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Featured Article

Serious Game Simulation as a Teaching Strategy in Pharmacology

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KEYWORDS
nursing education;
games;
serious games;
simulation;
teaching strategies;
research

Abstract

Background: The purpose of this pilot study was to explore student learning through the use of a serious game (SG) simulation.

Method: A pre-test/post-test design was used to measure knowledge. Importance of the SG simulation design and satisfaction and self-confidence were also measured.

Results: Seventy-nine (n = 79) students participated in this SG simulation. There was a significant increase in scores between pre- and post-tests ($p < .01$). Students evaluated the importance of design elements and were satisfied and confident engaging in this activity.

Conclusions: SG simulation may be an effective teaching strategy and has promise as an emerging pedagogical approach.

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Gaming in some form has existed for centuries. Many of today's traditional nursing students have come of age in a world filled with sophisticated, rapidly evolving video games and gaming systems in which programmed sets of rules and outcomes drive play. Recently, games, role playing, computer-assisted instruction and technologies, and high-fidelity mannequins have become commonplace (Nehring & Lashley, 2009). Serious games (SGs) are a category of games that are emerging as a new pedagogical approach in nursing and health care. SGs were first described as games played not for amusement of the player, but for the sole purpose of educating students (Abt, 1970). SGs are competitive, driven by educational goals, require the player to be in control of his/her learning, and involve pedagogical features aimed at imparting skills and/or knowledge (Abt, 1970; Sawyer & Smith, 2008; Zyda, 2005). Some other common attributes of SGs include a back story/storyline, game mechanics, rules, an immersive environment, interactivity, challenge, and risks and consequences (Bedwell, Pavlas, Heyne, Lazzara & Salas, 2012; Derryberry, n.d.; Skiba, 2008a, 2008b). Specifically, (a) the backstory provides the rationale for why the game is being played, (b) game mechanics govern how the simulated world will behave and what players control, (c) rules provide constraints on engagement and player action, (d) an

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immersive environment is the representation of the game's reality to the player, (e) interactivity provides for a relationship between players, space, and time, (f) challenge, or level of engagement, needed to win or achieve a goal, and (g) risk and consequence, where the impact of player choices determines the final outcome (Bedwell et al., 2012; Derryberry, n.d.; Michael, 2006; Skiba, 2008a, 2008b).

Key Points

- Students and teaching environments are changing.
- Serious game simulation is a new pedagogical approach to learning.
- Serious game simulation can be integrated in large scale, cost effective ways.

SGs is a new, immersive approach to learning; however, there are differing viewpoints and little consensus on how to more formally define what constitutes a SG, and whether or not this approach sustains deep learning (Bedwell et al., 2012; Marsh, 2011). In a recent meta-analysis of SGs as an educational tool, researchers found few randomized control trials or experimental studies that would support the claim that SGs are an effective learning tool. Researchers were unable to reach a conclusion about a causal link between SGs and learning and recommend that many more experimental studies be conducted (Girard, Ecalle, & Magnan, 2013). However, there is evidence that suggests that SGs may effect cognitive process and motivation especially when supplemented with other instructional methods, and when played in groups (Wouters, Nimwegen, van Oostendorp, & van der Spek, 2013). SGs and their application in higher education are in their infancy, making scientific inquiry more difficult. Despite this, SGs and human patient simulation have many shared features. In particular, SGs and simulations both occur in a synthetic world structured by rules, feedback and tools to support them (Aldrich, 2009). SGs and simulations are points on a continuum all of which create highly interactive virtual environments for learning (Aldrich, 2009). Simulations differ from SGs in that simulations are not typically considered competitive or entertaining. Some researchers are convinced that SGs are the educational tools of the future (Girard et al., 2013).

To keep pace with changing students and technologies, it is becoming increasingly imperative that educators rethink higher education delivery methods. The aim of this pilot study was to explore student learning through the use of SG simulation as a teaching strategy. The setting was a large classroom composed of third-year baccalaureate nursing students enrolled in a pharmacology course. The SG simulation involved caring for a patient experiencing morphine overdose. The activity was presented using a high fidelity human patient simulator and Desire 2 Learn™ (D2L), the university's learning management system (e-classroom). For this pilot study, SGs was defined as "digital games, simulations, virtual environments, and mixed reality/media that provide opportunities to engage in activities through responsive narrative/story, game play or encounters to inform, influence, for well-being and/or experience to convey meaning" (Marsh, 2011, p. 63). For this SG simulation, the following game attributes were utilized: back story/storyline, game mechanics/rules, immersive environment, interactivity/challenge, and risk/consequence. The research questions were: (a) Does SG simulation increase student knowledge in large group settings? (b) Do students perceive the presence and importance of SG design features as a successful learning strategy? (c) Does SG simulation increase student satisfaction and self-confidence? Institutional review board approval was obtained before data collection.

Methods

Participants comprised a convenience sample of 79 third-year baccalaureate students enrolled in a two-credit pharmacology theory course. For the first research question, an instructor-developed content focused pre—post-test consisting of 11 questions was utilized to measure knowledge (Appendix, view at www.nursingsimulation.org). The test focused on care of a postoperative patient receiving morphine, was consistent with course objectives, and was to be completed before the start of class. Students received a grade of either completed or not completed; the intent of this activity was to be educational and entertaining without penalizing grades. Both tests were available in D2L and were not proctored.

For the second research question—do students perceive the presence and importance of SG design features as a successful learning strategy?—the student version of the Simulation Design Scale (SDS; 20-item scale; 5-point Likert scale; from 1 [strongly disagree] to 5 [strongly agree]) was utilized. The SDS is a simple rating scale that asks participants to judge attributes of an instructor developed simulation. The first part is designed to evaluate for the presence of features, including objectives and information (five items), support (four items), problem solving (five items), feedback/guided reflection (five items), and fidelity (two items). Reliability for presence of features has been reported as 0.92 (Jeffries & Rizzolo, 2006). The second part of the scale addresses the importance of those same specific features to the learner. Reliability for the importance of design features has been reported as 0.96 (Jeffries & Rizzolo, 2006).

For the third research question, of whether SG simulation increases student satisfaction and self-confidence, the Student Satisfaction and Self-Confidence in Learning Scale (Jeffries & Rizzolo, 2006; 13 items; 5-point Likert scale; from 1 [strongly disagree] to 5 [strongly agree]) instrument was utilized. This instrument is designed to measure satisfaction (five items) and self-confidence in learning (eight items). Reported reliability for the scale was 0.94 for satisfaction and 0.87 for self-confidence (Jeffries & Rizzolo, 2006). A voluntary demographic questionnaire and consent