The Potential of 3-D Virtual Worlds in Professional Nursing Education

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Abstract. Three-dimensional (3-D) virtual worlds (VWs), such as Second Life®, are actively being explored for their potential use in health care and nursing professional education and even for practice. The relevance of this e-learning innovation on a large scale for teaching students and professionals is yet to be demonstrated and variables influencing adoption, such as increased knowledge, self-directed learning, and peer collaboration, by academics, and health care professionals requires empirical research.

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1. Introduction

Despite growing exploration by academics of the development and application of immersive three-dimensional (3-D) Virtual Worlds (VWs) as learning modalities [1-10], their widespread use for teaching health care professional students [1,2,11,12], for example through using virtual simulations, may await the demonstration of benefits from the outcomes of more research. The low levels of use may be due to lack of familiarity among nursing faculty of the benefits of VWs, such as immersion, role-playing opportunities, simulation, and personal interaction associated with the technology and its influence on formative and summative learning outcomes. Hansen [13,14] provides a recent detailed literature review exploring, evaluating and clarifying the current literature and background to the use of 3-D VWs in medical and health professional education within the context of specific educational theories. This paper builds on this work to summarize some current examples from early work.

2. An Overview of Virtual Worlds

A 3-D VW is an example of a Web 2.0/Web 3-D dynamic computer based application. Eysenbach [15] suggests:

> *Web 2.0 is a term which refers to a) improved communication and collaboration between people via social-networking technologies, b) improved communication between separate software applications ("mashups") via open Web standards for describing and accessing data, and c) improved Web interfaces that mimic the real-time responsiveness of desktop applications within a browser window.*

Currently, the most popular VW used by the public, and one whose potential is being explored by healthcare professionals, students, and educators, is Linden Lab's Second

Life® (SL) [16], which has over 6.5 million virtual residents [17] from over 100 countries. It includes, but is not limited to, streaming media, including YouTube collections, 3-D virtual libraries, social interactive venues, health information sites, global preparedness discussions, lectures, conferences, and support groups [4]. Virtual medical universities exist [18] and many 'real world' organizations and institutions are hosting events in SL and other VWs [5,19]. There is an emerging group in SL, "Healthcare Education," founded by Anderson at the University of Michigan [20]. Within SL users choose a fictitious name (e.g., the authors' SL avatars are, respectively, Maggie Waechter, Pyotr Habana and Skott Eales) with the opportunity to create a unique self (e.g., human figure, animal, or object) known as an "avatar." With these figures the user navigates SL via a computer keyboard, interacting with other objects and avatars, speaking [4], and "teleporting" to various regions. Users may also make and design physical objects and have cash (1000 Lindens = $4.85 US) to purchase such items as planes, boats, and even body parts. SL incorporates other Web 2.0 social networking capacities, such as instant messaging, wikis, podcasts, and sharing user-created objects.

In VWs such as SL, participants socialize, communicate, build, seek facts, and conduct business; residents in SL thus benefit from each other's participation via networks, which offer dynamic evolving systems reflecting aspects of the semantic web [21,22]. Access to VWs on the Web is predicted within 2 to 3 years to be mainstream in education [23]. Google Corporation has released "Lively" [24] for individuals to easily create their own avatar and personal room at a location of choice on the Web. This could offer educators a new social network tool to create online learning areas and take advantage of the ability to embed YouTube videos on virtual plasma screens. Increasingly easy to use Web 2.0 advanced tools may mean the creation of 3-D learning environments is no longer perceived as a daunting task.

3. Educational Potential

Many authors are expounding the educational and research potential of VWs [4-6, 7,17,18,21], however educational research involving the use and effectiveness of these innovative technologies is limited. By allowing students time to actively interact with other avatars (e.g., patients and health care professionals) in a simulated environment a decrease in student anxiety, an increase in competency in learning a new skill, and encouragement to cooperate and collaborate is possible [2]. Active learning takes place due to other participants being in the same VW and constructing objects to represent ideas possibly enhancing self-reflection and knowledge [2]. If a gaming component is associated with the 3-D VW the student may be more motivated to login and participate. High quality 3-D entertainment freely accessible via Web browsing facilitates engagement opportunities with individuals or groups of people in an authentic manner that illustrates collective intelligence [25]. Historically, 3-D learning environment development has required complex and highly involved elements of software engineering and computer science [24]. For many educators an online 3-D learning environment will not be perceived as being an advantage because the "plasticity" associated with the VWs, – or, in other words, the ease of constructing and changing the learning environment as necessary is not understood until the educator plays and experiments with the VWs [6].

4. Healthcare Professional Education Examples

Can one imagine attending nursing school in a VW? For many years healthcare educators have developed online learning opportunities for nursing students. Stott [8] reports universities are using SL and encouraging students to "fly" into 3-D lecture halls. Problem based learning groups, enrolled in a clinical management course at Coventry University (UK), meet in SL and are paid to build learning facilities for the next semester of SL students. Forterra Systems and the Summit group at Stanford University medical school are developing the idea of combining medical simulation with gaming technologies; human avatars which exhibit life signs with the hope the learner's active participation will encourage awareness, team cooperation, and decision-making skills [5]. The staff at the Imperial College in London showcases the Second Health Project [9], which provides detailed animations simulating disease processes. Mesko [10] presents the top 10 virtual medical sties in SL, including the Ann Myers Medical Center [26], an environment where students may practice physical exams and analyze radiological films as well as learn how to detect heart defects. Boulos [27] presents "The Sexual Health" SIM in SL wherein avatars may interact with different objects in an aesthetic "in-world" environment and learn about safe sex. Miller [1] has nursing students build SL "objects" to show what they have learned. Objects representing lungs connected to large airway objects illustrate various lung disorders for student learning. Furthermore, the student's avatar may walk on different electrocardiogram tracings provided on a 3-D floor and then names the represented rhythm. Another example of a cognitive, experiential 3-D learning tool is PULSE!! [28]; researchers state students respond positively to using the VW as a method to learn clinical skills and increase diagnostic thought processes.

5. Strengths and Challenges of 3-D Virtual Worlds

Virtual worlds may change the way people learn and live in the future [17, 23, 25]. The major strengths associated with VWs are one's ability to design and construct unique environments and then share with others in a collaborative fashion. Sibbet [29] outlines how VWs are "reshaping" learning, communications, and social interactions. Since an online VW is available 24/7 there is an anytime/anywhere benefit for distance education students. There are other advantages, such as virtual training approaches, yielding results and are invaluable for health care professionals. And, for the health care consumer, there is an advantage of logging on and learning from events happening in SL. The technology lends spatial representation useful for hands-on learning and heightened student engagement because the real-time social interaction and gaming aspect spurs chances for "discovery-based and goal-oriented learning" [25]. One of the major challenges associated with VWs in education is the time involved in creating learning spaces within a virtual environment and cost involved. A negative human response to other avatars is possible, however this may exist in traditional learning settings. The allure of the dynamic colorful SL environment may distract the student's attention to the learning objectives. Of course these are all points-of-view for debate.

6. Future Use in Healthcare Professional Education

Nurse education has a long tradition of using simulations for teaching, including whole-body and body-parts, as well as real patients. Computers are now integrated into some manikins providing more complex patient emulation and therefore richer and

more realistic environments for students. These computer-controlled manikins provide a rich environment for promoting the use of critical thinking and clinical skills by students without securing patient permission. These 'patients' are able to repeat a scenario over and over as well as provide an environment allowing students to experience and interact with critical conditions. High-performance patient simulations are now used throughout health education worldwide ranging from emergency medical technicians to other health care professionals. One may view online VWs and serious gaming as a threat to the adoption and purchase of high-fidelity computer patient simulation mannequins currently utilized for healthcare profession training. For example, nurses may login into SL and learn Advanced Cardiac Life Support [1]. Why reinvent the wheel when such a training opportunity already exists on the Internet? Debate may focus on the fact the VW lacks haptic quality essential for the procedure or does not provide one-on-one assessment of skill acquisition. The advisory board responsible for Educause's Horizon Report [25] states collaborative learning experiences taking place in VWs today is easier to find than one year ago.

7. Conclusion

Virtual 3-D learning environments may encourage active learning while students construct and explore activities similar to those of a "field trip" versus a static classroom setting. Participating or playing in a VW may be fun, encourages creative expression, broadens socialization skills, promotes independent problem solving, provides opportunities for self-teaching, and sets the stage for group work. Also, there are established opportunities for educators to network with alliances that are already developing, implementing, and researching 3-D VWs as learning spaces [1,6,7,28,29]. Therefore, the wheel of technology does not need to be reinvented by individual educators, as there are opportunities for educators to meet like-minded individuals who wish to promote active student learning in a meaningful manner for today's learners.

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