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Using the Virtual Reality World of Second Life to Teach Nursing Faculty Simulation Management

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Abstract

Healthcare faculty members have come to depend on the advantages of teaching with clinical simulation, but not all faculty are competent in their ability to manage students during the simulation experience. This federally funded proposal provided the opportunity for nursing faculty to participate in a synchronous learning event using the virtual reality world of Second Life (SL). Based on competencies, faculty participants were guided through the simulation process by a "Master Teacher." Participants then became the teacher and chose the settings, objectives, and clinical data to manage their own simulation using avatar role assignments. Feedback populated the participant informatics dashboard, so that progress towards their competencies was recorded. Another unique informatics application was the use of the Synthetic Derivative project to use de-identified patient data to promote better clinical realism. Additional evaluation activities regarding content, appropriate use of the technology, and design features were assessed. The development of the SL environment for this educational study provides the setting in which to pilot test the provision of actual clinical care that does not require "hands-on" interventions.

Keywords:

Computer simulation, User-computer interface, Nursing education, Nursing faculty.

Introduction

Despite the fact that the US is beginning a documented nursing shortage, nursing schools across the nation turned away an unprecedented 49,948 qualified applicants to baccalaureate and graduate programs primarily due to insufficient numbers of faculty [1]. For the faculty members who remain, they must be able to rely on efficient teaching strategies that promote more independent student learning and critical thinking. For those nurses who are preparing for faculty roles, they must be able to select appropriate teaching strategies for the goals they wish to accomplish. Both groups must become competent and confident in their abilities to use technology in order to impart these skills into the learning of today's students.

Clinical simulations have the potential to provide such solutions, but only if nursing faculty are competent in simulation management. As part of a Robert Wood Johnson Partners Investing in Nursing's Future Grant, the Tennessee researchers surveyed nursing programs across the state. Results revealed that although 100% have some sort of simulation equipment, 74% state they are not using simulation at 100% of capacity. The reason cited for not using simulation technology by 72% of the respondents was a lack of trained faculty.

The virtual reality world of Second Life (SL) provides an environment that allows users from around the world to "log on" to this web-based platform. Second Life is a 3D virtual world, created by its residents. The world is driven by the interactions of real-world individuals and their "inworld" residents or "avatars" [2]. Thus, for every avatar one encounters in SL, there is a live person somewhere in the world who is dictating that avatar's actions, emotions, words, dress, etc. SL provides the place for interactions with people, businesses, and organizations in a 3D environment but requires only an Internet connection and working computer rather than extensive travel arrangements. Hansen notes that the major strengths of virtual worlds are one's ability to design and construct unique environments and then share them with others in a collaborative fashion [3]. A pilot postgraduate medical education program was delivered in SL. All participants (12 of 12) agreed that this experience was an effective method of medical education, that the virtual world was superior to other methods of online continuing medical education, and that they would enroll again as well as recommend this format to others [4].

The purpose of this project was to provide a computer application for nursing faculty that would allow them the opportunity to manage clinical simulations while advancing in their own competency and proficiency levels of simulation management. The virtual world of SL was chosen for the delivery of the geriatric cases because it could be used as an educational meeting place that requires no travel arrangements. Although the educational session took place in a synchronous fashion similar to a face-to-face meeting, it required much more effort to build the virtual environment according to user needs. In addition, planning was also necessary to design the learner experience. A unique complication of our development efforts was the fact that the learners were also faculty members. Their purpose in attending the event was to learn to provide the appropriate faculty guidance in simulation rather than to learn the details of the simulation itself. Prior to attending the learn-

ing session, participants were required to complete an orientation session to SL that has been specifically designed for our use. Competencies provided the structure for both the orientation and educational simulation sessions and were presented graphically using a color-coded dashboard.

Materials and Methods

Competency Development

Most faculty required orientation activities to the SL platform. One of the negative implications of using the SL platform is that most users start their experience on "Orientation Island." Many times there are other avatars on the Orientation Island who are predators and are there only to harass new users either verbally or through the use of nudity or sexual innuendos. It was possible to bypass this island by providing participants with the specific island location for the intended education session via a SLURL (Second Life Universal Resource Locator). In doing so, however, participants do not learn how to manipulate their avatars. As a result, orientation activities specific to this project were required.

Video sessions and one-on-one orientation sessions ensured that all participants reached pre-determined competency levels in this environment. Competencies included the following:

1. *Getting Started Tasks* (setting up an account in SL, selecting a name and password; installing the SL client; creating an avatar, alter appearance, alter clothing; learning how to walk, run, fly, land, sit, turn around, teleport, alter your viewpoint, use gestures; learning how to use the various maps; bringing up chat bar, chat window; acquiring and managing inventory);

2. *Intermediate Tasks* (using search tool; adding a "friend"; instant message a friend; going to a SL URL; selecting and configuring of headset; bringing up and using audio chat; acquiring and spending Linden dollars; uploading and playing a PowerPoint presentation); and

3. *Social Tasks* (awareness of how to teach and learn within this environment; how to identify and report abuse; how to document care in this environment; how to get technical help).

Competencies for faculty in simulation management do not currently exist and thus had to be developed by the project faculty. Rather than an extensive Delphi technique with content experts that takes valuable time, project faculty drafted proposed competencies and received feedback from two consultants recognized for their international expertise in nursing simulation development. [1] Informal focus groups were then conducted using members of the International Nursing Association for Clinical Simulation and Learning (INACSL). Although it is not within the scope of this paper to list every developed competency, general categories for the nurse educator were as follows: plans simulations, participates in simulations, provides debriefing and reflection, and evaluates simulation. In addition, competencies for the simulation coordinator/specialist were developed (although not used for our SL experience).

[1] Consultants were Dr. Pamela Jeffries and Dr. Sharon Decker

Informatics can be applied to the competency process with the development of visual dashboards that illustrate at a glance the progress users have made in meeting the identified competencies. The use of dashboards in the clinical setting has been validated as an effective measure of quality improvement in Vanderbilt's fight against ventilator acquired pneumonia [5]. With the use of dashboards designed by evidence-based care parameters, the number of ventilator acquired pneumonia cases dropped from over 300 a year to 140 a year. The impact of this project was prevention of 16 deaths per year, more than $4 million in savings per year, more than 100 hospital days per year avoided and more than 400 ICU days per year avoided. The project illustrated the behavioral implications of visually seeing progress in the clinical domain, and the SL project team sought to replicate this positive behavior in their project environment.

Second Life Development

The first priority for beginning the development in SL was the leasing of the island itself. In order to do this, the project team had to determine a name for the island. Because this project is a collaboration between the Vanderbilt University School of Nursing and the University of Kentucky College of Nursing, it was determined that the name of the island should not reflect either institution. Instead, the name "NURSIM4U" was chosen and a welcome sign was designed that contained the logos from both institutions (see Figure 1 below).

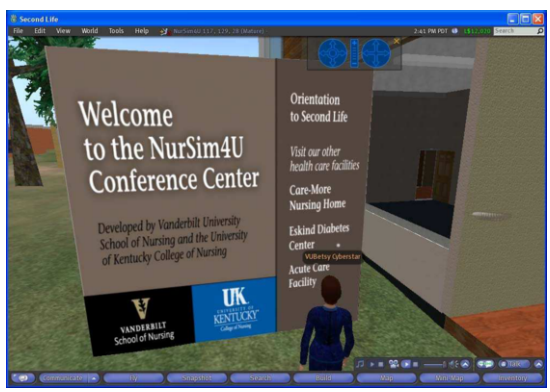

Figure 1 – Welcome to Conference Center

Because the team wanted to provide nursing participants with a variety of choices, it was determined that there would be an outpatient facility, a nursing home facility, an acute care facility, and a variety of homes on the island. A conference center was planned for the center of the island, and would be the place in which all participants would start after entering the NURSIM4U SLURL. All of these locations were mapped onto a graph of the island to determine both size and location of the buildings. It was also determined that two new facilities (outpatient diabetes clinic and acute care critical bed tower) would be replicated in the SL environment, allowing for the use of existing plans to dictate the room dimensions and layouts.

Simulation Development and Populating the Electronic Medical Record

Content experts were faced with the challenge of ensuring that the clinical data they used for simulated patients resembled reality. After determining the types of patients to be included in the case scenarios, clinical data were accessed using the unique database at Vanderbilt University called the Synthetic Derivative (SD). The Synthetic Derivative is a database containing clinical information derived from Vanderbilt's electronic medical record, labeled with a unique research ID, and stripped of personal identifiers [6]. Thus, the SD is a set of records that is no longer linked to the identified medical record from which it is derived and has been altered to the point that it no longer closely resembles the original record. The SD interface allows the user to search data extracted from most of the major health information databases at Vanderbilt. The database contains records for over 1.7 million unique individuals. The search interface allows the user to input basic clinical and demographic information, such as ICD9 codes, medication, lab values, age and gender and returns de-identified data to the user for review and selection.

Use of the SD requires approval from the Institutional Review Board as well as completion of a data request form by the SD administrators. Both approvals were received by the project investigators so that the clinical simulation cases could be population with realistic data values that had actually been demonstrated by an individual at some point in time.

Several simulation design issues surfaced during scripting. How much of the simulation should be scripted versus depending on knowledgeable participants who were assigned roles with descriptive parameters for behaviors? How much choice should faculty participants have in the selection of singular objectives versus groups of objectives? How do you teach faculty while they are also playing roles in the simulation? How do you make certain that the experience allows the "Master Teacher" to role model behavior but at the same time critique the teaching behaviors of the faculty participants? These issues were frequently discussed by the project team before final decisions were made as to how to guide the simulation experience.

Evaluation Tools

There is a need for more empirical research in order to unearth the pedagogical outcomes and advantages associated with this type of e-learning technology. The relevance of this innovation on a large scale is yet to be demonstrated and requires empirical research [7].

Many of the original evaluation tools selected for use in this study were developed by the National League for Nursing in conjunction with Laerdal who funded a national, multi-method project with the following purposes: 1) To develop and test models that nursing faculty can implement when using simulation to promote student learning, 2) To develop a cadre of nursing faculty who can use simulation in innovative ways to enhance student learning, 3) To contribute to the refinement of the body of knowledge related to the use of simulation in nursing education, and 4) To demonstrate the value of collaboration between the corporate and not-for-profit worlds [8]. The research goals were to explore how to design simulations, implement simulations as a teaching strategy, and evaluate selected learning outcomes using simulations. The study was designed with eight project coordinators and one Project Director (Jeffries).

Selected tools for this SL project included the Simulation Design Scale and the Student Satisfaction and Self-Confidence in Learning. The Simulation Design Scale, a 20-item instrument using a five-point scale, was designed to evaluate the five design features of the instructor-developed simulations used in the NLN/Laerdal study [9]. The five design features include: 1) objectives/information; 2) support; 3) problem solving; 4) feedback; and 5) fidelity. The instrument has two parts: one asks about the presence of specific features in the simulation, the other asks about the importance of those features to the learner. Content validity was established by ten content experts in simulation development and testing. The instrument's reliability was tested using Cronbach's alpha, which was found to be 0.92 for presence of features, and 0.96 for the importance of features. The second tool was the Student Satisfaction and Self-Confidence in Learning, a 13-item instrument designed to measure students' satisfaction (five items) with the simulation activity and self-confidence in learning (eight items) using a five-point scale. Reliability was tested using Cronbach's alpha satisfaction = 0.94, self-confidence = 0.87.

Additional evaluation tools designed specific to this SL project included a content evaluation tool (effectiveness of teaching/learning methods, whether program met the stated objectives, whether the content was relative to their work, whether the online environment was conducive to learning, whether the participant was able to achieve own personal objectives, whether attending the event was an appropriate use of time, and whether the participant would recommend this workshop to others). Scales ranged from A (Strongly Agree) to E (Strongly Disagree) or A (Very Effective) to E (Very Ineffective). Furthermore, an Instructor Feedback tool was designed by the project team in order for the faculty participants to receive feedback from both the "Master Teacher" and the other faculty participants.

Pilot Testing

Pilot testing is just beginning as of the writing of this paper. By the time of paper presentation, results will be available for not only the pilot testing for the first six months of the continuing education offerings for nurse educators. Nursing faculty members from both schools constituted the 20 pilot testers in five different groups.

Results

Content experts had no familiarity with the SL environment and were unsure of the potential capabilities of providing a simulation experience in this world. They continued to want to rely on video production rather than graphic representation of situations. A standardized scripting format including the "props" for the simulation was helpful in moving the project forward. Scripts were developed for each setting (outpatient,

in-patient, nursing home, and home) that included three different sets of objectives with three matching scripts. This provided the faculty participants with choices and allowed the "Master Teacher" to role model teaching behavior in one of the scripts while allowing two student teachers to guide the remaining two scripts. Practicing these scripts and providing the appropriate feedback was a crucial development activity for the project team.

Much was learned in the development of the SL environment. Using the plans of real buildings resulted in a claustrophobic effect when using an avatar to navigate. This was because of the camera angle being above the head of the avatar. Hallways and rooms were widened to accommodate this problem. Figure 2 illustrates the expanded hallways.

Figure 2 – Expansion of Hallways

In addition, once a group of avatars were clustered within one room for a simulated experience, the room became crowded and difficult for the designated caregiver to navigate. Early attempts at having the "observer" avatars either suspend themselves in the air or sit on an observation wall were dropped when it was determined that the inexperienced faculty participants had too much difficulty with these maneuvers. Assigning the observers places to stand in the rooms provided a more viable alternative, as well as enlarging the actual square footage of each room (see Figure 3).

Figure 3 – Nursing Home Room

At the current writing of this paper, the project has completed nine months of a 36 month project period. After pilot testing has been completed, it is planned to offer the simulation modules as continuing education sessions for nursing educators in the states of Kentucky and Tennessee. The final year of the project will offer the sessions as continuing education for nurses in the Southern region of the United States.

Discussion

The environment of SL is one creative solution to synchronous learning that is only beginning to be used in nursing education. A more popular application of SL has been to meet within the SL world in order to present information to one another, usually using a typical Power Point presentation. Another popular use of SL is to have information resources available for a variety of support groups. Several universities have replicated their physical campus within the SL world, and the Duke University School of Nursing has created a popular You-Tube video that demonstrates their SL use [10].

It was never the original intent for this project to build a simulated environment that could be used for both education and clinical care. Because the SL clinical environment has already been created for this educational application, it now becomes feasible to also use the facilities for the provision of actual care that does not require a "hands-on" approach. Faculty at the Vanderbilt University Schools of Nursing and Medicine are partnering to pilot test the delivery of maintenance care to diabetic patients in the outpatient environment (which is a replica of the current Eskind Diabetes Center). It is postulated that these virtual visits will require less time and expense while providing a resource rich environment for those patients willing to enter the SL world for their care

Early in the development efforts the issue of privacy was of monumental concern for the provision of patient care. Anyone on the island that was within 65 meters could hear conversations that were intended to be private between a patient and healthcare provider. In order to ensure that the audio portion of care delivery could not be overheard by others, selected patient care rooms were elevated to levels that could not be accessed by other avatars who were "flying" on the island. In other words, avatars in SL can only fly at 200 meters, but buildings can be built as high as 300 meters. Private patient interactions thus required teleporting by the healthcare providers and patients from within designated privacy protected rooms. A privacy button placed within the room required the avatars to touch the button in order to be teleported to the elevated private room which was suspended above avatar flying levels. Once the visit was completed, the privacy "off" button teleported participants back down to the original building in order to complete any post visit activities and exit the facility. A recent feature added to the SL world now allows for point-to-point discussion between two avatars so that this elevation feature is no longer necessary.

Conclusion

It is feasible to use SL as an environment for nursing faculty to learn how to manage clinical simulations. Although currently

in pilot testing, early results indicate that a "Master Teacher" can provide enough structure and coaching to provide "student teaching" experiences when a cadre of seasoned nursing faculty is not available to all. Using SL does require orientation to that environment for those learners who are not familiar with its features, but it remains a viable choice for those willing to take on the challenge. At the same time, production of various clinical facilities allows for them to be used with groups of students (nursing and interdisciplinary). Perhaps the most important contribution to this project will be the use of constructed facilities to provide an alternative choice for the provision of patient care in an era when computer usage is ever increasing.

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