Chapter 8
Virtual Simulations and Serious Games in Community Health Nursing Education: A Review of the Literature

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Abstract The recent shift in healthcare delivery from that of the hospital to the community calls for skilled community health nurses. The role and practice of community health nurses differs from that of a nurse clinician. Unlike the skills required for that of a nurse clinician, much of the skills required for community health nursing and their application cannot be developed and practised within newly developed and highly innovative practice laboratory facilities where the focus of patient care is the individual. Virtual simulation (and serious gaming) presents a viable, cost-effective training option for community health nursing trainees, providing the opportunity to practise within an interactive, engaging, and safe environment. In this chapter we review and examine the use of virtual simulation (including serious gaming) in health care education with a particular emphasis on community health nursing. Findings demonstrate that students and nursing educators recognize the value of virtual simulation in community health nursing education. Best practices in simulation development indicate that a framework that guides the design, implementation, and evaluation should be employed. Assessment methods of student learning have been suggested however, further research is needed on assessment techniques and learning outcomes to demonstrate that virtual simulation may be a sound pedagogical tool.

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8.1 Introduction

Recent health care reforms have resulted in a shift in healthcare delivery from that of the hospital to that of the community. Proponents of health care reform are advocating for greater focus on health promotion and the prevention of injury and disease. This, coupled with emerging social and public health issues has resulted in an increasing need for competent and skilled community health nurses.

Unlike the nurse clinician, the role and practice of the community health nurse focuses on promoting, protecting, and preserving the health of populations by working with individuals, families, and communities [1]. Their practice setting, target audience, and the strategies they employ are ever changing, requiring different skills, training, and education. Developing innovative ways to teach these concepts and processes is challenging for nursing educators. Consequently, community health nursing curriculums have predominantly relied on traditional teaching-and-learning approaches where the application and practice of such skills is often quite challenging. Limited clinical placements in community health nursing further intensify the challenges. Virtual learning environments offer a solution to teaching community health nursing education and training.

A *virtual learning environment* can be defined as a self-contained computer based (or internet-based) environment where various tools are provided to enable interactions between the instructor and the student, support teaching, and facilitate the learner's learning experience [2]. Online virtual learning environments including those established on Linden Labs *Second Life*, facilitate distance learners in accessing educational materials. The term virtual learning environment has been used broadly and interchangeably with the terms "educational website", "online learning", and "managed learning environment", amongst others terms. Virtual learning environments provide the opportunity for a learner-centered approach to teaching that is attractive to the current generation of learners, the millennials. Millennial students are technologically literate and see technology as a necessity, both in life and in learning [3]. According to Villeneuve and Macdonald [4], the millennial generation does not remember a time without email, Internet, cell-phones, or lap-top computers and this has shaped the ways in which these students prefer to receive information and how they acquire and retain knowledge. Millenials do not appreciate or learn as much from passive, lecture style learning, but rather, they prefer being actively involved [5]. This high level of interactivity is not easily captured in traditional teaching/learning environments. However, the more recent use of simulations through virtual reality and videogame based technologies have been noted as one of the most effective means of promoting interactivity and active involvement in learning [6].

Recently there has been a push in the use of immersive (3D) virtual learning environments such as virtual simulations, and particularly serious games. A *serious game* can be formally defined as an interactive computer application, that (1) has a challenging goal, (2) is fun to play and/or engaging, (3) incorporates some concept of scoring, and (4) imparts to the user a skill, knowledge, or attitude that can be

applied to the real world [7] (see Djaouti et al. [8] for a discussion on the origins of serious games). Serious games have also been more loosely defined as videogames that are used for training, advertising, simulation, or education [9]. Although virtual simulations and serious games are similar and can employ identical technologies (hardware and software), being a videogame, serious games should strive to be fun and should include the primary aspects of games including challenge, risk, reward, and loss. The relationship between serious games, games and simulations is more formally described by Becker and Parker [10] as follows: every serious game (or "simulation game" according to Becker and Parker [10]) is a game, and every game is itself a simulation. As described below, there are a number of benefits associated with the use of serious games for education and training (many of these benefits are equally applicable to virtual simulations). Due in part to these benefits, it has been suggested that serious games provide the potential for a paradigm shift in the delivery of education and training in the twenty-first century [11].

Serious games present a learner-centered educational approach where the player controls their learning environment through interactivity, allowing the player to learn via active, critical learning [12]. They present opportunities for individuals to demonstrate and apply learning, receive immediate feedback on decisions made in realistic learning environments, and are further able to captivate, while engaging students to achieve academic success [13]. Serious games allow users to experience situations that are difficult to achieve in reality due to factors such as cost, time, and safety concerns [14]. Further benefits to learning include: improved self-monitoring, problem recognition and solving, improved short-and long-term memory, increased social skills, transfer of learned skills, use of research skills and increased self-efficacy [15, 16]. Serious games focus on the goals and learning activities of the learner rather than on the presentation of content which is reflective of constructivist theories of learning. The learner is actively constructing knowledge and context of the culture and situations in which they are participating [17]. The constructivist pedagogy typically employed in serious games allow learners to develop personal constructs based on personal observations and interactions; thus, they gain the socialization necessary to make them members of society of which they are studying to become part of [18]. Constructivist theory supports blended learning, providing web-based and face-to-face teaching and learning environments in community health nursing education that are adaptive, highly interactive and meaningful, and learner-centred. However, care must be taken to ensure that blended learning environments consider a number of issues, from the theoretical to the practical, to be effective.

The aim of this chapter is to examine the use of virtual simulation and serious gaming in health care education with a particular emphasis on community health nursing. For clarity, for the remainder of this chapter, unless specified otherwise, the term virtual simulation will encompass serious game. Findings explore both student and educator perceptions regarding the use of gaming as a pedagogical application, how virtual simulations should be integrated into the classroom, assessment techniques, and finally a discussion regarding the need for evaluating learning outcomes associated with virtual simulations in community health nursing is provided.

8.1.1 Review Method

The infancy of nursing informatics and inconsistent definitions within the area of virtual learning environments has resulted in a literature base comprised of disparate studies and commentaries. As a result, an integrative review design was employed. A computerized search using Cochrane Database of Systematic Reviews, CINHAL, Medline (PubMed), Proquest, and OVID was undertaken. Specific strings were developed for each database using a combination of key words, subject headings, abstract, and subject terms such as virtual learning environments* AND health care education* OR nursing education*; virtual simulations* AND nursing* AND education, computer simulation* AND nursing* AND education*, serious games AND nursing* AND education*, serious games*, virtual reality* AND nursing* AND education*. This strategy ensured the comprehensive identification of papers, helping to mitigate potential limitations caused by inconsistencies in the indexing of review topics [19]. In addition, the reference lists of those papers identified for inclusion formed the basis for a hand search to identify further potentially relevant literature. Peer reviewed journal articles with primary quantitative studies such as those with quasi experimental or similar design, any qualitative research design, literature review, or theoretical framework written in the English language only, published from January 2000 to April 2013, were included.

The search strategy identified 368 abstracts for review. Based on the inclusion criteria, and after eliminating overlaps and screening of titles, abstracts, and key words, 10 publications were retained for review: one framework report, and nine empirical studies. After examining the reference lists of all included publications, two additional empirical studies were included. Twelve articles were finally identified and included in this review.

Quality checks were performed on all of the included empirical studies, first selecting the abstracts for inclusion and completing the initial review. The second review involved quality checks using an assessment tool offered by the *Effective Public Health Practice Project* [20] (see Thomas et al. [21] for greater details). A four-stage systematic analytic method making use of qualitative approaches was then employed. First, a standard format for summarizing descriptive and methodological information and outcomes of included studies was developed. The recorded dimensions included: descriptive information (author, date of publication, and methodology); description of study objectives (focus, target audience); and definitions offered; and any findings and opinions related to gaming as an educational tool intended to enable the design, implementation and evaluation of simulations by healthcare educators. The extracted information was compared and patterns recorded as they became apparent. The results of the comparative analysis were further analyzed, from which it was possible to discern groupings of similar data and identify themes. Four key themes were identified at this stage and will be discussed further in the remainder of this chapter. Quality checks of the framework was completed using Chinn and Kramer's [22] guide for theory/model analysis, exploring clarity, simplicity, generality, empirical precision, and deliverable consequences.

8.2 Perceptions of Games in Learning

Traditional teaching-and-learning environments do not meet the unique learning needs of millennial students and are often quoted as boring. Two quantitative studies found that almost half of the respondents reported playing games and that students support the use of new media technologies in education [23, 24]. Respondents in each study indicated that strategy/simulation games were amongst the top three genres most often played [23, 24] and approximately half of the respondents (52 %) were interested in using multiplayer online health care simulations that would realistically replicate the experience of being in professional practice [24]. Kapralos et al. [23] found more than three quarters of the respondents have used virtual simulations in the past and indicated that they found them useful and aided in grasping course theory. In a Midwestern United States university, pilot testing with nursing students using a "virtual simulation game" revealed that students were very enthusiastic about the experience and provided suggestions for expanding the game [25].

A study examining the use of a virtual community known as *The Neighbourhood* reported students seeing relationships between course concepts and The Neighbourhood [26]. A qualitative survey completed by students using The Neighbourhood reported positive benefits to learning when assignments or in-class learning activities incorporated characters or situations from the virtual community. Comments also suggested that the degree of integration between The Neighbourhood and class work was a key factor in their perceived benefits [27]. Continued use of The Neighbourhood characters and situations gave life to concepts and content as students were able to link them to clinical applications [27]. The frequency of virtual community use in nursing education appears to be linked to positive learning benefits and engagement [28]. In Schmidt and Stewart's [29] evaluation of Linden Lab's Second Life, students reported that they liked the ability to meet with other students in real time and receive feedback, and they also appreciated the opportunity to meet the instructor in Second Life to clarify material or discuss course concerns [30].

Faculty appear reluctant to apply a pedagogical tool that has received limited research regarding pedagogical implications, and learning outcomes. In a survey conducted by Kapralos et al. [23], 50 % of faculty participants indicated that they have used virtual simulations, and 72 % answered that they added value to their course. Of those who did not use them, 50 % responded that they did not use them due to a lack of availability. In addition, 66 % stated they would fully integrate a simulation were it available to them, yet 22 % said they would allow students to "play around with them as an extracurricular tool, but would not use it as a part of course evaluation". Although a large number of faculty are willing to integrate a virtual simulation into their curriculum, there are still those that are reluctant to do so. This reluctance may be due to a number of factors including lack of prior knowledge and experience with virtual simulation and game-based learning, and the fact that such technologies in the past, particularly during the *Edutainment* era, have not lived up to their expectations and the resulting resentment still remains today (see Becker and Parker [10] for greater details regarding the Edutainment era).

Millennial students have not lived without technology thus it is not surprising that they regard the experiential learning offered by virtual simulation a necessity for their learning success. Previous findings suggest that students and educators appreciate the use of virtual simulations but care must be taken to ensure that they are relevant to the course material, that educators have access to them and are familiar with their use to assist students should problems and questions arise.

8.3 Designing and Integrating Virtual Simulations into the Nursing Curriculum

Nursing education is calling for innovative strategies and integrative teaching to build a body of evidence that will guide the practice of teachers. Integration into the course or curriculum is vital to success. However, successful integration and learning from the use of virtual simulations requires proper design. There is a need for a consistent and empirically supported model to guide the design and implementation of virtual simulations and to assess outcomes. Jeffries [31] offers a theory-based framework that proposes a four step process to simulation development. Step one: involves working from a conceptual framework that specifies variables and relationships that promote understanding of the processes involved in developing, implementing, and evaluating simulations in nursing education. Step two: relates to the materials needed for the setup, such as, simulation set-up, staffing, and guided reflection time. Step three: refers to four major components in the structure: (1) the teacher's role, (2) the student's role, (3) the process of embedding educational practices into the simulation, and (4) the timing of the simulation itself. The teacher's role refers to the essential need of teachers to the success of alternative learning experiences. When virtual simulations are employed, teachers work as facilitators and it is therefore crucial that they feel comfortable with the virtual environment itself and are prepared to assist students with any questions and problems they may have. Specific roles are assigned to the learner during the simulation and therefore students must have specific information related to their assigned roles, and learning needs should be evaluated related to progress in attaining learning outcomes. Jeffries [31] refers to four principles of good educational practices that are identified as important to learning: (1) active learning, (2) collaboration, (3) diverse ways of learning, and (4) high expectations. When developing a virtual simulation, the amount of time needed to accomplish the objectives also requires consideration. Simulations (physical or virtual) should be timed with student instruction and instrumental to the timing of the simulation is the time provided for guided reflection. The fourth and final step in the four step process includes evaluation, which is needed to assess the learning outcomes as well as the overall process of design and implementation.

The Federation of American Scientists held a summit on harnessing the power of videogames for learning in October 2005 [32]. Among the groups recommendations was a list of 10 attributes of games for application learning (although not specific to nursing education, these attributes are applicable to learning in general):

1. Clear learning goals.
2. Broad experiences and practice opportunities that continue to challenge the learner and reinforce expertise.
3. Continuous monitoring of progress, and use of this information to diagnose performance and adjust instruction to the learner's level of mastery.
4. Encouragement of inquiry and questions, and response with answers that are appropriate to the learner and context.
5. Contextual bridging: closing the gap between what is learned and its use.
6. Time spent on task.
7. Motivation and strong goal orientation.
8. Scaffolding: providing learners with cues, prompts, hints, and partial solutions to keep them progressing through learning, until they are capable of directing and controlling their own path.
9. Personalization: tailoring learning to the individual.
10. Infinite patience.

Other authors concur with many of Jeffries' [31] four steps and the Federation of American Scientists' [32] recommendations. For example, Susi et al. [9] cautioned that the individuals playing educational videogames (within an educational setting) may not necessarily be seasoned gamers, therefore game set-up should ensure accessibility. Shuster et al. [27] found that students appreciated when the simulation coincided with course concepts. Schmidt and Stewart [30] learned that students and faculty need to be adequately prepared with an orientation session before or at the start of the semester, not in the middle of an already stressful program. It was also suggested that a designated staff member should help both students and faculty with technical problems or training needs [29, 30]. Students using Second Life identified the need for clear expectations and explanations in advance of the implementation and overall the authors suggested that there is a need for clinical faculty to encourage students to use the activities [30]. Honey et al. [33] stressed the importance of planning and adequate preparation to ensure a focus on learning and the need for orientation. Finally, Kapralos et al. [23] noted that the virtual simulation must feel as though it is being linked to the course material; the simulation must be user friendly; and the faculty/educators must integrate the simulation into their course material through understanding and competency with the application. Many of the empirical studies also made reference to the need for additional research on assessment and learning outcomes related to virtual simulation.

A simulation framework that specifies relevant variables and their relationships is needed to design, implement, and conduct research in an organized, systematic fashion ensuring learning outcomes are adequately evaluated.

8.4 Assessment of Student Learning

Assessment and testing is crucial in determining whether the student has understood the material and is able to recall and use the material appropriately. Therefore, virtual simulations, just like every other tool of education, must be able

to show that the necessary learning has occurred and must provide some means of testing and progress tracking which is recognizable within the context of the education or training they are attempting to impart [15]. One of the main disadvantages with present virtual simulations is the lack of research validating outcomes. That being said, learning is a complex construct making it difficult to measure and determine whether a simulation has achieved the intended learning goals or has had the desired effect [34–36]. Commentaries suggest that consideration must be given to the pedagogy adopted (e.g., *problem-based learning*) as this will guide assessment. For example, with respect to a serious game, the game can monitor activities, and outputs, and the game characters can probe student behaviour in the course of their interactions. Once the game has determined the status of the student's proficiency, it can make decisions on how to evolve the scenarios to embody more challenging learning objectives or to offer various forms of remediation [37].

Virtual simulation involves less emphasis on rote memorization of facts and therefore assessment data obtained from traditional methods may not accurately reflect the learning gained from serious games. With respect to serious games, Michael and Chen [15] suggest that there are three main types of assessments: (1) completion assessment, (2) in-process assessment, and (3) teacher evaluation. Completion assessment simply asks, "Did the student complete the serious game". Serious games involve interaction by the students with the material, thus completing the game could signify more learning progress and comprehension than passively attending lectures [15]. In-process assessment is analogous to teacher observations of the student. The game (or virtual simulation) offers logging potential and may track such items as: time required to complete the lesson, number of mistakes made, number of self-corrections made, amongst others [15]. Multiplayer games often include *observer modes* which offer the teacher an opportunity to observe the student in action. Teacher evaluation is a combination of both completion assessment and in-process assessment (a thorough overview of serious games assessment is provided by Bellotti et al. [38]). Hogan et al. [39] describe a serious game for community health nursing and suggest that scenarios in the game be structured around rigid protocol scripts that require adherence to time-or sequence sensitive action protocols, or they can be unstructured, requiring satisfactory real-time response to emerging events and information. Student responses can take the form of immediate, direct action in real-time, or the issuance of recommendations for further action by a third party. Instructors may use in-process assessment to evaluate student's success, thereby allowing the educator to provide the student with feedback and generate a grade [39].

Assessing the learning within a virtual simulation is not a trivial matter and further research is required. Serious games (and games in general) can and generally do contain in-game tests of effectiveness. More specifically, as players progress through the game, they accumulate points and experience which make the next stages and levels of the game easier and thus should score higher if any learning has been imparted [10]. Recent work is focusing on the use of such *in-game assessment* as it takes us away from the predominant, classic form of assessment comprised of questionnaires, questions and answers, etc. These classic forms

of assessment do nothing more than test our memory rather than measure an understanding and/or creative use of the acquired knowledge which can interrupt and negatively affect the learning process [40]. In-game assessment provides the opportunity to take advantage of the medium itself and employ alternative, less intrusive, and less obvious forms of assessment which could (and should) become a game element itself [40]. Integrating the assessment such that the player is unaware of it forms the basis of what Shute et al. [13] describe as stealth assessment and this represents a new and growing area.

8.5 Evaluation of Learning Outcomes

Numerous benefits of virtual simulation have been espoused however little research has been completed on actual learning outcomes. Farra et al. [41] recruited second year students from an associate degree nursing program at a community college. The aim of the study was to examine the effects of a virtual simulation on learning outcomes and retention of disaster training with nursing students. Participants were randomly assigned into two groups; both groups completed web-based modules; the treatment group also completed a virtually simulated disaster experience in Second Life. Analysis of the overall model was statistically significant $(p < 0.0001)$ indicating that there were significant differences between the virtual simulation (treatment) and non-simulation (control) groups. The two month post-knowledge assessment demonstrated that virtual simulation had a strong positive effect on retention of disaster training [41]. Similarly, a study evaluating the effectiveness of a serious game in teaching major incident triage by comparing it with traditional training methods found that compared to the traditional method, those who underwent the serious game training performed higher on tagging accuracy (assigning correct triage tag to the causality [42]). Step accuracy (following correct procedures) was also higher in the game group. A recent study by Cook et al. [43], which examined reviews of the medical simulation literature, has shown that technology-enhanced simulation, in comparison with no intervention (i.e., no simulation), is associated with large positive training effects. However, the relative merits of different simulation interventions remain unknown.

Given the lack of research in the area of virtual simulation for community health nursing, the scope was expanded to learning outcomes in all virtual simulations used for healthcare education. In a quasi-experimental study conducted to determine the effectiveness of supplemental gaming on students' comprehensive knowledge of pediatric cardiovascular dysfunction, with no significant differences in the pre-test, the experimental group (lecture and game) scored significantly higher than the control group on the post-test [6].

In another novel study, instructional videos were developed to facilitate medical students' understanding of how to perform an effective home visit [44] in a video-game environment. In this videogame, students were expected to navigate the home of an elderly person. In doing so, the student had the opportunity to identify any

risk factors they assessed. They clicked on the risk factor, and if correct, they scored points; there was a total of 50 risk factors. Once entering the elderly person's home, the player had a total of 10 minutes to identify the risk factors. After completing the game, the student was directed to a summary page that highlighted the correct risk factors in each room and included referenced feedback. Medical students were required to use the game during a 4-week geriatric rotation. Students using the game during a 4-week geriatric rotation demonstrated statistically significant improvement from pre-test to post-test [44]. These results support the use of instructional videos as a beneficial tool for learning home risk factors for the elderly.

From the scant literature, it appears gaming does have a positive effect on student learning outcomes (as shown in [44] and as shown in various other studies too including those described in [7, 45, 46]). However, as noted by Jeffries [31], outcome measures such as knowledge, skill performance, selfconfidence, learner satisfaction, and critical thinking related to the use of gaming (serious games) in healthcare education requires further research.

8.6 Discussion

This review focused on the use of virtual learning environments in the form of virtual simulation and serious gaming in health care education with emphasis on community health nursing. Research demonstrates that students do play and enjoy videogames, have positive attitudes toward virtual simulation and recognize that new media technology could facilitate and strengthen nursing education. Students prefer to have any virtual learning environment used within the course curriculum linked to classroom concepts and increased perceived benefit with continued increased use of the application was noted. When provided the option, students consistently chose to continue with the application and offered recommendations related to orientation, additional scenarios, and feedback on student performance.

Although health care educators recognize the value of virtual simulation, additional research regarding their use as sound pedagogical applications is required to support uptake of this innovative strategy, particularly with respect to the integration into the classroom, assessment, and learning outcomes is needed. Endorsement will also be enhanced with faculty orientation and support as this is a new application for many educators.

This review demonstrates that virtual simulation provides nursing students the opportunity to experience and analyze system influences on personal and patient safety, enabling them to practice skills without harming patients. Virtual simulation ties into constructivist pedagogy by offering opportunities for first-person, experiential learning and reflection. Students gain knowledge and experience through interaction with the concepts and constructs in the simulation, reflecting on their learning through blog posts and discussion threads, which helps construct their learning. Recently, there has been a growing interest in the use of serious games but despite their popularity, there are many examples of ineffective of serious

games that is, serious games that provide little, if any, educational value. This is often attributed to the fact that these they lack appropriate instructional design [35, 47]. To develop effective serious games (and virtual simulations in general), care must be taken to ensure that they are properly designed to meet their intended goals [10, 48]. In other words, designers and developers cannot ignore the importance of instructional design.

Best practice for developing simulations in general involves the use of a framework that guides the design, implementation and suggests variables for evaluation. Integration of the game into the curriculum is integral to the educator's success. If it is viewed as an add-on or additional experience the value of the technology will be lost.

The lack of research regarding learning outcomes that can be achieved and the cost of production are barriers to the design and development of virtual simulations by educational institutions. However, as a didactic medium, virtual simulation provides the opportunity for applying learned theory in a life-like clinical environment and assists in developing skills required for community health nursing practice and should not be ignored. Future recommendations include the need for interdisciplinary collaboration in the development of a virtual simulation. Specialists with programming skills and technology system design will need to work closely with educators and nurses' with knowledge of the subject matter to ensure good pedagogy is incorporated. There is also the need for high-quality research on assessment strategies and learning outcomes of simulations.

With respect to health professions education, Cook et al. [43] conducted a study that involved a thorough literature review and synthesis of the existing evidence in educational science to determine the instructional design features that lead to improved outcomes in studies that directly compared one technology-enhanced simulation training approach to another. Although they highlight the need for further research, Cook et al. [43] suggest 12 essential features and hypothesized that outcomes would increase with an increase of each feature. The 12 essential features are: (1) clinical variation, (2) cognitive interactivity, (3) curriculum integration, (4) distributed practice, (5) feedback, (6) group versus independent practice, (7) individualized learning, (8) mastery learning, (9) multiple learning strategies, (10) range of task difficulty, (11) repetitive practice, and (12) time spent learning.

8.6.1 Limitations and Future Work

As an emerging application in healthcare education there is little research regarding the use of and effectiveness of virtual simulation. The evidence available is limited to descriptive and comparative commentaries that focus on the implementation and development of virtual simulations and little on learning outcomes. Available evidence is limited to single-site studies with small sample sizes and relies on self-report and interview methods to obtain data. The lack of homogeneity among the research available make it challenging to make comparisons with the findings.

Future research needs to focus on better explaining the engaging aspects of serious games, and if there is a need for practical guidance regarding how (when, with whom, and under what conditions) to integrate games and learning processes to maximize their learning potential [9]. Process evaluation of game design and additional high-quality large scale evaluations exploring the impact of educational games on patient and performance outcomes is needed. Lastly, there is also a need for research evaluating virtual simulation as an assessment method.

8.7 Conclusions

Community health nurses require different knowledge and skill sets than those of their nurse clinician counterpart. Despite the current studies focusing on one-to-one patient interaction or didactic skill, we find that the research on virtual simulation also suggests benefit to community health nursing education. Virtual simulation offers alternatives to the current lack of clinical placements and the incorporation of new technology addresses the different training required by community health nurses. The use of new technology in education also reflects the direction of nursing education, which includes more interactive learning, student-centered approaches, and increased opportunities to experience realistic scenarios, and simulations of clinical practice to promote problem-solving and decision-making skills. As new methods are incorporated into the teaching-learning process, nurse educators will have to be mindful of the need for educational research testing of learning outcomes.

References

1. Canadian Public Health Association.: Public health—community health nursing practice in canada: Roles and responsibilities. (Tech. Rep. No. Fourth Ed.) Canadian Public Health Association (2010)
2. Chin, P.: Using C and IT to Support Teaching. Taylor and Francis Group, New York (2004)
3. Mangold, K.: Educating a new generation: teaching baby boomer faculty about millennial students. Nurse Educ. **32**(1), 21–23 (2007)
4. Villeneuve, M., MacDonald, J.: Toward 2020: visions for nursing. (Tech. Rep.). Canadian Nurses Association (2006)
5. Sinclair, B., & Ferguson, K.: Integrating simulated teaching/learning strategies in undergraduate nursing education. Int. J. Nurs. Educ. Sch. **6**(1) (2009)
6. Cowen, K.J., Tesh, A.S.: Effects of gaming on nursing students' knowledge of pediatric cardiovascular dysfunction. J. Nurs. Educ. **41**(11), 507–509 (2002)

7. Bergeron, B.: Developing Serious Games. Thomson Delmar Learning, Hingham (2006)
8. Djaouti, D., Alvarez, J., Jessel, J., Rampnoux, O.: Origins of serious games. In: Ma, M., Oikonomou, A., Jain, L.C. (eds.) Serious Games and Edutainment Applications, pp. 25–43. Springer, London (2011)
9. Susi, T., Johannesson, M., Backlund, P.: Serious games—an overview. (Tech. Rep. No. HS-IKI-TR-07-001). School of Humanities and Informatics, University of Skovde, Sweden, Feb 2007
10. Becker, K., Parker, J.: The Guide to Computer Simulations and Games. Wiley, Indianapolis (2011)
11. de Frietas, S., Liarokapis, F.: Serious games: a new paradigm for education? In: Ma, M., Oikonomou, A., Jain, L.C. (eds.) Serious Games and Edutainment Applications, pp. 9–23. Springer, London (2011)
12. Stapleton, A. J.: Serious games: serious opportunities. In: Proceedings of the 2004 Australian game developers' conference, P. 1–6. Melbourne, Australia (2004)
13. Shute, V.J., Ventura, M., Bauer, M., Zapata-Rivera, D.: Melding the power of serious games and embedded assessment to monitor and foster learning. In: Ritterfeld, U., Cody, M., Vorderer, P. (eds.) Serious Games. Mechanisms and Effects. Routledge Publishers, New York (2009)
14. Squire, K., Jenkins, H.: Harnessing the power of games in education. Insight **3**(1), 5–33 (2003)
15. Michael, D., Chen, S.: Serious Games: Games that Educate, Train and Inform. Thomson Course Technology, Boston (2006)
16. Oblinger, D.: Games and learning. Educause Quarterly **3**(1), 5–7 (2008)
17. Kirkley, S.E., Kirkley, J.R.: Creating next generation blended learning environments using mixed reality, video games and simulations. TechTrends **49**(3), 42–53 (2004)
18. Simpson, R.L.: See the future of distance education. Nurs. Manage. **37**(2), 42–51 (2009)
19. Whittemore, R., Knafl, K.: The integrative review: updated methodology. J. Adv. Nurs. **52**(5), 546–553 (2005)
20. Effective Public Health Practice Project.: Quality assessment tool for quantitative studies. http://www.ephpp.ca/tools.html. Canada (2011)
21. Thomas, B.H., Ciliska, D., Dobbins, M., Micucci, S.: The integrative review: updated methodology. Worldviews Evid. Based Nurs. **1**(3), 176–184 (2004)
22. Chinn, P.L., Kramer, M.K.: Integrated Theory and Knowledge Development in Nursing. Mosby Publishing, St. Louis (2008)
23. Kapralos, B., Hogan, M., Pribetic, A.I., Dubrowski, A.: Virtual simulations and serious games in a laptop-based university: gauging faculty and student perceptions. Interact. Technol. Smart Educ. **8**(1), 107–119 (2011)
24. Lynch-Sauer, J., VandenBosch, T., Kron, F., Livingston Gjerde, C., Arato, N., Sen, A., Fetters, M.D.: Nursing students' attitudes toward video games and related new media technologies. J. Nurs. Educ. **50**(5), 1–11 (2011)
25. Pittiglio, L.I., Harris, M.A., Mili, F.: Development and evaluation of a three-dimensional virtual hospital unit: VI-MED. Comput. Inf. Nurs. **29**(5), 267–271 (2011)
26. Giddens, J.F., Shuster, G., Roehrig, N.: Early student outcomes associated with a virtual community for learning. J. Nurs. Educ. **49**(6), 355–358 (2010)
27. Shuster, G., Giddens, J.F., Roehrig, N.: Emotional connection and integration: dominant themes among undergraduate nursing students using a virtual community. J. Nurs. Educ. **50**(4), 222–225 (2011)
28. Giddens, J.F., Fogg, L., Carlson-Sabelli, L.: Learning and engagement with a virtual community by undergraduate nursing students. Nurs. Outlook **58**(5), 261–267 (2010)
29. Schmidt, B., Stewart, S.: Implementing the virtual reality learning environment second life. Nurse Educ. **34**(4), 152–155 (2009)
30. Schmidt, B., Stewart, S.: Implementing the virtual world of second life into community nursing theory and clinical courses. Nurse Educ. **35**(2), 74–78 (2010)
31. Jeffries, P.R.: Melding the power of serious games and embedded assessment to monitor and foster learning. In: Oermann, M.H., Heinrich, K.T. (eds.) Annual review of nursing education: Innovations in curriculum, teaching and student and faculty development, pp. 161–177. Springer, New York (2006)

32. Federation of American Scientists.: Report: summit on educational games. In: National summit on educational games. Washington, DC. USA, Oct 25 2005
33. Honey, M., Connor, K., Veltman, M., Bodily, D., Diener, S.: Teaching with second life: hemorrhage management as an example of a process for developing simulations for multiuser virtual environments. Clin. Simul. Nurs. **8**(3), e79–e85 (2012)
34. Enfield, J., Myers, R.D., Lara, M., Frick, T.W.: Innovation diffusion: assessment of strategies within the diffusion simulation game. Simul. Gaming **43**(2), 188–214 (2008)
35. Hays, R.T.: The effectiveness of instructional games: a literature review and discussion. (Tech. Rep. No. 2005-004). United States Naval Air Warfare Center, Training Systems Division (2005)
36. Thiagarajan, S., Stolovitch, H.D.: Instructional Simulation Games. Educational Technology Publications, Englewood Cliffs (1978)
37. Mitchell, A., Savill-Smith, C.: The Use of Computer and Video Games for Learning : A Review of the Literature. Learning and Skills Development Agency, London (2004)
38. Bellotti, F., Kapralos, B., Lee, K., Moreno-Ger, P., Berta, R.: Assessment in and of serious games: an overview. Adv. Hum. Comput. Interact. (Special Issue on User Assessment in Serious Games and Technology—Enhanced Learning) **2013**, 1–11 (2013)
39. Hogan, M., Kapralos, B., Cristancho, S., Finney, K., Dubrowski, A.: Bringing community health nursing to life with serious games. Int. J. Nurs. Educ. Sch. **8**(1), 1–13 (2011)
40. Bente, G., Breuer, J.: Making the implicit explicit: embedded measurement in serious games. In: Ritterfeld, U., Cody, M., Vorderer, P. (eds.) Serious Games. Mechanisms and Effects, pp. 322–343. Routledge Publishers, New York (2009)
41. Farra, S., Miller, E., Timm, N., Schafer, J.: Improved training for disasters using 3-D virtual reality simulation. West. J. Nurs. Res. **35**(5), 655–671 (2012)
42. Knight, J.F., Carley, S., Tregunna, B., Jarvis, S., Smithies, R., deFreitas, S., Mackway-Jones, K.: Serious gaming technology in major incident triage training: a pragmatic controlled trial. Resuscitation **81**(9), 1175–1179 (2010)
43. Cook, D.A., Hamstra, S.J., Brydges, R., Zendejas, B., Szostek, J.H., Wang, A.T., Hatala, R.: Comparative effectiveness of instructional design features in simulation-based education: systematic review and meta-analysis. Med. Teach. **35**(1), e867–e898 (2013)
44. Duque, G., Fung, S., Mallet, L., Posel, N., Fleiszer, D.: Learning while having fun: the use of video gaming to teach geriatric house calls to medical students. J. Am. Geriatr. Soc. **56**(7), 1328–1332 (2008)
45. Brown, S.J., Lieberman, D.A., Germeny, B.A., Fan, Y.C., Wilson, D.M., Pasta, D.J.: Educational video game for juvenile diabetes: results of a controlled trial. Med. Inform. **22**(1), 77–89 (1997)
46. Livingston, S., Fennessey, G., Coleman, J., Edwards, K., Kidder, S.: The Hopkins games program: final report on seven years of research. (Tech. Rep. No. 155). Johns Hopkins University, Center for Social Organization of Schools (1973)
47. Gosen, J., Washbush, J.: A review of scholarship on assessing experiential learning effectiveness. Simul. Gaming **35**(2), 270–293 (2004)
48. Iuppa, N., Borst, T.: End-to-end game development: creating independent serious games and simulations from start to finish. Focal Press, Oxford (2010)