The Computerworld Honors Program

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Final Copy of Case Study

YEAR:
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STATUS:
Laureate

Organization name:
Institute of Interactive Arts and Engineering, University of Texas at Dallas

Organization URL:
http://www.utdallas.edu/ah/atec/

Project Name:
University of Texas System Virtual Pediatric Patient Project

What social/humanitarian issue was the project designed to address? What specific metrics did you use to measure the project's success?

One of the factors behind the nation's critical shortage of qualified nurses is a lack of clinical practice opportunities for nursing students. The UT System Virtual Pediatric Patient Project is a game-based simulation designed to afford undergraduate nursing students virtual clinical practice opportunities in order to enhance their education, which, ultimately, impacts patient safety. The simulation was developed using video game technology and afforded students at the University of Texas at Arlington College of Nursing the opportunity to apply classroom knowledge in an interactive virtual pediatric hospital. This simulation was designed to allow student nurses to make clinical decisions in the care of acutely ill pediatric patients. In the project, students are required to practice assessing and caring for four virtual infant pediatric patients with respiratory diseases. Project developers had to design a special Content Management System to work with the video game engine, Unreal 3. This CMS allowed developers to link all patient data to high-fidelity, 3-D audiovisual representations of patient signs and symptoms. The CMS also was developed to integrate with a database of all actions taken in the game by students, thereby allowing nursing faculty to analyze and assess student learning. The project was used in a randomized, controlled study designed to compare the clinical application of content of students using a virtual clinical experience with that of students receiving the same pediatric respiratory content in traditional lectures. Ninety-three students participated in the study; 46 participated in the simulation (intervention group). The results showed that students participating in the simulation had significantly higher knowledge acquisition and, using mannequin-based simulators, had better knowledge application than students in the control group. The results

suggest that a virtual patient training environment may be an effective adjunct for achieving learning outcomes traditionally met through lectures.

Please describe the technologies used and how those technologies were deployed in an innovative way. Also, please include any technical or other challenges that were overcome for the successful implementation of the project.

Developers used Autodesk Maya 3-D animation software and the Unreal 3 game engine to create sophisticated audiovisual representations of a virtual clinic and four high-fidelity 3-D infant patients. Unreal 3 was selected because the game engine provided the necessary graphic fidelity for presenting nuanced signs and symptoms of respiratory distress, as well as the capability to handle the multiple, complex player interactions with the virtual patients. Considerable development time was required, however, to customize the simulation within Unreal 3 to achieve the desired teaching objectives and allow nursing faculty to analyze data from game play and assess educational effectiveness. In particular, developers created a custom User Interface (UI) and Content Management System that utilized patient symptom data to develop the behavioral AI that generated each patient's medical conditions. Also, developers customized Unreal 3 code to serialize all player data to an XML format. This allowed nursing faculty the ability to query all player data and analyze the type of actions taken and their timing, critical factors in assessing student performance. The Virtual Baby project was first used as part of a study of undergraduate nursing students and then was redesigned for use by first-year professional nurses at a local children's hospital. The simulation is currently being used to help nursing professionals at the hospital recognize decompensating conditions in pediatric patients. The UI was redesigned to include a journal and patient charting system to assist players in tracking changes in patients based on their interactions. Screenshots from the UT System project and the updated version used at the local children's hospital are represented in Appendixes 1, 2 and 3.

Please list the specific humanitarian benefits the project has yielded so far.

Because of the encouraging results of the initial UT System Virtual Pediatric Patient Project study, nursing faculty at the University of Texas at Arlington College of Nursing have continued research on additional virtualization projects that enhance educational opportunities for nursing students and professionals. A shortage of nursing faculty impacts the ability of nursing schools to enroll more students. One of the goals of the Virtual Pediatric Patient Project and other similar research projects is to explore the use of virtual worlds to extend the reach of nursing faculty. Using virtualization technology and web-based blended learning, we are developing asynchronous teaching experiences that allow nursing faculty to reach more students.

Please provide the best example of how the project has benefited a specific individual, enterprise or organization. Feel free to include personal quotes from individuals who have directly benefited from the work.

The simulation and study received first place in the Emerging and Innovative Technologies & Methods category at the 2011 International Meeting on Simulation in Healthcare. An article about the simulation and study is scheduled to be published this spring in the Journal of the Society for Simulation in Healthcare.