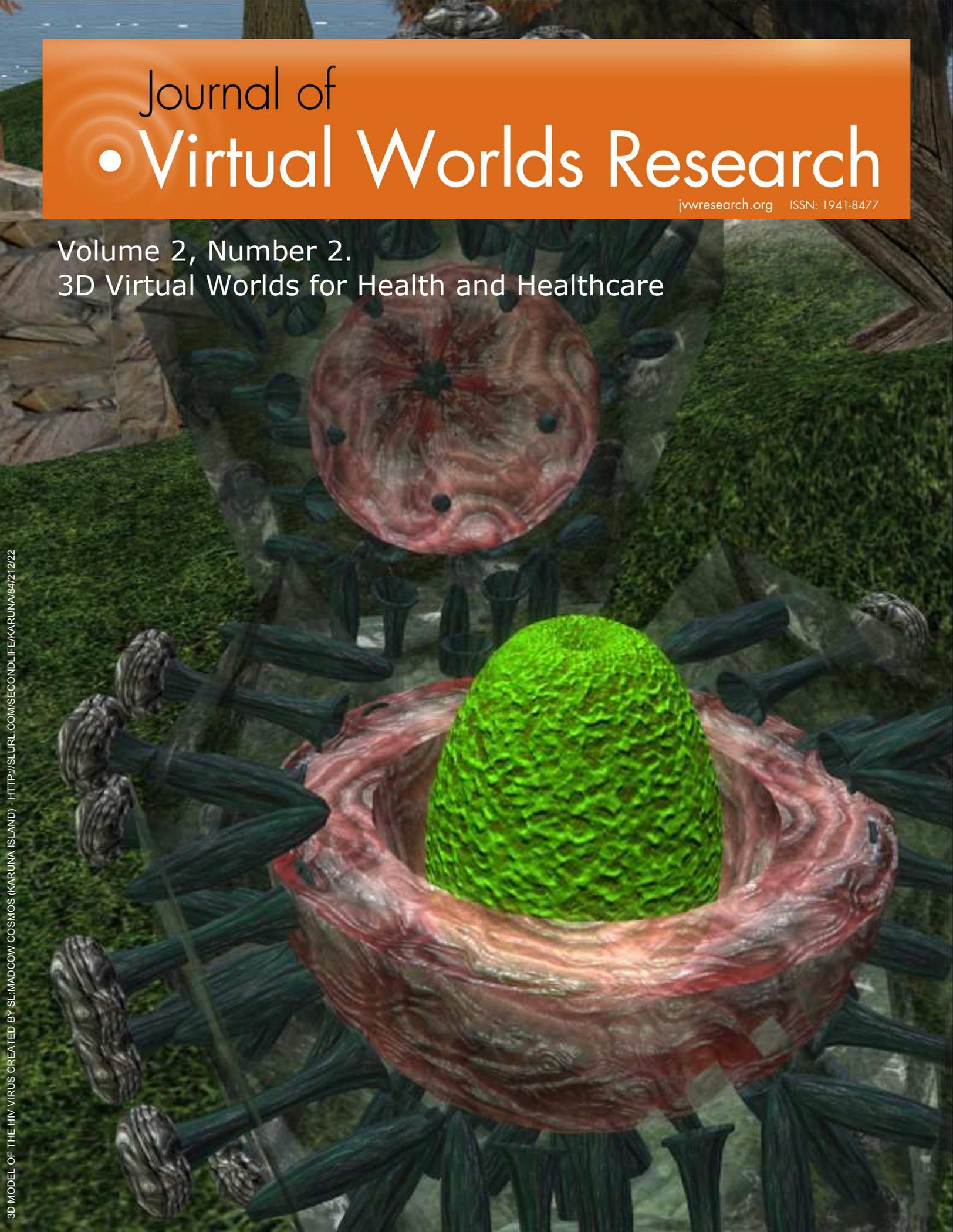


Journal of • Virtual Worlds Research

jvwrsearch.org ISSN: 1941-8477

Volume 2, Number 2.
3D Virtual Worlds for Health and Healthcare



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August 2009

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Virtual Worlds in Health Care Higher Education

By Constance M. Johnson, Allison Vorderstrasse and Ryan Shaw,
Duke University School of Nursing

Abstract

Advances in information technology bring progress in distance education. Online education programs are pervasive, however, only recently has the Web 2.0 brought about interactive, dynamic distance based health care education in virtual worlds (VWs). VWs allow for real time representations of environments, manipulable objects and interactions between avatars or bots, creating a sense of realism and presence that is absent in traditional, flat online education. Presence has been linked to knowledge transfer and better learning. Second Life®, currently the largest virtual world, has been used in higher education, including health care education at the Duke University School of Nursing. Students have indicated higher levels of satisfaction with the learning environment and quality of instruction in this VW compared to other online learning systems. There is a need for further research in online education in VWs, and room for growth in applications of VWs in education.

Keywords: Virtual Worlds; education nursing graduate; nursing informatics; Internet; cooperative behavior.

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Distance education enabled learning has existed for nearly three centuries (Hesser, Hogan, & Mizell, 1992). In 1728 Caleb Phillips advertised a short hand correspondence in the Boston Gazette (Battenberg, 1971). Such courses were typical until the mid-twentieth century when radio and television emerged as popular communication mediums (Sherry, 1996). With the advent of the Internet and remarkable advances in information technology, distance education has entered a “boom” era (Albright, 1996). There are thousands of distance education programs available online from many different institutions (Bates, 2009). As the world continues to transition from the era of Web 1.0 to Web 2.0, higher education is shifting as well, moving from flat, web-based education and interfaces, to interactive and dynamic ones. With this shift, distance based health care higher education enters the era of 3-D virtual worlds (VWs).

Virtual worlds

Although commercially developed VWs have been in existence since the early 1990’s, the diffusion of high-band width on the Internet and more realistic graphics have brought forth the availability for networking in these environments (Questi, 2008; Schroeder, 1996, 2002). VWs are real time computer-generated 3D representations of a contrived or natural environment running over the Internet. Through digital technology, elements such as topography and gravity, and spaces such as buildings are created that may contain objects, e.g. tables and chairs (Guadagno, Blascovich, Bailenson, & McCall, 2007), and avatars (digital representations of humans) or bots (Bailenson, Swinth, & Hoyt, 2005). The realism of these simulated environments is perceived through sensory information giving users the perception that they are really experiencing the environment or “being there”, known as presence (Blascovich et al., 2002).

Presence

Presence is defined as the subjects feeling of being in a particular place even though the user is situated in another environment. In relation to VWs, the user feels as though they are really present in the VW or have the feeling of “being there” (Blascovich et al., 2002; Witmer & Singer, 1998), even though they may be physically at home at their desks. Two different psychological states are required to experience presence; involvement which is focused attention; and immersion or feeling “enveloped by” the environment through a continuous stream of experience and stimuli (Witmer & Singer, 1998). Presence is also a function of agency or co-presence (whether people see other avatars as representations of real people) and behavioral realism (the degree to which all objects including avatars and bots mimic real world objects) (Blascovich et al., 2002). According to Blascovich’s Threshold Model of Social Influence, when agency and/or realism increase, social presence should increase (Blascovich et al., 2002). Presence has been linked to (1) knowledge transfer (transferring knowledge gained in a virtual world to the real world) (Slater, Linakis, Usoh, & Kooper, 1996); (2) potential for better learning and performance (Witmer & Singer, 1998); and (3) behavior consistent with that of the real world (Slater, Usoh, & Chrysanthou, 1995).

Presence is a cornerstone of success in distance based higher education health care for students. At the Duke University School of Nursing (DUSON), students are immersed in the Second Life® virtual world by attending lectures in a building similar in appearance to the real world counterpart found on the Duke University campus in Durham, NC. The building has a classroom for lectures and an atrium where students can socialize and access to resources for landmarks, tutorials, and avatar clothes, skins, and shapes (http://nursing.duke.edu/modules/son_about/index.php?id=90). The classroom consists of chairs for students to sit in, a podium for the instructor to lecture, a computer to manage PowerPoint slides, a whiteboard for PowerPoint presentations, and a blackboard. The blackboard serves two purposes. First, it allows students to text questions to the professor which appear on the blackboard, thus the professor can incorporate the answers directly into the lecture without stopping the lecture. Second, it stops the students from texting each other in class using local chat, since all text appears on the Blackboard.



Figure 1. Real world DUSON and Second Life® DUSON

Second Life® is the largest 3-D virtual world, with over 15 million users (Linden Labs, 2009). Launched by Linden Labs in 1993, it is an entirely user-created environment with active educational, business and government associated communities (Linden Labs, 2009). Second Life® is being actively used for teaching and learning, social networking, focus groups, data visualization and modeling, immersive displays, research and training and simulation (Linden Labs, 2009). In particular, it is being used by numerous university faculty and institutions to provide learning experiences and conduct online classes (Kemp & Livingstone, 2006). Virtual campuses and classroom settings that mimic their real world counterparts have been created, providing a semi-realistic university atmosphere for students.

In 2008, we queried the nursing informatics students at Duke University regarding their overall assessment of the learning environment, their perceptions of learning, and their self-rated gains in content within three different environments; a learning management system, webinars and VWs. The results showed that Second Life® was significantly higher than that of a learning management system for overall assessment of the learning environment and perceived quality of instruction. Students reported that having class in Second Life helped to clarify class content and found the class discussions more spontaneous. Likewise, consistent with the self-verification theory that people seek to preserve a consistent self-concept (Messinger et al., 2008; Swann, Pelham, & Krull, 1989), many of the students' and instructors' avatars are similar to their own likenesses,

enhancing the realism of the experience and presence. The avatars that the students use to interact with the instructor and fellow classmates help to create a sense of social presence and increase the sense of community, not only visually, but within a social context (Fabri, Moore, & Hobbs, 1999; Gorini, Gaggioli, Vigna, & Riva, 2008). Students show preference for synchronous web-based learning (Murray, Belgrave, & Robison, 2006). Social presence in online learning has been positively related to student satisfaction and perceptions of learning (Richardson & Swan, 2003).

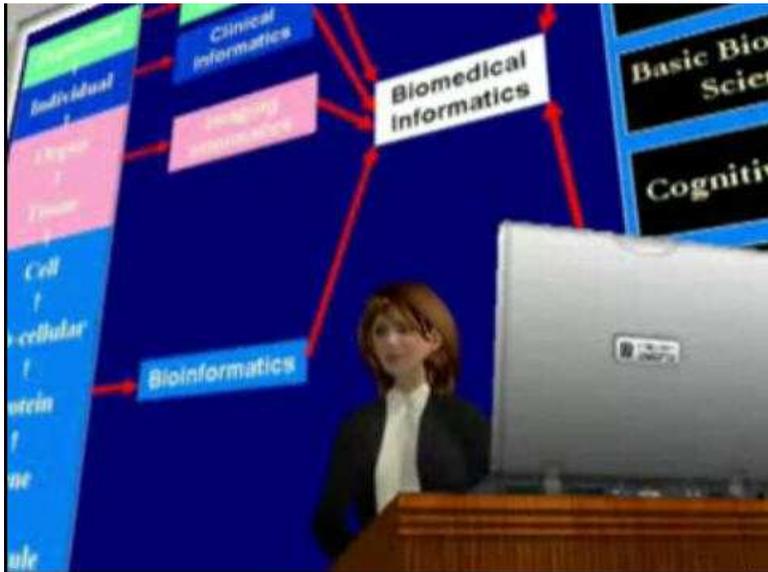


Figure 2. Professor Constance Johnson, PhD, RN lecturing to students in Second Life®

These immersive environments offer a new type of paradigm: instead of being passive observers of images on the computer, users are active participants in computer-generated 3D worlds. In these computer generated virtual worlds, avatars can interact with other avatars or bots as they would in the real world through voice or text chat via a headset with a microphone, and navigate by walking, running, swimming, flying, or teleporting from one location to another. Avatars can stand up or sit down in various poses, move their mouths, blink, and make human-like gestures. These online immersive environments allow users to learn, socialize and behave in ways that closely resemble how they behave in the real world. Through the combination of creating a virtual world that in many ways mimics that of the real world and allowing students the ability to customize their avatar to their liking, students are able to feel a real sense of presence and authenticity in world that is virtual.

Social Learning

One of the most profound aspects of using virtual worlds in education is that they are able to support and expand on social learning. Social learning is based on the premise that our understanding of content is socially constructed through conversations and interactions we have with others (Brown & Adler, 2008). Through interaction with social networks and the ability to manipulate virtual objects, students have an added layer of social learning to enhance their

education. Additionally, they allow health care students the opportunity to practice new behaviors in real-life scenarios without the disadvantages of making mistakes in real life.

The structure and nature of VWs support social interaction and social learning by using a collaborative manipulation metaphor (Hutchins, 1989; Stanney, Chen, Wedell, & Breaux, 2003). Collaborative manipulation metaphors are ideal metaphors since they permit manipulation of virtual objects that mimic real world objects, yet also provide a conversational intermediary, to a scripted bot or embodied agent such as an avatar, increasing the sense of realism. Social interaction has long been used in making human interaction possible from remote geographic locations, considering the continuum beginning with the act of letter writing to present day e-mails, instant messaging, web cams and VWs. With the advent of VWs, the sense of connectedness is presented through the concepts of presence, agency, and behavioral realism. Connected-ness impacts social influence, which is purported to be affected by a number of factors including behavioral realism and agency (Hoyt, Blascovich, & Swinth, 2003). Social processes that occur in real life also occur in VWs (Hoyt et al., 2003).

At DUSON, social learning is enhanced by students being able to interact and discuss topics with their peers, instructors, and others in the Second Life® metaverse. Students have the opportunity to not only communicate and travel within the virtual islands of Duke University, but travel to other second life islands such as the one created by the centers for disease control (CDC) (Cassanova, 2006). It is areas such as these where students are able to interact and communicate with other health care professionals, students and consumers' avatars and manipulate interactive objects about health care topics. It is through these opportunities that social learning is enhanced by being only a "teleport" away.

Usability of the Environment

Although social influence should affect perceived usefulness, students' perception of the usefulness of these environments may additionally be related to the usability of the environment. There are three important issues in the design of usable web applications. The first challenge is to determine the characteristics of the intended users of the system, including age, education, skill level, disabilities, cultural background, goals, computer literacy level, and familiarity with the domain (Shneiderman, 1998). The second is to identify system functions that have to be performed, the required input and output formats, system constraints, information categories and flow, and the communication needs of the users (Hackos & Redish, 1998; Kirwan & Ainsworth, 1993; Nielsen, 1993; Vicente, 1999). Third, environmental analysis is used to specify the conditions in which the site is used. Privacy of information is important, but social and cultural issues are also a consideration in the environment. The social environment of users can affect the success of a website. Social issues that need to be addressed are: 1) Will users share information?; and 2) are resources readily available to assist users? (Hackos & Redish, 1998). Cultural issues are significant to consider and not only relate to ethnicity but also to socioeconomic status, professional status, and regional differences (Hackos & Redish, 1998).

In 3-D environments a few more factors need to be considered for usability and usefulness: way finding, defined as understanding one's location or orientation when moving about the virtual space; navigation, which is moving to perform required tasks; object selection and manipulation, which is selecting objects and moving or querying for some purpose; good visual and auditory inputs and outputs that are seamlessly integrated into the activities of users; and engagement, which includes presence, immersion and the ability to socially interact with others (Hix & Gabbard, 2002; Poupyrev, 2000; Shilling & Shinn-Cunningham, 2002; Stanney, Mollaghasemi, Reeves, Breaux, & Graeber, 2003; Witmer & Singer, 1998).

The basic objective of VWs is to provide user-centered multimodal interactions, which afford perceptual illusions that support human information processing and interactive social networking, while minimizing cognitive obstacles such as way finding, navigational, auditory, or visual difficulties. Usability is crucial in ensuring user satisfaction and acceptance, decreasing errors, and increasing use of the environment, allowing users to focus on integrating the knowledge gained from the use of these environments rather than the mechanics of these systems.

Online virtual learning is not without its challenges. As with many technologies, there is always the possibility of technical problems. This is especially true for online virtual worlds. However, there are ways in which to help reduce technical and frivolous problems. We found that providing a proper orientation to the virtual world and allowing students time to familiarize themselves with the user-interface and underpinnings are important. Students need to be able to learn how to customize their avatar, navigate the virtual world, interact and communicate (Calongne, 2008). This is not intuitive for many users. Though basic, it is crucial to add these elements into any curriculum involving a virtual world.

In creating optimal online education in online virtual worlds, a combination of approaches and modalities is warranted. Using additional web-based collaboration ware (i.e. wikis, blogs and podcasts) synergistically provides a coherent wholesome learning experience (Boulos, Maramba, & Wheeler, 2006).

In order to create a richer online learning experience for students, it is also important that they know their peers and instructors not only online, but in regular face-to-face meetings (Nichani, 2000). This strengthens the foundations of context and social interactions (Feenberg, 1989) and reinforces the online social relationship students have with their peers and instructors (Nichani, 2000).

Conclusion

Initial studies suggest that virtual worlds, which promote social and educational interaction via repetition, practice, feedback, and application, lead to superior learning (Okita, Bailenson, & Schwartz, 2008). However, as a virtual learning environment, 3-D virtual worlds, and in particular Second Life®, have not been fully explored. There is potential for the creation and growth of innovative educational experiences as Second Life® and other 3-D virtual learning environments are investigated and incorporated into curriculum (Boulos & Wheelert, 2007).

The transition from Education 1.0, traditional classroom settings, to Education 2.0, online and blended courses, which utilize information technology, is causing a shift in pedagogy. Education is moving from an instructor-centered pedagogy to a constructivist and student oriented pedagogy (Hiltz & Turoff, 2005) of increased participation (Robbins-Bell, 2008). As online education becomes increasingly prevalent in higher education, faculty are required to examine existing assumptions of teaching, learning and methods of content delivery. It is vital that educators identify and utilize the educational strengths of virtual worlds, as well as explore combining these environments with other applications such as learning management systems (Boulos & Wheelert, 2007).

Research is needed to understand the “best practices” of using 3-D virtual worlds not only in higher education, but in health care higher education in particular. Research on how to develop optimal 3-D online virtual worlds that mimic the real world through patient simulations, along side classrooms, and peer to peer social interactions is the next step. VWs such as Second

Life® are the frontiers of this new era of health care higher education. Utilizing these mediums allows for a way to train much needed health care professionals by decreasing costs of education and increasing the access of high quality education to those in remote locations. In combating a national nursing shortage (Rosseter, 2009) and a shortage of primary care physicians (Steinbrook, 2009), utilizing VWs is an opportune way to increase the number of much needed health care professionals.

Acknowledgements

This work was funded in part by Duke University Center for Instructional Technology, Durham, NC.

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