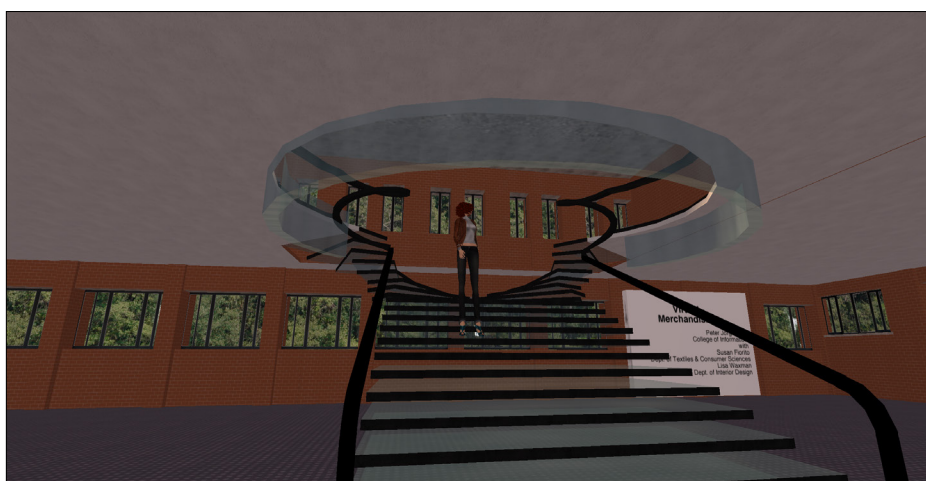


FIGURE 4. Early model of a grand stairway outside the retail bays.

the library staff did not agree how the library space would be best used. Some felt the library should provide a visual representation of online resources, like the journal database and book renewal system. Others wanted to have a virtual classroom with lecture-style seating that could be reserved by university faculty for classes that would be held in *Second Life*. Further suggestions included creating an art gallery, coffee shop, or a sandbox, which is a creative space for building in *Second Life*.

The design group considered these suggestions within the context of *Second Life*'s flexible platform and determined that all these suggestions would be possible if the group created a variety of interchangeable space plans. These various plans were to consist of all the elements of a designed space—partitions, furnishings, lighting, equipment and décor—all stored within a file within the platform. They could then be loaded into the library space as needed allowing the space to provide various functions as needed. Time for class? Load the classroom setup with projection screen. Ready for a study group? Load the coffee shop with comfortable

lounge chairs. With packaged plans the library environment would be completely adaptable. Figure 3 shows the setup for an orientation session.

The Retail Space

Design development of the virtual retail space for use by the merchandising students came next. The retail shops were placed in the southeast corner of the campus, in what was, historically, the campus dining hall. Completed in 1939, this structure was designed in the collegiate gothic style; its high, arched windows and regular spacing of bays made the building ideal for conversion to a multi-story retail space (Figure 4).

Once the new location was determined, the retail design team began by working on the functional requirements of the retail space. The retail work was the most script-intensive part of the design project because of the requirements given by the merchandising instructor who would be using the space. It was important for the team to understand the requirements of the merchandising course and how it would guide design decisions. Each student in the

merchandising course would be assigned a bay within the retail space. Each bay was required to be of the same shape and size, and each had a display window. There were to be twenty students enrolled in the course, so the structure was planned to hold a total of twenty identical retail spaces, ten in front and ten in the rear.

Avatars visiting *Second Life* have the opportunity to select clothing and make other purchases for their avatar. These purchases would give the students a chance to test their merchandising skills in the virtual world and give the teacher a way to measure the student's designs.

Each merchandising student was responsible for designing the assigned retail space and placing virtual garments within it. A well-designed space with good garment placement should result in a higher volume of garment sales than the sales in a poorly designed space with poor garment placement. The goal was to measure the effectiveness of the design by tracking how many garments were purchased by visiting avatars. The instructor needed a way to automatically

track this information. The design team achieved this function in three steps. First, they embedded every garment with a unique tracking code. Second, they created display racks and tables and embedded each of these with a script that registered the garments it housed and how many times each item was purchased by an avatar. Last, the data generated from the racks and tables was collected by a centralized point-of-sale (POS) device within each shop.

Not all items in *Second Life* are sold for Linden Dollars—some are free. The merchandising course allowed students to change the price of each item and track how price impacted sales numbers. For the purposes of writing the scripts, an item was considered purchased when a player selected a garment with the cursor and downloaded it, whether or not the item cost anything to download. Each purchase was recorded within a text file. Once all purchases for a period were recorded, the student could download the file and import it as a spreadsheet document that tracked when an item sold and for what price. As part of the course, students were taught how to use this information to generate merchandising reports.

Each garment was coded and each rack scripted to log those codes, but the biggest challenge of the project was to find a way to collect the codes for each shop and create a downloadable database for each student. This was achieved by assigning a number to each shop and coding each rack and display table with the shop number. A point-of-sale (POS) device, much like those used in a real store, was given to each retailer and scripted to collect only the information pertinent to its assigned retail space.

In *Second Life*, retail spaces do not require an attendant, because items can be purchased by a player at any time and thus, items cannot be stolen from a store. Therefore the POS was designed to be invisible by being hidden inside some object within the finished space. As part of the merchandising course, each student was required to design their retail space, plan merchandise displays, and select garments to sell. During the shopping experience the hidden POS would record a shopper's purchase as soon as the player added the garment on the rack to their inventory. The system designed by the team was able to automatically

catalogue every garment placed within the shop and every garment purchased from the shop without requiring the merchandising student to learn Linden Scripting Language. The ultimate goal of this aspect of the project was to provide a way for merchandising students to track virtual inventory and make informed merchandising decisions, just like in a real retail business.

Design development of the library and retail spaces was followed by an evaluation phase during which the project team tested and adjusted building systems.

Evaluation Phase

Once the space was created, it provided the opportunity for careful evaluation of the design, which was conducted using a test group of twenty students and six faculty over the course of two weeks. This evaluation benefitted the project in several ways. First, it revealed an error in the functioning of the sliding door systems. The doors were programmed to detect an approaching avatar, open, and close automatically behind the person. However, beta testing revealed that there were large variations in avatar walking speed and ability to move through small openings than initially anticipated. Many users reached the entrance before the doors fully opened, or failed to reach the door before it closed again. Careful evaluation allowed the team to develop a new timing system that functioned properly for 90% of avatar users and pointed out another problem with universal accessibility—stairs.

The default avatar form in *Second Life* is capable of walking, running, flying and teleporting. However, some users choose a form that is not capable of all of the above modes of transportation. Some, for example, are wheelchair users. Although these avatars represent a small percentage of total users, the team was able to add ramp access to all level changes



FIGURE 5. Testing the garment rack functionality.



FIGURE 6. Avatar perusing the merchandise.

and improve the accessibility of the library and retail public spaces. In other areas, such as the courtyard, level changes were removed completely for accessibility.

The evaluation phase also revealed a flaw in the inventory tracking system. When beta testers from the merchandising course began setting up their retail spaces, the inventory reports revealed that some garment purchases were not being recorded. Figure 5 shows an avatar testing functionality in the retail space.

The POS devices were scripted to record purchases within a specific distance, but based on the location of the POS some merchandising displays were out of range. Further adjustments to the distance setting resulted in a different problem, namely that some garment purchases were duplicates, which meant a single purchase was recorded on multiple inventories. The solution was to assign each POS device a unique communication channel, but retain the larger distance setting.

Without the evaluation phase, this error would have occurred during a live course and resulted in major problems for the student users, the professor, and customers. Adjustments allowed the project team to resolve these problems early without any inconvenience to the end users. The two-week evaluation phase was planned around larger project deadlines. Given the opportunity, the authors would have preferred a longer timeline for evaluation—possibly a semester-long beta test in which the space could have been occupied by students from a couple of different classes over the course of a full academic term.

Occupancy Phase

After successful evaluation of the space, the virtual campus was opened to the public, meaning anyone from anywhere

around the world could visit the University's *Second Life* space. As part of this grand opening, the virtual library began serving students and campus visitors and the virtual retail space opened to its first group of merchandising students. Figure 6 shows one of the retail spaces being visited by an avatar.

In the library space, the staff set up informational posters and links to online

library resources around the reception desk. They created an online reservation system and began scheduling *Second Life* events using the adaptable event packages provided by the design team. The librarians, more than any other user group, claimed their territory by personalizing the *Second Life* library much as they had personalized their real life one. The project team interpreted the compatibility of the design with the users' adaptation as an extension of the positive working relationship between the users and team during the design process.

In the retail space, each student was assigned a bay. Using the team's scripted inventory system, the students were able to track how many and which type of items were sold in each store. This information was downloaded into a database that allowed each student to analyze the data and write a report summarizing the relationship between consumer purchasing habits and merchandise planning decisions. Students were also able to observe visitor behavior within the retail space and ascertain the impact of merchandise placement and space planning on the decision to purchase. The merchandising instructor reported that the virtual retail space supported the necessary student learning outcomes as identified during the design process. At the conclusion of the semester, the retail space—later named The Campus Mall—was opened to use by any merchandising course and possibilities exist to further extend the semester-to-semester merchandise offerings into a year-round virtual campus store.

CONCLUSION

This case has described the process of designing a virtual learning environment with a focus on two parts of the project: a virtual library and a virtual retail space. The first phase of the virtual campus also included a historic center,

classroom building, sandbox creative space, ecology learning center, and central teleportation hub.

The process used by the design team resulted in the completion of a design that successfully met the goals defined by the University in that it served as a recruitment, orientation, and teaching and learning resource. The team identified project objectives and communicated effectively across multiple disciplines to respond to the needs of a variety of constituencies. The resulting design solutions were carefully evaluated and adjusted prior to occupancy, saving time and effort. The final design successfully met client needs and supported student learning outcomes. The process can be described as:

1. Pre-Design
2. Design-Build
3. Evaluation
4. Occupancy

These four phases summarize the progress of the design from ideation through execution and the authors felt that this process worked well for this project.

This project was developed in response to certain expectations of the University, including the goal that the virtual campus would in many ways mimic the real life campus. The authors did not advocate for this approach, but encouraged the exploration of strengths, weaknesses, and opportunities inherent in multiple platforms and approaches during the pre-design phase so that the final design could be as strong as possible.

The authors also ensured that all members of the interdisciplinary design team were brought on board at the very start of the project and were kept engaged throughout the entire design process so that all team members felt ownership of the outcomes. This enabled the team to identify potential problems early on and adapt solutions at any point in the design process.

From an educational perspective, participation in the interdisciplinary virtual design team provided valuable learning experiences by exposing students to a variety of perspectives from different professional and user groups.

The authors' experiences on this and other projects suggest that interior designers had a valuable role to play in the development of this virtual environment. Interior design expertise, along with the knowledge brought by this interdisciplinary design team, resulted in a virtual design project that met the behavioral, psychological, and virtual needs of its avatar users.

REFERENCES

- Bell, B. S., & Kozlowski, S. W. J. (2002). A typology of virtual teams: Implications for effective leadership. *Group and Organization Management*, 27(1), 14-49.
- Clark, L. & Waxman, L. (2008). Interior design in *Second Life*: Collaborative criticism of a virtual environment. In *Proceedings of the IDEC South Regional Conference: Making connections* (pp. 41-45). Auburn, AL: IDEC.
- Harris, M. (2008, September 29). *Second Life* beats real life for collaboration. *Tech Radar*. Retrieved October 8, 2008 from <http://www.techradar.com/news/internet/second-life-beats-real-life-for-collaboration-471985>
- Jones, D. (2006). I, avatar: Constructions of self and place in *Second Life* and the technological imagination. *Gnovis*, 6. Retrieved July 21, 2008 from <http://www.gnovisjournal.org/journal/i-avatar-constructions-self-and-place-second-life>
- Kirkpatrick, D. (2006, November 10). No, *Second Life* is not overhyped. *Fortune*. Retrieved April 2, 2007 from http://money.cnn.com/2006/11/09/technology/fastforward_secondlife.fortune/index.htm
- Linden Labs (2008). *Where worlds are born*. Retrieved October 8, 2008 from <http://lindenlab.com/>
- Ondrejka, C. R. (2004). *A piece of place: Modeling the digital on the real in Second Life*. Social Science Research Network. Retrieved July 2008 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=555883