Chapter 9
Advancing Emergency Nurse Practitioner Training Using Virtual Nursing Centers

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ABSTRACT

The purpose of this chapter is to describe the design of a live emergency room simulation for nurse practitioners using augmented reality and virtual reality. The authors describe the specific design and development procedures including (1) the design of a learning analytic system for formative and summative assessment, (2) the design of the virtual space for the live event, (3) the development of a timed script for the emergency room event, and (4) the development of the virtual world in Second Life. The authors also define all the design decisions based on research on the cognitive theories that support the development of advanced problem-based learning curriculum, research of virtual immersive learning environments, and research on virtual simulations used to develop advanced skills and knowledge.

INTRODUCTION

The purpose of this chapter is to describe the design and implementation of the Virtual Nursing Center designed to train nurses. The goal is to describe the details surrounding the design of the virtual space, the assessments, the scripts for the live events, and the learning management and learning analytic systems required in the educational space to provide holistic and systemic evaluation of the nurses' responses.

The Virtual Nursing Clinic (VNC) was designed based on a problem-based learning curriculum design model that creates live interactive events that engage learners in simulations of real-world events, in this case design, a pediatric emergency occurring in the Emergency Room in the clinic. The VNC also includes several players to increase the complexity including a mother, a Registered Nurse (RN),

and a pedagogical agent, a baby bot, both preprogrammed using AI to respond to specific interactions using specific tools in the simulation.

The live ER simulation includes a timer for phases of the Nurse Practitioner response to assess the level, quality, and timeliness of the nurse practitioner's interactions, communication, decision-making, evaluation, and the use of the varied tools in the simulated environment including medical devices and a simulation of an electronic medical report interface. The simulation is designed to include (a) pedagogical agents; (b) a learning analytic system; (c) a pre and post-event conference; (d) multiple players that will interact with the nurse trainee during the live event; and (e) a system of timed interactions that have medical consequences in a live event.

The learning analytic system was designed to create a Competency Map for Emergency Nurse Practitioners based on the review of national and international standards. The in-situ assessments, e.g. the timed responses for case diagnosis, the interactions within the simulation, will be included in the learning analytic system in near real-time. Additionally, there will be an expert nurse practitioner who will do observations and score the trainees. Finally, there are multiple rubrics that will be scored on the higher-order cognitive processes required by nurse practitioners. The Competency Map will then link these assessments with the selected standards to map the level of response to provide a comprehensive rubric for trainee or instructor review.

This chapter will describe the design case for this project. including the systemic design of the interactions and responses in the learning environment (Boling, 2010). Throughout this chapter, we will describe the designed artifacts and experiences as a guide for future designers in the instructional design field, which is lacking in design case examples (Boling, 2010). Instructional designers utilizing the process of design case research can provide new conceptual formats for the integration of immersive technologies into learning environments. As a result, this chapter will provide a design case with a comprehensive description of the design of the Virtual Nursing Clinic and the integration of VR technologies.

BACKGROUND

A study by John Hopkins found that 250,000 deaths per year in the U.S. are due to medical errors (Daniel, 2016). This makes medical errors the 3rd leading cause of death in the U.S. Researchers have shown that improved live training programs can prevent medical errors because of limited experience in responding to live events that replicate the types and qualities of thinking and decision-making needed by medical personnel to reduce errors in live events (Kohn et al., 2000; Shah et al., 2020).

The Institute of Medicine's 2003 Report, Health Professions Education: A Bridge to Quality, was prompted by the 2002 Health Professions Education (HPE) Summit. The Summit was organized in response to the Institute of Medicine's report To Err is Human, which revealed the chasm between quality care and patient safety in the United States. The HPE report concluded that nurses, doctors, and other allied health professionals lack the education and training necessary to meet 21st-century healthcare needs. The report urged all health professionals to develop proficiency in five common core competencies, specifically: delivering patient-centered care, working as interdisciplinary teams, practicing evidence-based medicine, focusing on quality improvement, and using information technologies (Kohn et al., 2003).

The use of simulations has increased in recent years in the nursing industry as a result of a greater emphasis on patient safety (Foronda et al., 2017). Gaba et al (1998) insisted that in an industry where human lives depend on the skill of the practitioner, one cannot wait for the unequivocal proof of the

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