Pedagogy and Learning in the Virtual World of *Second Life*®

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INTRODUCTION

Second Life® is a computer-based 3-D virtual world environment that is accessible over the Internet and that features massively user-created content. Second Life (SL) involves multiple users, called "avatars," who create and interact in a spatially-organized ecology of virtual 3-D representations of people, space, time, motion, sound, objects, topography, and tools. First made publicly available in 2003 by Linden Lab®, this 3-D virtual world environment is an emerging convergence of technologies. It represents the robust creative nature of human-centered computing with a rapidly growing population from 100 countries around the world (Linden Lab, 2007). Open virtual world platforms such as SL (that are not games, although games may be played within them), are still in their infancy, and extensive research, development, and investment are on-going as critical challenges continue to emerge.

Yet educators are already able to create virtual classrooms, conduct classes, share virtual world teaching strategies, and design virtual research projects. Alongside the limitations of its current iteration, SL provides a complex system of affordances for learning, including synchronous interaction among real persons, an embodied sense of social presence, and virtual spaces where geospatially separated education practitioners are brought together to create situated learning environments. In particular, 3-D virtual world learning environments such as SL feature multiple channels for engagement, communication, collaboration, modeling, data visualization and simulation, sound and spatial relationships, language immersion, and opportunities for crossing physical, geographical, and even temporal boundaries.

In December 2007, SL reported 11,396,586 total residents, with resident defined as "a uniquely named avatar with the right to log into Second Life, trade Linden Dollars and visit the Community pages" (Linden Lab, 2007). Gartner, Inc. (2007) estimates that by 2012, 80 percent of active Internet users, including Fortune 500 enterprises, will have a "second life" in some form of 3-D virtual world environment. SL's currency, the Linden dollar ($L), is tied to the value of the U.S. dollar with exchange rates fluctuating between $250-300 L per $1 U.S. Virtual activity in SL includes major corporations, sports, politics, commerce, real estate, building design and construction, services, religion, culture, art, music, entertainment, museums, libraries, government, environmental studies, non-profit activity, international development, research and education. An estimated 200 universities and colleges have a presence in SL, and this article focuses on some of the issues surrounding that educational activity.

Transitional Issues in the Shifting Paradigm to 3-D Virtual World Environments

Online virtual worlds are still in their infancy, and some suggest their development is analogous to the development of the Internet in the early 1990s (Ward, 2007). Different perspectives on key issues have emerged during this transitional period that are specific to educational applications in Second Life and are concerned with how educational practitioners approach the 3-D virtual world (See Figure 1).

Figure 1. Traditional and Innovative Perspectives on 3-D Virtual World Environments

Briefly, from a traditional perspective, educational institutions approach entry into a 3-D virtual world with the intention to replicate reality so that buildings, classrooms, and curriculum are immediately recognizable. Also, given the existence of mature content in virtual worlds, security is a high priority and administrative control is emphasized. Finally, conventional pedagogy and curriculum design are favored. However, others critique the traditional approach for undervaluing the new functionalities of 3-D virtual world technology. The innovative approach emphasizes creation of new versions of reality that may not resemble an educational institution nor be immediately recognizable as "Campus *n*." Discovery and exploration are favored over security, classrooms are located in open fields with no seating ("sandboxes"), and rather than lecture, the class activity may involve teams of students taking a virtual field trip to the Sistine Chapel, gathering information, and later submitting their homework through a SL group chat space or by collaboratively creating 3-D Venn diagram sculptures to illustrate their analyses (user-created content).

There are two critical dimensions related to all emerging educational activity in SL. If we consider the (1) *function or purpose of the activity*, and (2) the *audience or user*, then there are reasonable instances when a traditional approach is warranted, such as with recruiting or development. For example, an institution may want potential students and donors to be able to visit a virtual campus in SL and to readily identify with its recognizable buildings. Security is relevant in this case to avoid embarrassing incidents or a misrepresentation of the safety of the actual campus. On the other hand, if the function or purpose of the activity is to actually conduct a class, then, quite simply, the very fact of virtual replications of actual buildings with doors, hallways, ceilings, and crowded classrooms may create navigation difficulties in SL for the audience, in this case the students. While sometimes useful, having students sit in a closed virtual space and listen to a prepared lecture clearly underutilizes the extensive 3-D functionality of the virtual environment.

Finally, there is the transitional issue of *experience in a 3-D virtual world*. Given the compelling sense of social presence and engagement reported by some users, an educator's own experiential understanding gained from being active in SL (or lack thereof) influences their comfort level with one perspective or the other. Most educators working in SL are challenged by the new affordances provided by a 3-D virtual world environment. A major difficulty is trying to imagine new

pedagogical methods with old "habits of mind." Freedom from the constraints of the real world's physical laws creates immense opportunity for innovation, and a long-term challenge will be cultivating new ways of imagining in a 3-D virtual environment. Effective applications in SL will result from educators developing skillful mental flexibility and a deeper understanding of other perspectives, of underlying worldviews, of virtual artifacts, including new technologies, and of the special affordances of virtual space (Figure 2).

Figure 2. Vassar College's Virtual Sistine Chapel in Second Life

BACKGROUND

Underlying Second Life is the electronic network that is the Internet itself, or what Vinge (2006) refers to as "the creativity machine" because it provides massive coordinated processing of information for hundreds of millions of users (p. 411). An early look at an Internet-supported 3-D virtual world appeared in Neal Stephensen's prescient novel *Snow Crash* (1992), and it described many of the virtual reality concepts in use today. Research is examining 3-D virtual reality, shared virtual environments, shared collaborative environments, and Massive Multiplayer Online Role Playing Games (MMORPGs), such as *World of Warcraft*, *Ultima Online*, and *Knight Online*. Much of the research on 3-D shared virtual environments has been limited to small groups of participants (Sonnenwald, 2006), or timed and coordinated events (Nilsson et al, 2001), or in isolated group environments (Spante et al, 2006).

The field of computer supported collaborative learning (CSCL) studies the use of technology to mediate collaboration among learners and to enhance their learning (Stahl et al., 2006; Koschmann, 1996; Resta et al., 1999). 3-D virtual world environments such as SL provide synchronous collaboration environments and, compared to text-based online learning settings, create an enhanced sense of place with the visual projection of oneself and other individuals. Stahl et al. (2006) argue that "CSCL requires a focus on the meaning-making practices of collaborating groups and on the design of technological artifacts to mediate interaction" (p. 409). In SL, the students themselves, as users, can become the creators of content, that is, of the artifacts to mediate their own interaction and learning.

Without the experience of actual immersion, conceptualizing a 3-D virtual world environment like SL can be a challenge. It is helpful to think of two co-evolving systems, one social and the other

technical. The social system includes the users, the entire SL community of residents, and includes their extensions in real life. The technical system includes the SL software, the individual computer and Internet connection of each user, and the vast expanse of virtual simulations that comprise the SL metaverse (a combination of the real world with the virtual world). One approach for considering the development of the social system of SL is to view it as "constellations of interconnected practices," multiple communities of practice that are related depending on the perspective one adopts (Wenger, 1998; p. 127). An approach for understanding the technical system is through the lens of Nonaka and Takechi's (1995) spiral of knowledge design, evolving from novice to expert users. Because of the co-evolution of both the technology and the social systems, SL is inherently a *learning organization* (Senge, 1993).

HOW AFFORDANCES OF THE 3-D VIRTUAL WORLD IMPACT PEDEGOGY

This section discusses features of the emerging 3-D virtual world technology and ways those features provide for a sense of embodiment, for social presence, for the convergence of social networking technologies.

The Technology of Second Life and its Affordances

> *As a result of transferring the power to change their worlds from developers to residents, digital worlds take radically different approaches to world building, gameplay and design. They leverage powerful economic and social forces and enjoy significant advantages relative to the real world.* (Ondrejka, 2005; p. 22).

Second Life's 3-D virtual world exists on a scalable server grid running Linux, and each server can sustain one continuous simulation, or "island" in SL. Ondrejka (2007) states that over 10,000 islands have been constructed, and each island can support the activities of approximately 60 logged-in avatars, actual users at their keyboards. Further, he reports that SL has supported over 35 terrabytes of user-created data. In this endlessly expandable "space," the technology creates a platform for users that is massively distributed and that has pervasive connectivity (Figure 3).

Figure 3. A Big Map View of a Small Part of Second Life

SL is a contiguous, persistent world (what students build stays), with flexible building tools, scripting tools for animation of objects, images, voice, audio, video tools ("machinima"), a weather system with wind, cloud formations, and a day/night cycle. It provides International Language Support, including Asian character sets, and EU keyboards are supported (Linden Lab, 2007).

The technology that supports this capacity for user-created content is the most robust and innovative feature of SL. These technologies afford users with multiple abilities to create and transform their experiences in the 3-D virtual world (Table 1).

TABLE 1. Affordances / Extended Capabilities in 3-D Virtual World of Second Life

Affordance	Extended Capability
Communication/community	Voice, chat, SL groups, search
Embodied social presence	3-D perspective on avatars (oneself & others)
Building/engineering/design/sculpting	Highly flexible robust tools & training
Animation and scripting	Motion, behaviors, sensors, lighting, sound
Data visualizations & simulations	Modeling, infinite scale, micro/macro, role-play, spreadsheet conversion, historical, art
Sound & spatial relationships	Example: reflexive architecture, avatar orchestra
Language immersion	Example: 27 language-specific islands
Learning communities created by & for users	Example: Educators Coop Residential Island
International	SL collapses geography
Low capital expense operations costs	Overhead, travel, equipment, training, energy
Fundraising	Am. Cancer Soc., Katrina Relief, kiva.org
Recruitment/administration/management	Universities, IBM > 1500 employees in SL
Bringing distance & online learning together in the 3-D virtual world	Online-course class photo only in SL

Embodiment and Social Presence: Second Life as a Tool

The construct of the self, that which experiences its own embodiment, can be both persistent and mutable. For example, humans regularly "attach" tools to ourselves to extend our abilities beyond normal human-scale reach; a hammer attached to a hand leverages greater force, and a user "attached to" the Internet connects virtually with an online course. Gibson (1986) suggests that "the *boundary* between the animal and the environment is not fixed at the surface of the skin but can *shift*" (p. 41). Similarly, logging-in to the SL platform ("attaching it") provides users with a set of 3-D *sensory-orthotics* including robust camera controls, navigation capabilities (flying, teleporting, underwater), and the ability to create new objects. These comprise embodied experiences for the user, and in interesting ways, the perceived boundary of the embodied self shifts into the highly extendible and socially-constructed world within and with which users "dwell" in SL (Polanyi, 1966; and see "extensible self" in Adams, 2005).

The experience of embodiment includes the synchronous interactions among real persons (via their avatars), objects, sounds, spatial constructs, communication systems (voice, chat, instant messaging). Users' *connectivity* with their computers, monitor screens, keyboards, headsets, the computer mouse or keypad, hands, and bodies is also part of an embodied ecology of experience. Taken all together, these elements can constitute a situated learning environment (Lave & Wenger, 1991).

Finally, recent research in neuroscience and psychology has suggested that a network of mirror neurons in the human brain constitutes an experiential "embodied simulation" and provides the basis for understanding one another in interpersonal relationships and thus in collaboration (Gallese et al., 2007; Freedberg & Gallese, 2007; Gallese & Lakoff, 2005). This research may have critical implications for some special needs populations. For example, stroke victims visiting the SL Dreams protected area for people with disabilities have reported that the experience of seeing themselves walking aided in their recovery (Stein, 2007).

Engagement and Connection

The three critical elements for engagement in learning in the digital age are interactivity, connectivity, and access (Dresang & McClelland, 1999), and these are the three key elements of SL. Research suggests that such a learning environment enhances student engagement through a sense of shared experiences, offers opportunities for collaboration, and provides access to information about the virtual environment and user-created content (FitzGerald, 2007; see also Nardi, 2005).

In research on education and learning, Yee (2006) collected online survey data from 30,000 users of Massively Multi-User Online Role-Playing Games (MMORPGs) over a three year period, and the findings involve features that are characteristic of SL. Yee's research indicated that users are willing to invest considerable time and emotional energy in virtual environments, that the relationships people make playing an MMORPG are real, and that users are more than willing to collaborate to accomplish a goal (see also de Bruyn, 2004). Prensky (2003) argues that students involved in 3-D virtual worlds for extended periods of time are highly motivated because they are learning in profound ways, including decision-making, synthesis of information, and understanding complex systems. Research on pedagogical agents suggests that the presence of avatars enhances engagement and learning beyond computer-mediated communication without such agents (Atkinson et al., 2005; Moreno et al., 2001).

Performative strategies for engaged learning including narrative and improvisation (Bateson, 1993; Taussig, 1993) are being used in SL. Role play and improvisation are used in training emergency personnel and nurses (Ann Meyers Medical Center in Second Life), for interacting with *reflexive architecture* (Brouchoud, 2006; and see Akrich 1992 on "technical objects"), and for playing virtual musical instruments with the *avatar orchestra metaverse* (AOM) (Figure 4). It is suggested that 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 & Jenson, 2007) including, for example, vocational learning (Hamalainen, 2008).

Figure 4. The avatar orchestra metaverse (AOM) in Second Life

Social Networking Convergence: RLSLRL (Real Life-Second Life-Real Life)

It is important to clarify that SL is not a game, although games may be played and created there. Concerning educational activities in SL, there are real classes, real peer-to-peer and team learning activities, and real collaborations among real individuals. Actual research is being conducted, and actual associations, organizations, and funding opportunities are being created. Educators and students are pursuing objectives and acting with embodied purpose. There are extensive training resources for teachers and students available through the SL community, YouTube video tutorials, and free training classes within SL itself.

The massive amount of user-created content and user-initiated activity in SL has already revealed the convergence of other technologies and social networking activities. New applications are discovered and unanticipated new instructional technology tools are created; the International Society for Technology in Education (ISTE) has a robust presence in SL and provides teachers with newly-invented virtual tools for managing their virtual learning environments.

Teachers and students are creating ways to integrate other computer-supported communication and research tools into their SL activities. They are importing image collections from Facebook, MySpace, and flickr, forming study groups in Google groups, importing spreadsheet data for genetics class, importing PowerPoint materials, linking to standard web URLs in SL (called SLURLS), connecting with RSS feeds, creating video content, and streaming digital audio.

In addition, educational simulations have been created, including Harvard University's law course, Stanford University's virtual operating and emergency rooms, and Britain's National Health Service's virtual hospital (Stein, 2007). Other examples of simulations in SL include the U.S. National Oceanic and Atmospheric Administration, the Virginia Tech Memorial, the Van Gogh Virtual Museum, the U.S. Centers for Disease Control and Prevention, and the Genome Island simulation, where a protein's amino acid sequence has been used to generate music (Everts, 2007; p. 49). For foreign language teachers and students, the Second Life Conference on Learning Foreign Languages was held in June 2007. Students have the opportunity to work collaboratively with other students, teachers and scientists at multiple locations throughout the world and to be introduced to subject matter experts outside their fields of study. These capabilities foster the creation of user-centered educational strategies. However, tremendous challenges remain.

Figure 5. Virtual Project Management Class in Second Life

FUTURE TRENDS AND CONCLUSION

To connect us all to an online world that advances the human condition.
(Vision and Mission, Linden Lab, 2007)

While recent research suggests that there is a sustainable trend for users to continue investing their time and capital in SL, user acceptance of 3-D virtual world environments may be one of the most critical challenges to overcome (Fetscherin & Lattemann, 2007, p. 20). Educational users want more stability in the software platform, faster functionality, lower or less expensive initial equipment requirements, easier-to-learn scripting and building tools, increased ability to import ready-made objects from other programs, simpler ways to stream media, and more seamless integration of most other standard-use software products into the SL virtual environment. To begin to address such challenges, IBM, Linden Lab, and participants from the IT sector have formed an industry wide consortium to lay the global groundwork for 3-D virtual world environments (IBM, 2007).

If the Gartner (2007) estimates (by 2012, 80 percent of active Internet users will have a "second life" in some form of 3-D virtual world environment) are even partially accurate, then educators and learning institutions face serious challenges, and imagination and creativity will be required. At a time of decreased public funding for public schools, innovative cost savings opportunities should be explored, and SL provides for low capital expense operations in the form of virtual classroom space, administration space, virtual recruitment and development opportunities, and other cost-saving components. What might be most critical for educators are "flexibly insightful assessment tools that can investigate and document successful teaching and learning in this interesting and promising environment" (Lamoureux, 2007, p. 110). Collaborative learning models that leverage the technology are needed, like the on-going Educators Coop project, the first long-term residential community of educators and researchers in SL. "As digital communities grow, they will leverage their wealth and connectivity to seriously change the real world" (Ondrejka, 2005, p. 22). The allure of connecting geospatially-distant learners and workers through 3-D environments will likely attract even more organizations across sectors including corporate, public, nonprofit, and educational institutions.

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TERMS AND DEFINITIONS

Human-centered computing - Human-centered design of computational tools with an emphasis on user-input

3-D Virtual World Environments – Digital online simulations of contiguous, persistent virtual worlds that render 3-dimensional representations of avatars, objects, and landscapes.

Social Presence (at-a-distance) - The ability of online users to project themselves into interactions with one another

Embodiment – The construct of the self that experiences its own presence; can be both persistent and mutable

Computer Supported Collaborative Learning – The field that studies the use of technology to mediate collaboration among learners and to enhance their learning

Second Life - A computer-based 3-D virtual world environment that is accessible over the Internet and that features massively user-created content

Avatar – The virtual representation of an online user's identity; can be both persistent and mutable; users can have multiple avatars