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Questions and answers in a virtual world:
Educators and librarians as information providers in Second Life

By Lorri Mon, Florida State University

Abstract

The education community in Second Life has grown rapidly since the launch of the virtual world by Linden Labs in 2003, with an influx of universities, colleges, and libraries seeking land on the digital frontier to build campuses, libraries, and educational workspaces. However, these new virtual educational settings have also challenged educators and librarians to adapt or to innovate new ways of providing information for learners. This study explores the varying roles that educators and librarians fulfill in Second Life, examining techniques they have evolved for teaching, providing information, and answering questions within a virtual world. Semi-structured interviews were conducted with twelve educators and librarians who worked within a variety of virtual world education settings including colleges, universities, and academic and public libraries, as well as "embedded" workplace settings in Second Life's roleplaying or themed communities. Snapshots, artifacts, and observational data were collected during visits to fifty library and education workplaces in Second Life and were examined in combination with interview results to document tools, tasks, problems, and best practices in virtual world education. Findings of this study demonstrate how educators and librarians have used information tools such as notecards, landmarks, whiteboards, language translators, and heads-up displays (HUDs), as well as reveal problems that educators and librarians have encountered, including limitations of existing information tools. A wish list of new informational tool features desired by librarians and educators is provided. Other issues found in the design of virtual education and information spaces ranged from accommodating needs for avatar personal space to understanding accessibility issues for disabled users. Playful and immersive experiential environments were among the examples of new ways of teaching and presenting information within a world where "real life" limitations no longer constrain educational designs.

Keywords: Second Life; distance education; virtual reference.

Questions and answers in a virtual world:
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By Lorri Mon, Florida State University

Educators and librarians have long held an interest in using virtual world environments as settings for distance education and online information interactions. Educators taught a variety of classes during the 1990s in text-based MUD and MOO virtual worlds such as LinguaMOO, schMOOze University, and MOOSE Crossing (Holmevik and Haynes, 2000; Peterson, 2000; Bruckman, 1998). MUDs (Multi-User Dungeons) and MOOs (MUD Object Oriented) emerged from text-based online adventure game-playing. Within the MOO and MUD text-based virtual worlds, descriptive language rather than graphical images was used to create the environment through which users traveled using text commands (e.g., "go north," "read sign"). In 1995, librarians built and operated IPLMOO, an early live reference experiment at the Internet Public Library, using a MOO-based virtual world question-answering service (Shaw, 1996 and Eustace, 1996). The ARKMOO resulted from librarian/educator collaborative efforts to create a MOO-based online writing laboratory (D'Angelo & Maid, 2000) and in July 1995, a University of Texas at Dallas doctoral student even successfully defended a dissertation during an online session held within a MOO (Grigar and Barber, 1997).

However, as text-based worlds began to give way to a new generation of more graphical, image-based virtual worlds, educators and librarians followed in exploring what Castronova (2003) describes as the "avatar-mediated life" (p.35). Within the visually-based virtual worlds, users typically traveled by using arrow keys or a joystick to operate an avatar self-representation, sending this image of the "self" walking, swimming, running, and/or flying through a world rendered in game-like graphical images. Active Worlds (http://www.activeworlds.com), initially launched as 'Alpha World' in 1995, became the setting for a business computing course at the University of Colorado at Boulder and for exploration of science education at Cornell University (Damer, 2008 and Corbit, 2002). In Active Worlds, visitors could walk into virtual library environments designed by Appalachian State University or Eastern University to ask questions of librarians or to initiate searches of library resources (Mon, 2006; Bronack, Riedl, and Tashner, 2006). These examples represent just a few of the uses by librarians and educators of AWEDU, the Active Worlds educational universe.

Second Life (http://www.secondlife.com) is of the next generation of graphically intensive, image-based virtual worlds that followed upon the example of Active Worlds and other early virtual world efforts. Launched in 2003, Second Life (SL) has been especially successful in attracting a large and active community of educators and librarians, in no small part due to its implementation of several features amenable to educational needs. In 2003, Linden Labs granted its residents intellectual property rights over their own in-world creations, and in 2004, Linden Labs announced a "Campus: Second Life" initiative offering free account access for instructors and students (Ondrejka, 2004). By 2006, Linden Labs had dropped the requirement for paid account membership entirely, except for those users wishing to purchase virtual land. As a result, a rapid influx of new users joined Second Life beginning in 2006. By 2007, a research study identified 170 educational institutions such as colleges, universities, and schools represented within Second Life (Jennings and Collins, 2007). Linden Labs CEO Philip Rosedale estimated in testimony before Congress during April 2008 that Second Life had six

million unique registered users and occupied approximately 390 square miles of virtual land, a space roughly equivalent to six times the size of Washington, D.C.

A review of Second Life's history finds that educators had already begun teaching classes in-world even before the virtual world's beta launch in 2003. In the summer of 2002, assistant professor Anne Beamish of the University of Texas at Austin's School of Architecture taught an urban planning course in Second Life. Early classes taught by educators during 2003-2004 were Aaron Delwiche's *Games for the Web* course at Trinity University in San Antonio, Texas, and Jane Veeder's course *Design of Virtual Worlds* at San Francisco State University's Department of Design and Industry (Childress & Braswell, 2006 and Terdiman, 2004).

The interest of some non-librarian Second Life residents in having libraries within the virtual world can be seen as early as 2004, when Jade Lily spearheaded the original and now-defunct Second Life Public Library on Gualala. In 2005, Wandering Yaffle opened _blacklibrary on Hyperborea (91, 30, 26), featuring writings and artworks by SL residents. Another early effort, the Librarium at Abitibi (189, 21, 38) was originally part of a virtual university project by OmegaX Zapata in 2005, but under the directorship of JJ Drinkwater became affiliated with the professional community of librarians who were arriving in increasing numbers in Second Life during 2006 and joining in a collaborative effort to provide information services through the Second Life Library 2.0 project, headed by Lori Bell, Kitty Pope, and Rhonda Trueman of the Alliance Library System in Illinois. April 2006 marked the official launch of Second Life Library 2.0 that was later to also become known as the "Info Islands" as the project grew and expanded.

The Info Islands archipelagos of the Alliance Library System in Illinois quickly became a key center for innovation in supporting the efforts by librarians and educators, averaging 5,000 visitors per day, hosting three or more social and educational events in-world each week, and staffing a collaborative live reference service for 80 hours each week (Bell, Pope & Peters, 2008 and Bell, Pope & Peters, 2007) By 2007-2008, nearly forty islands were associated with it, providing land for libraries, colleges, universities, and museums, as well as non-profit organizations and educational associations. This study explores how librarians and educators have learned how to work as information providers within Second Life and examines the tools and techniques used in providing answers and information to questioners within a virtual world.

Literature Review

While there is some published work on the growing presence of libraries and educational institutions in virtual worlds, comparatively little research has been done to explore how virtual worlds are used as information spaces or how educators and librarians conduct information interactions in an avatar-mediated setting. Most of the research on library services consisted of case studies of a specific virtual world library describing the extent of its in-world collections and services. Statistics on numbers and types of questions from Info Island's reference service suggest that a preponderance of questions asked there focused on Second Life topics. For questions asked at Second Life Library during 2007, 91.2 percent of 'directional' questions concerned Second Life as compared to only 8.8 percent of 'directional' questions concerning 'real life'; likewise, only 11.1 percent of the 'reference' questions focused on 'real life' issues as compared to 88.9 percent focusing on Second Life. (Bell, Pope & Peters, 2008) This represents

a notable divergence from the patterns of questioning that information providers in a 'real world' library reference service would expect to receive.

The influence of the physical workspace on the interactions between avatars was another issue emerging in the literature review. Heim (2001) mentioned the problem of creating a "comfortable intimacy" within which to engage avatars in teaching and learning interactions in Active Worlds. In addition to maintaining a sense of spatial closeness between teachers and learners, there was also a problem with the visual field in being able to see other avatars during the interaction. Heim advocated the use of architectural design for avatars (or "avatecture") to subtly influence the behavior of avatars in ways that would better support educational efforts. Jakobsson (2003) recommended the use of "position markers" such as railings to guide avatar behavior, for example leveraging workspace design in order to prompt avatars to face the right direction and avoid "milling around" during lectures.

Further issues raised in information workplace design concerned choices for reproducing real life objects in the virtual world and for designing immersive experiences. Bronack, Riedl, and Tashner (2006) advocated the use of immersion as a way to communicate information, giving the example of telecommunications students learning about network components by walking through an immersive recreation of a network. However, Heim (2001) criticized some designs which reproduced conventional metaphors in the virtual world, such as a schoolroom with chalk boards, questioning whether these types of representations truly supported more effective interaction and learning.

Jones (2006) and Ford (2001) pointed to the impact of the virtual world on disabled users who may be able to interact with others online in ways they could not in "real life." Their discussions about disability suggest that information interactions and information workplaces will not be experienced in exactly the same ways by all users; some users of virtual world settings have real life disabilities affecting the way that they perceive, experience, and engage with the interaction and setting. This also indicates a potential for issues arising from the impact of special needs on information interactions, as when users have disabilities that influence the ways they can perceive and interact with information providers in the virtual world.

Method

This study sought answers to the following research questions about how information providers conduct information interactions within a virtual world.

- What questions are answered by information providers such as educators and librarians in Second Life?
- How are answers provided within the Second Life virtual world setting?
- Are there aspects of the design of Second Life information workplaces that help to facilitate information interactions?
- Are there aspects of the design of information workplaces that work to hinder information interactions?

This research study took a qualitative, ethnographic approach to the study of the subjective perceptions and experiences of information providers in Second Life. Early in Spring 2007, I met a researcher who strongly criticized shortcut-style methodologies of dropping in

briefly to complete surveys or interviews, only to log out forever after spending comparatively little time in-world. This researcher then turned her critique on those present. "*Do you live here? Do you have a job here?*" she asked. At the time, my answer was 'yes and no.' I had rented a small cottage and learned enough to adopt the visual appearance of a "resident" (longtime participant) rather than a "newbie," (new arrival) but otherwise still had comparatively little experience with Second Life.

In the months that followed, over the course of time from my "rez date" or first appearance (avatar birth) in Second Life in August 2006 to the beginning of my information provider interviews and workplace observations in May 2008, I spent five or more hours each week gaining experience with life "in-world." I learned about "money trees" where new arrivals can collect free Linden dollars and about "camping" as a job to earn money in exchange for lending my avatar's virtual presence to build the 'popularity' of an in-world location. I also joined groups and participated in Second Life meetings, activities, discussions, social events and fundraising events, rented land and lived in two residential communities, traveled throughout the virtual world visiting different types of "sims" or locations, took classes as a student, and brought in two of my own classes there as an educator, assisted with other classes and with building an in-world campus, taught workshops, presented in virtual conferences, asked questions as a library patron, and answered questions as a librarian in Second Life. This ethnographic approach involving over a year and a half as a participant-observer prior to beginning the interview phase was invaluable in establishing an insider's knowledge of the educator and librarian communities in Second Life, as well as in building the necessary expertise and vocabulary to understand the terms and concepts used by research participants in the interviews.

Funding for this study by the ASIS&T SIG-USE Elfreda A. Chatman Research Proposal Award in October 2007 supported the costs of the virtual world space and research center where interviews were conducted and provided a remuneration of $1000 Linden dollars per participant (approximately $4 US) for time spent in interviews. From May 2008 until December 2008, I conducted one hour interviews in SL with twelve educators and librarians on their role as information providers. I also visited fifty information workplaces identified from the Alliance Virtual Library Infoisland Archipelago directory of libraries and organizations (http://infoisland.org/directory/index.php),   SimTeach   education   wiki (http://www.simteach.com/wiki/index.php?title=Institutions_and_Organizations_in_SL),   and prior travels through the virtual world. Data collected included text transcripts of interviews, snapshots of information providers and of information workplaces, and artifacts such as notecards, landmarks, and other objects collected at information workplaces. An iterative process of coding and analysis included note-taking, memoing, theory notes, and member-checking through presentation of preliminary results to individual research participants for review, discussion and feedback.

Results

Questions in Second Life

The Linden Labs motto for Second Life is 'a world imagined and created by its residents.' Within the virtual world, users can play any role and transform themselves into any visual appearance that they choose. Indeed, some information providers spoke of carrying within their inventories various non-human shapes and skins such as a monkey, the Kool Aid man, a lion, a bear, a butterfly, a solar system, a neko (cat-like) avatar. Thus it is perhaps not surprising that one question librarians mentioned commonly being asked was: *Are you really a librarian?* In a world where everything from personal appearance to the surrounding environment is so easily mutable, establishing trust becomes more difficult (see Figure 1).

Figure. 1. Mutability of Personal Appearance.

Questioning flows from the situation and context of questioners. Information providers found that when questioners were situated within Second Life, their most immediate questions tended to be *about* Second Life, and the activities they were trying to accomplish there:

I get very few questions about things outside of SL.

I don't think I've gotten any typical reference questions in SL yet.

I would say that the majority of questions are about SL itself.

Questions dealt with Second Life on two different levels – basic questions about navigating the virtual world and using the features of the interface and more advanced questions about understanding the physical and social structures within the virtual world. As can be seen in Table 1, questions also could require information providers to understand the vocabulary of Second Life, such as "sims" (from 'simulations' but referring to specific locales within SL), "terraforming" (shaping the virtual world landscape), "scripting" (writing programs or 'scripts' in Linden Scripting Language or LSL), "poses" (referring to animations that allow an avatar to stand, sit and move) and "prims" (from 'primitives,' the building blocks of Second Life; all objects in the virtual world are created from prims).

Table 1. Types of Questions Asked about Second Life.

Basic Questions	Advanced Questions
Wayfinding of places • *Where are interesting sims?*	Understanding the virtual world • *What is a prim?*
Obtaining items • *Where are the books?*	Living as a resident • *How do I earn money?* • *How do I rent an apartment?*
Controlling the avatar • *How do I dance/stop dancing?*	Understanding society & governance • *What is proper etiquette/behavior?* • *How to get Linden Labs to intervene?*
Presenting the self • *Where did you find that pose?* • *Who is the designer of that outfit?*	Shaping the environment • *How do I learn building, scripting, terraforming?*

Questions asked about non-Second Life topics predominated in subject areas where there was no direct applicability to avatars, such as health/medicine. An information provider for health and medicine had been asked many "real life" questions in Second Life including:

• *migraines*,
• *a rare genetic disorder*, and
• *caretaking for a disabled child*.

An information provider with expertise in law reported most commonly being asked SL-related law questions, such as "*how Intellectual Property or contract law applies in Second Life*" and "*how someone can enforce an in-world agreement.*" Only rarely did this provider recall receiving "*questions about people's RL [real life] legal situation (e.g. divorce).*"

Overall, the experiences of these information providers suggest that an institution establishing information services in Second Life should expect to attract questions that are not the same as those typically asked at the institution's "real world" service points. One librarian recommended that preparation for establishing an information service in Second Life should include "*becoming as familiar as possible with SL in general, due to the nature of the questions.*" Exceptions may be for providers in those areas where there is no virtual world analogue for the information need, such as health/medicine and nutrition.

Answers in Second Life

The many and varied forms in which answers could be provided was a distinctive feature for librarians and educators in Second Life, as compared with 'real life.' While both venues offered the ability to communicate via text chat, voice, instant messaging, and email, Second Life information providers reported that they also answered questions by "gifting" objects such as 'textures' (images), 'scripts' (programming code), and 'LMs' or 'landmarks' (essentially 'bookmarks for places' allowing users to click on a landmark and teleport to an SL location).

One participant said *"I can drag notecards, objects, scripts, textures, LMS, everything from my Inventory directly into their profiles."*

Notecards, which are analogous to scribbling a note and handing it to a questioner in real life, were in common usage among the information providers in Second Life. Information providers sometimes prepared notecards in advance with pre-written answers to questions commonly asked in their venues such *as basic SL info, etiquette, how to start a library* and *how to dance*; these notecards could be handed out directly to questioners, or if the information provider was unavailable at the workplace, could be automatically dispensed from 'giver' objects. These 'giver' objects could be of any shape, size, and appearance, and were programmed using LSL 'scripts' to give out information items when touched by the questioner. Besides notecards, 'giver' objects could also be set up to dispense landmarks (location markers), textures (images), and other objects.

Gifting of notecards and other items was one method for providing information to questioners, in which the information providers 'dragged and dropped' from their own personal inventories to the questioner a variety of Second Life information objects, tools, and resources. Information providers also gave questioners referrals to individuals, groups, and organizations within or outside of Second Life, wore augmenting information devices called HUDs ("heads-up displays" used to operate information-providing gadgets such as language translators and radar sensing devices for awareness of other avatars), and used information objects in the environment such as posters and calendars among various other techniques for locating and supplying answers, as seen in Table 2.

Table 2. Techniques Used in Providing Information and Answers

Connecting with social networks	Referrals to avatars, support groups, SL or RL libraries, SL classes
Gifting of items	Animations, landmarks, notecards, objects (e.g. clothes, books), scripts, sounds, textures/images
Linking out-of-world	Individual and group e-mails and Web sites (including blogs, Web-based tutorials, definitions, journals/newspapers about Second Life, and YouTube videos)
Navigating SL interfaces	SL search, SL events listings, SL interface menus, text chat, instant messages, group notices, voice chat
Using workplace information objects	Artificial intelligence object, books, calendars, comment boxes, exhibits/posters, information architecture and immersive learning environments, rss feed displays, surveys, teleportation boards, time zone map, sounds, tour cars, audio and video, visitor counters, virtual guides, whiteboards
Using/wearing informational tools	Costumes/historical attire; HUDs (heads-up displays) for radar awareness of approaching avatars, foreign language translation, and Second Ability referral network help alerts

Information workplaces offered various displays such as videos, posters, books, whiteboards for showing slides and devices which looked like computer monitors that, when touched, opened a menu of links to web pages (such as university homepages, library catalogs,

and subject area resource links). Information providers also augmented their own awareness and answering abilities by using 'heads-up displays' or HUDs, devices that performed informational functions such as notification of the name and presence of another avatar entering within the twenty meter chat range, allowing the information provider to give a friendly greeting even before seeing the new avatar approaching on screen. Other HUDs served as translators to enable multilingual chat communication or facilitated referrals, such as a Second Ability network HUD which connected the wearer to a network of volunteers willing to help disabled users with their questions about Second Life ("*when someone needs help, they can ring a bell and it notifies a network of SecondAbility mentors that someone is in need*").

Most referrals were not mediated by a HUD technology, but instead initiated either through SL-based communication tools (chat, instant messaging, landmarks, maps, Second Life URLs or 'SLurls' which functioned as clickable links to in-world locations, and SL searches for avatars, groups, or places) or through external communication tools, such as web sites, blogs, email, and email groups. Referring questioners to the live reference question-answering service at Info Island's Second Life Library was mentioned by both librarians and educators; other referral sources mentioned were the SL Bar Association and dispute mediation services, Second Life mentors and Second Ability mentors, and one librarian mentioned a general wish to be able to call upon a network of knowledgeable experts ("*It might be nice to have backup brains in certain areas, like building/scripting*").

Experimental efforts described by the information providers included the use of an external artificial intelligence decision-tree database linked to an in-world object ("*a giant cigarette … when you click on it, you're asked: what would you like to know about smoking? you choose, and are led through to find info on cessation, physiology, etc.*") and the designing of immersive environments in which the entire workplace setting surrounds the visitor in an 'information architecture' conveying a learning experience, such as the recreation of a historic time period (e.g., Renaissance Island with Shakespeare's Globe Theatre, the Library of Alexandria on Roma within a recreation of classical Rome, and Land of Lincoln which recreates the U.S. Civil War era) or the design of other interactive surroundings ("*a musical garden where you can walk through colors that play notes*"). In another technique for using the environment to convey information, an educator spoke of teaching a building skill by creating a series of example objects made out of 'prims,' the basic building-blocks of Second Life, each example in the series being slightly more finished than the last, to visually demonstrate the consecutive steps of building the final object: "*i have found it to be effective to leave a trail of prims out in sequential steps with a little text to teach people how to build instead of using my voice or chat.*" Text can be left with the objects (or *prims*) through methods including signs posted nearby, notecards given when the object is touched, or embedded scripts (programming code) which causes explanatory text to 'float' in the air above the object.

Through observational visits to fifty Second Life information workplaces, two additional information-conveying techniques not mentioned in the interviews were identified and added to this list:

- *Games,* such as an interactive sorting game in which visitors could rearrange periodicals on shelves to learn which were considered 'popular magazines' and which were 'scholarly journals'; and

- *Chatbots,* or automated representations of an avatar with a limited text-based repertoire for greeting and giving information to visitors.   Tour cars, which carry visitors throughout an area and narrate the visuals in passing, can be seen as somewhat similar to the chatbots in function but lacking in interactive capability.

Figure 2. Game, U. of Notre Dame Libraries and Chatbot, _blacklibrary

Beyond the 'one-to-one' model for conveying information and answers to individual questioners and learners, educators and librarians also proactively offered information on a 'one-to-many' and 'many-to-many' basis to in-world groups through arranging and running events such as classes, workshops, lectures, group discussions, tours, presentations and demonstration activities, and social events.   A librarian commented about the wide range of activities undertaken in SL for information-giving and outreach efforts as compared to work in a 'real world' information service setting: "*here* [in SL], *it feels as if I have to do everything.*"

Information Providers' Workplaces

Types of information workplaces

Information workplaces can be typified according to various broad categories such as institutional affiliation (e.g., university, college, public library, state library, association, business, or not affiliated with any institution); subject area focus (e.g. general, health, law) or location within Second Life (mainland or island). However, in terms of fit within the society and culture of Second Life, the representational style of the information workplace is a particularly useful distinction to consider. Representational style can be broadly defined as falling within a continuum from *reproduction of real life* to *Second Life adapted* to *immersed or immersive*.

The typical information workplace in Second Life is a *reproduction of real life*, replicating the visual elements that would be seen in a real-life setting. For example, a library or university may be set in a building with bookshelves and classrooms, with perhaps even a façade recreating the building's real life outer appearance. While some concessions may be made for better navigation (e.g., ramps instead of stairs), the main representational focus of the landscaping and buildings is to give visitors a sense of 'really being there.'

A *Second Life adapted* information workplace contains some of the trappings that stand as metaphors for evoking real world settings, but takes greater liberties with realism in adapting the workspace design to Second Life needs. Walls and ceilings might be entirely open so that avatars can fly in, rather than having to open doors and climb stairs. A classroom or library reference area may be placed in an outdoor, open setting rather than inside a building, yet still retain some traditional visual elements, such as maintaining a library 'reference desk' or

bookshelf as a visual metaphor even though it may rarely be used for an actual workplace purpose.

Both the 'reproduction of real life' and 'Second Life adapted' information workplaces tend to be isolated from a larger sense of Second Life community, beyond attracting other like-minded neighbors (like libraries, colleges and universities clustering near other libraries, colleges and universities.) However *immersed or immersive'* information workplaces include those that are integrated with the larger Second Life community and cultural experience. Alexandrine libraries, for example, are situated within existing communities and have adopted the cultural backstory and architectural styles shared by local residents. Library staff adopt culturally-acceptable appearances and costumes, play appropriate roles within the community, and use speech patterns that fit in with local styles. Both the library's architectural design and contents are adapted as befits the needs and cultural mores of the local residents, such as an informational exhibit situated within a nineteenth century dirigible as seen in Figure 3.

Figure 3. Library Exhibit in a Dirigible, Caledon.

Other 'immersed or immersive' information workplaces use the entire setting to convey information and learning, through, for example, interactive games and recreations of literary scenes, scientific visualizations, or historic periods that visitors can walk through and experience as if transported to that time, place or space. An educator commented: "*Info transfer in SL is more like the real world (the school of hard knocks), not the world of book-learning. You have to make it immersive, engaging, and immediate.*" Information objects and information environments in fully immersive settings create a literal 'information architecture' in which even the walls and landscaping become part of information sharing experience.

Information spaces and physical settings

The setting for a typical information workplace was within a building structure, although some buildings featured open walls allowing avatars to more easily fly or walk in. Interior spaces commonly offered chairs for avatars to sit in, posters on walls, and items that visitors could touch to open web links for access to subject resources (e.g., consumer health, law, and

local city/state resources) and sites with relevant information about the sponsoring institution. Some institutions further augmented this basic setup by adding notecard givers, whiteboards for showing slides, video players, and other such combinations of informational tools as listed in Table 2.

The commonplace use of chairs, while not needed for an avatar's physical comfort, may afford a psychological sense of comfort. Seating allows equalization of avatars who are at different heights and eye levels when standing and clears the visual field making it easier to see all participants in a conversation or meeting. An educator commented that looking for a chair to sit the avatar down seemed to be a preferred strategy among some new users: "*they TP to a place and they won't walk around....they will look for a sit ball or dance floor but once they get set they don't move.*"

Information workplace designs generally sought to minimize visitor difficulties with controlling the avatar by providing clear central spaces while placing furniture and other items back against the walls. One participant stated "*I keep the displays around the edges of the room so that people don't bump into things.*" The need for larger areas of space was mentioned by educators in terms of providing a sufficient space for setting up teaching materials as well as providing questioners with room to try out skills such as building. Proximity to other avatars and a comfortable interaction distance were also issues in providing working areas with sufficient open space. A librarian commented regarding her avatar, "*there's still a personal space issue...I feel weird when someone is right next to me.*" A common experience of 'griefing' (harassment) in Second Life is the invasion of personal space that occurs when one person's avatar deliberately 'pushes' into another and keeps pushing to slam and pin the other avatar into a wall. Ideally then, information working spaces should be designed to bunch avatars closely enough together that they would be able to communicate (that is, within a twenty meter circular "chatting distance," outside of which the avatars would not be able to hear each other) yet not so closely as to impinge upon 'elbow room' in establishing a mutually comfortable interaction distance between avatars.

Working spaces and accessibility

Among the questions encountered by the educators and librarians were problems of disability and accessibility in Second Life, particularly in the impact of workplace designs. A librarian mentioned the differential height of floor levels in her workspace as an issue for standing avatars due to "*the height difference thing*" while an educator pointed out the height difference issue for avatars in a wheelchair, which necessitates designing "*places to sit so a standing avatar can sit down and be at eye-level with someone in a wheelchair.*"

The wheelchair user who perceives certain terrain or building features as difficult, dangerous, or impossible to navigate in the real world may react negatively upon encountering the same perceived barriers when using a wheelchair in the virtual world. As one participant stated, "*Accessibility is mostly about mind set.*" Recommendations from the librarians and educators for designing more accessible working spaces for all avatars, including avatars in wheelchairs were:

- create open spaces for better maneuverability;
- use ramps rather than stairs;
- use elevators;
- include places to sit so that avatars can be on eye level with wheelchair users
- avoid perceived indoor space impediments such as differential floor levels and rugs on the floor; and
- avoid terrain textures that would be perceived as barriers, such as sand, gravel, or flagstone with grass growing in between the stones ("*you and I know it's a flat texture but mentally, it's not*").

Users with visual disabilities such as color blindness, sensitivity to bright or flashing lights, and blindness or near blindness faced further challenges in navigating the virtual world. One information provider spoke of helping a questioner who was colorblind to figure out ways of building: "*understanding how the menus work in SL and how his colorblindness can affect his building...I spent several hours going through different options and trying to build him a "building studio" where he could work and see what he needed to see.*"

For legally blind users, ability to even see their own avatar could be a challenge. An educator described how a visually impaired user "*immediately made her avatar white and featureless...and the reason was so that she could track herself across the screen.*" Using the 'gifting' technique, the educator provided this user with a folder of white clothes "*so she could look more normal and still track herself*."

Integration of voice chat into Second Life in August 2007 was a key improvement in supporting information interactions with visually impaired users who could not participate in text chat.   However, personal preferences of some SL residents for only using text chat to communicate can exclude visually impaired users from an interaction, just as use of voice chat only can exclude deaf users. An educator described experiencing a problem with a referral of a legally blind user to a Second Life mentor: "*the SL mentor was most insistent that he use text chat...that was just impossible.*" In using existing Second Life communication tools for information interactions with disabled users, recommended techniques were:

- Be flexible in terms of willingness to use both voice and text chat during initial communication until it is clear which methods will work best for all participants in the information interaction;
- Be patient, as a 'good wait time' is essential to allowing a participant with a disability a sufficient amount of time to respond; and
- Keep the 'typing animation' enabled, as it is useful in signaling to text chat interaction participants that a response is still in process

Problems and wish lists for information providers

To improve their abilities in answering questions and meeting the information needs of users, the information providers identified a wish list of tools and improvements that would help them to more effectively conduct information interactions in Second Life as seen in Table 3.

Table 3. Wish Lists of Information Providers

Improvements to Existing Functions	A smoother /easier interface More prims per parcel Richer communication abilities for groups
New Functionalities	Being able to drag from my desktop into SL -- like WORD documents To be able to do real html ... create and display interactive html pages in world Ability to create or at least easily display external databases to store info To be able to search my inventory by creator of item To be able to query the system for where all the things I've made are To be able to query objects for their scripts NOT by opening them one at a time To be able to track when people copy and pass around an info-object that I made
New Information Tools	Databases of SL literature An inventory of great notecards to handout for all types of questions with tips, landmarks, and instructions

Information provider wish lists sought improvements on existing Second Life functionalities such as an easier-to-use interface, more allowed 'prims' for building, and better ways of communicating in-world. New functionalities desired included integrating web pages and word processing files into the virtual world, expanding in-world searching to include searching for one's own objects, and searching *within* objects (e.g., searching for books within the virtual world, and searching the contents of each book.) Information providers also wanted a searchable index to the published literature of Second Life and a collection of information resources to hand out to questioners with answers and information. While some progress has been made on this list of wishes by Linden Labs, such as an initial integration of web pages, many of the ideas have yet to be addressed.

The information provider as institution

A notable aspect of avatar-mediated information work was that many tools and techniques used by information providers did not require their presence at a specific workplace location in Second Life. In the real world, information provision historically had been focused around repositories of knowledge in physical form (books, clay tablets, scrolls) – physical places housing the world's inscribed knowledge, around which scholars, learners and information seekers gathered. However in the virtual world, information providers do not need to gather at any particular Second Life location for proximity and access to reified knowledge.

"*I do my work anywhere, everywhere.*"

"*It can be ... just about anywhere.*"

"Since everywhere I go…people know me as That Librarian, I'm never really off duty."

The information providers themselves served instead as mobile storehouses as of the institution's knowledge and information objects. Each information provider answered questions with the help of their own personal 'inventories' of hundreds or thousands of items – essentially transforming their avatars into walking, talking 'libraries' or 'universities.' Indeed, it is possible for an avatar to carry the institution's entire campus in inventory and simply pull out and deploy the buildings, displays, and landscaping whenever and wherever needed. The 'empty world' phenomenon of Second Life in which visitors complain about wandering through locations devoid of other people underscores the importance of the avatar as the true center of knowledge, activity, and interest in the virtual world.

Discussion

Answers within the virtual world were observed to be both proactive and reactive in nature. Reactive answers were seen in terms of the information providers answering a question from a user when asked, while proactive answers encompassed information providers' additional efforts to anticipate questions and build or implement tools such as chatbots and notecard "givers" for giving automated answers during their absences from the workplace, or to create group events such as classes, workshops, discussions, demonstrations, and social gatherings where information could be given.

In their personal experience as information providers, librarians and educators perceived the majority of the questions that they answered to be situated and contextual – that is, focusing mainly on Second Life itself, where users were currently located and engaged in activities. These subjective perceptions from the educators and librarians tended to support the 2007 questioning statistics from Alliance Library System's Second Life Library reference service which suggested a preponderance of questions asked focused on Second Life topics, rather than 'real world' concerns (Bell, Pope & Peters, 2008). Exceptions to this among the information providers were for observed for the subject expertise area of health/medicine – a topic with limited applicability to avatar-mediated life as compared to other subjects such as law or business, which do have virtual world analogues in their applicability to Second Life businesses.

The issue of a different type of questioning experienced by the information providers in Second Life has key implications for information services considering the launch of a virtual world service point. It should be anticipated that questions via the Second Life service point will differ from those received via the institution's other information service points such as chat, email, and real world help desks or reference desks. Staff handling the Second Life information service point will require training in Second Life skills and knowledge and should expect to handle a preponderance of Second Life-related questions - unlike the questioning patterns that would be expected at the institution's other information service points.

Architecture of information workplaces was observed to help to shape the nature of information interactions through issues of accessibility and avatar 'personal space.' In the case of 'immersed or immersive' workplaces, the 'information architecture' of the workplaces through historic recreations, interactive exhibits and games became part of the information interaction.

Bell, Pope, Peters & Galik (2007) predict, "Architecture serves different purposes in Second Life than it does in real life, and over time the form and function of the two types of architecture probably will diverge." There have been suggestions that experiences within virtual worlds will influence ideas for how information interactions in the real world might similarly become more immersive, interactive and participatory. Peters (2007) described the next iteration of libraries from Library 2.0 to Library 3.0 as "not only participatory but constructive" in encouraging users to "construct or modify their environments" (p. 7).

Castronova (2007) has predicted that there will be an influence pushing back on real world institutions from virtual world users to make real world experiences as fun and engaging as virtual world experiences, something he terms the "fun revolution." An example of "pushback" from the virtual world can be seen in this comment from a participant in this research study who suggested: *"maybe the Sandbox idea in SL should be taken to RL for example, a place where it is safe to work and play and nothing is hurt and can't be fixed or started over."* New ways of thinking about real world information interactions could eventually follow from the work of educators and librarians currently experimenting with providing services in virtual worlds; indeed, this interactive process of reshaping and rethinking information interactions may have already begun.

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