Evaluation of a Virtual Clinical Excursion: Impact of Knowledge Transfer in Relation to Critical Thinking Skills and Psychomotor Skills in First Year Nursing Students

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Abstract

In this era of evolving computer technology, virtual learning is a teaching strategy that can assist nursing students in the application of theory to practice in a safe environment. Currently, the traditional lecture method and supervised lab demonstrations play a major role in imparting knowledge to students in nursing curricula. Therefore, nurse educators need to be cognizant of alternate strategies like virtual learning to enable students to become critical thinkers and decision-makers. Fourteen first-year baccalaureate nursing students from a university in Atlantic Canada participated in a pilot test to evaluate a Virtual Clinical Excursion (VCE) software program (Potter & Long, version 3.0, 2006) and the accompanying workbook (Potter & Long). All students completed an evaluation questionnaire which was based on the literature and other evaluative components. The results showed that thirteen (93%) of the students agreed that the VCE is a positive learning experience and recommended this computer–based program as a valuable learning tool. Although the students reported enjoying the VCE experience, they unanimously agreed VCE was a complimentary resource and not a replacement for an actual clinical placement. While there is a need for further research, the VCE program can be customized to different nursing curricula and used as a learning resource for nursing students.

The ultimate goal of nursing programs has been to graduate competent practitioners, yet, nursing students at all levels continue to report feeling inept in clinical practice. They attribute this feeling to educational deficiencies in the nursing curricula (Croxon & Maginnis, 2006; Glossop, 2001; Magnussen & Amurdson, 2003; Simpson, 2002). The educational curricula for nursing programs seem to be lagging behind the evolutionary changes that have occurred as a result of increased reliance on computer technology in the health care system (Connors, Weaver, Warren, & Miller, 2002). This may be attributed to the fact that faculty continues to believe the lecture format is a better method for delivering factual information (Lowry & Johnson, 1999).

The innovative technology of computer-based learning (CBL) has been in existence in North America for over 25 years (Lewis, Davies, Jenkins, & Tait, 2005; Saba & McCormick, 2001; Vivekananda-Schmidt, Hassell, & McLean, 2004). Nurse educators became interested in CBL in the 1980's (Lewis et al.) and virtual learning using computer software programs was promoted for use in nursing curricula in the last decade (Gobbi et al., 2004). Currently, there is a growing interest in mannequin simulators as a teaching resource in nursing programs (Feingold, Calaluce, & Kallen, 2003; Saba & McCormick), but this technology is expensive to buy, operate and maintain. However, since the effectiveness of the traditional didactic teaching methodology is being questioned (Gibbs, Doggett, & Frost, 2005; Garrett & Callear, 2001; Simpson, 2002; Skiba & Barton, 2006), faculty are looking to simulation as well as investigating other cost effective CBL tools. An alternative to the expensive simulation mannequins are the creative uses for virtual learning vignettes that are being developed to assist in the facilitation of knowledge transfer in critical thinking and psychomotor skill development for nursing students. Virtual learning provides nursing

students the opportunity to develop and practice critical thinking abilities (Smith & Johnston, 2002) in a way that does not jeopardize patient safety (Kiegaldie & White, 2006; Oermann, Truesdell, & Ziolkowski, 2000). Patient acuity is increasing in the clinical practice areas and nurse educators are exploring alternative teaching strategies to help nursing students practice critical thinking and psychomotor skills without putting clients at risk (Gobbi et al., 2004; Kiegaldie & White; Seropian, Brown, Gavilanes, & Driggers, 2004).

Virtual Clinical Excursion (VCE) (Potter & Long, 2006, version 3) and the study guide (Potter, 2006) are marketed as learning tools and enable students to practice the delivery of patient care in a virtual environment until they demonstrate proficiency. In addition to repetitive reinforcement, VCE has the same benefits as other CBL tools and provides nursing students with an opportunity to work independently to increase their level of competency (Babenko-Mould et al., 2004; Simpson, 2002). For these reasons; students involved in virtual learning have reported a more seamless transition from nursing student to registered nurse (Turner, 2004). However, there is a paucity in the literature to support its effectiveness as a learning tool, therefore, virtual learning needs to be evaluated as a teaching tool to determine pedagogical evidence of learning outcomes (Green et al., 2006). The profile of today's student extends across a continuum that encompasses the high school graduate, the mature student with secondary education, and the older student with family and work responsibilities. Skiba and Barton (2006) identify the characteristics of the new generation of learners and provide examples of how faculty can provide interactive strategies that will engage students in learning. With the use of computers increasing, it is timely for nursing curricula to incorporate these strategies into the learning process. This technology will also help to address the learning needs of today's students and increase their

awareness of current demands in practice environments (Kiegaldie & White, 2006; Lowry & Johnson; More & Conklin, 1995).

The flexibility and extra learning opportunities afforded by computer-based study is appealing to all of these groups (Vivekananda-Schmidt et al., 2004; Wingard, 2004). These benefits were evident in a pilot study by Olson, Stedman-Smith, and Fredrickson (2005) in which registered nurses (*N*=34) evaluated an environmental health and nursing computer–based learning module. Ninety-four percent reported they were satisfied or very satisfied with the module. In addition to flexibility, nurses reported CBL reinforced learning for them (Olson et al.).

Nursing students (*N*=26) who participated in a pilot study by Kiegaldie and White (2006) reported many of the same benefits when they evaluated the educational outcomes of the interactive learning resource pertaining to a virtual patient. A self-administered questionnaire and focus groups were used to capture the students' reactions to this learning resource. Eighty-three percent of the respondents reported the realism of the automations increased their confidence levels prior to their clinical experience, thereby facilitating knowledge transfer from theory to practice. Although the students found this resource time consuming, they rated the learning as valuable (Keigaldie & White).

There are numerous other CBL resources available that report their goal is to provide assistance to nursing students for example, knowledge transfer, the development of critical thinking skills, and proficiency of psychomotor skills (Gibbs et al., 2006; Ryan, Carlton, & Ali, 2004). However, these resources lack definitive evidence to support this learning outcome. In a review of evaluative studies of computer-based learning in nursing education, Lewis et al. (2005) found only twenty-five CBL evaluation reports since 1966. Many of these studies failed to measure "efficacy of knowledge transfer" or "the concept of

knowledge retention" (p. 594). Many of the retrieved reports identified what the authors considered subjective accounts of CBL use and qualitative anecdotal notes (Lewis et al.). Computer-based learning packages designed for nursing education need to target the core competencies required by nursing students. The evaluation of these CBL resources can be focused on the achievement of learning outcomes, and therefore, determine their educational merit of (Lewis et al.).

H erriot, Bishop, Kelly, Murphy and Truby (2003) recruited fifteen nursing students to evaluate a computer assisted instruction (CAI) tool for nutrition that was originally intended for dietetic students. Questionnaires and focus groups were used to gather evaluation data regarding CAI as a teaching strategy. All the students (n=15) indicated the tool would be valuable as an adjunct to the traditional lecture format. They listed the flexibility and repetitive use of the tool as advantages, but voiced concerns about having the motivation to use it as a self-directed learning tool.

In all these studies, researchers relied on students to provide evaluation data through written or verbal communication strategies. Sometimes during the pilot-testing phase, facilitator observation of participant behavior and interaction is another source of valuable data. Insightful feedback can result from this manner of data collection but Epling, Timmons and Wharrad (2003) caution against the over surveillance or "policing" (p.415) of students during a pilot test because constant vigilance by faculty can inhibit students who are engaged in CBL.

It is evident in all of these studies that the evaluation process is an integral step in the adoption of CBL into nursing curricula (Hattie, Brown, Ward, Irving, & Keagan, 2006). Over the last twenty years technology development has increased, and so have the educational opportunities for computer assisted learning (Babenko-Mould et al., 2004;

Connors et al., 2002). Students that have used CBL report they prefer it to traditional methods of teaching, but there is no substantive evidence to support if learning outcomes are achieved (Garrett, Tench, Vander Wal, & Tench, 2007). The decision by an educational institution to purchase a computer-based program must be supported by data to verify that the program facilitates learning and fulfills course objectives (Vivekananda-Schmidt et al., 2004). A simplified evaluation model may be that all that is required to determine if student learning has resulted from computer software (Zahner, Reiser, Dick, & Gill, 1992).

Conceptual Frameworks

Since theoretical frameworks are used to develop nursing curricula and teaching strategies (Bevis & Watson, 2000), Knowles Theory of Andragogy (1984) and Bandura's Social Cognitive Learning Theory (1977) were used to affirm why virtual learning methodology may appeal to nursing students. The Donabedian Framework was used as the conceptual framework to effectively measure how VCE impacts on the outcome of knowledge transfer by nursing students in a virtual clinical environment. Donabedian's Framework (Donabedian, 1996, 2005) has been used extensively since 1966 to promote quality assurance and evaluate health care. In recent years, this framework has been used to evaluate work environments for nurses (McGillis Hall & Doran, 2007). In the Donabedian framework there are three constructs; structure, process and outcome (Donabedian, 2006; Driel, De Sutter, Christiaens & Maeseneer, 2005; Yakimo, 2006; McGillis Hall & Doran, 2007). Structure refers to the physical set up and resources of a study, process refers to the activities of the participants, and outcomes refers to the measurable results of the study that can be attributed to the independent variable (Yakimo, 2006; McGillis Hall & Doran, 2007). The purpose of this pilot was to evaluate a virtual clinical excursion (VCE) software program (Potter & Long, 2006, version 3.0) to determine the impact on knowledge transfer

in relation to critical thinking skills and psychomotor skills in first year university students. A virtual clinical excursion questionnaire (VCEQ) was developed based on the literature and administered to fourteen first year nursing students at CBU. Data generated were used to formulate recommendations pertaining to the future role and benefits of virtual clinical excursion in student learning.

Methodology

Recruitment Sample

A power point presentation describing the VCE pilot project was delivered to the first year nursing students registered in the Introductory to Nursing Course. Following the presentation, a signup sheet was posted on the bulletin board outside the classroom. The first fourteen students who signed the sheet were chosen as participants. These students met the criteria of availability for the four consecutive Thursday afternoon lab sessions. Students were informed that there were no risks to them for participating, refusing to participate, or withdrawing from the pilot after commencement. It was clearly articulated the pilot was purely for evaluation purposes of the VCE. The pilot did not require ethical approval.

Instrumentation (Virtual Clinical Excursion Questionnaire)

The Virtual Clinical Excursion Questionnaire (VCEQ) was designed to evaluate a Virtual Clinical Excursion (VCE) software program (Potter & Long, version 3.0, 2006) and the accompanying workbook (Potter & Long, 2006). The questionnaire contained 39 quantitative questions in sections that required either a Likert scale or a dichotomous (yes/no) response by students. There were four qualitative open-ended questions that allowed students to both elaborate on strengths and weaknesses of the pilot test and provide

examples of how they transferred knowledge related to critical thinking skills and psychomotor skills in the VCE.

It was never the intent of the VCEQ or the pilot test to determine if VCE increased psychomotor skill competency. The VCE does however incorporate exercises to develop the cognitive functioning needed for psychomotor skill performance. Psychomotor skills have a critical thinking and nursing judgment component that requires comprehension by the nursing students. For example, the incorrect performance of vital signs can produce incorrect values that have an impact on patient interventions and outcomes.

The VCEQ included a student profile to collect demographic information which included gender, education, computer skills and previous experience in health care for this nonprobablity sample. It is important to identify this information because it may impact the results of the VCE evaluation data. Lastly, there was an area for students to enter comments about their VCE learning experience. Learning is an individual experience (Bevis &Watson, 2000) and the recording of subjective data can be a valuable tool in understanding student attitudes towards the educational value of the VCE.

Student attitudes influence learning outcomes (Vivekananda-Schmidt et al., 2004; Zahner et al., 1992). Therefore, questions such as, "It was easy to complete the VCE exercises" provided relevant data. Student learning outcomes are used to measure the value of educational tools and questions for example, "The VCE helped me in the assessment of safety risks as they apply to the older adult" were designed for students to rate their learning (Vivekanada-Schmidt et al.; Simpson, R, 2002).

The quantitative information collected during the pilot test was analyzed using SPSS version14 and descriptive statistics. Qualitative comments were grouped into themes. The

qualitative and quantitative data accumulated from the evaluation components of the pilot

test are reported in the following results section.

Results

The overall sociodemographic characteristics of the nursing students indicated that the

group was fairly homogenous in relation to age, education, health care experience, and

computer literacy (see Table 1).

Table 1
Demographics of VCE participants

Characteristics		n^1	$\%^1$
Gender	Male	1	7.1%
	Female	13	92.9%
Age	18-25 yrs	12	85.7%
	30-35 yrs	1	7.1%
	Missing	1	7.1%
Computer Use	Email	14	100%
	Internet searches	14	100%
	School work	14	100%
	Games	7	50%
	Other	8	57.1%
Logged Computer Hrs/week	0-10	7	50%
	11-20	5	35.7%
	21-30	1	7.1%
	81-90	1	7.1%
Computer Enjoyment	Yes	11	78.6%
	No	1	7.1%
	Missing	2	14.3%
Level of Education	First yr University	10	71.4%
	University Degree	2	14.3%
	Other	2	14.3%
Employed in Health Care	Yes	2	14.3%
	No	12	85.7%
Position in Health Care	PCA	1	7.1%
	Other	1	7.1%

[1]n (%) number and percent of participants responding to identified characteristics

A syllabus which was developed to outline the framework of the four VCE sessions

included an independent set of objectives that addressed the needs of first year nursing

students. Four VCE sessions were conducted over a four week period on October 4, 11, 18 and 25, 2007 with all participants in attendance. The following is a list of the workbook exercises completed by the students during the allotted time frame.

- **Week 1:** A Quick Tour and A Detailed Tour

- **Week 2:** Critical Thinking and Nursing Judgment

- **Week 3:** Applying the Nursing Process; Physical Examination and Vital Signs; Activity and Mobility.

- **Week 4:** Principles Applied in Care of the Older Adults

The student workbooks were coded for confidentiality and the exercises were corrected using the answer key provided in the implementation manual. The data were analyzed using SPSS (version 15).

Session One VCEQ Results: Quick Tour and Detailed Tour

The first session was orientation, which was designed to assist the participants in understanding the purpose of the project, the VCE components and to prevent problems navigating through the software (Zahner et al., 1992). All participants (100%) agreed they were aware that the VCE was being evaluated for knowledge transfer in relation to critical thinking skills and psychomotor skills for patient care in a virtual environment. Session one allowed students to complete the quick tour and the detailed tour in the VCE workbook to provide orientation to the virtual hospital environment. Twelve students (86%) reported that the quick tour provided adequate direction to navigate through the virtual hospital. It is interesting to note that only two (14.3%) of these students indicated the detailed tour was not needed. The concept of virtual learning was a new experience for these students, but thirteen (93%) indicated they understood the concept of virtual learning when they completed the

orientation session. Thirteen (93%) of the respondents felt it was helpful to have the syllabus to provide directions for the sessions.

Session Two VCEQ Results: Critical Thinking and Nursing Judgment

Nursing students must be taught to use a problem solving approach, since they will be dealing with unanticipated events in their practice. Critical thinking and nursing judgment play key roles in the development of this ability (Smith & Johnston, 2002). Students have reported that CBL and simulation provided realistic case studies allowing them to practice these cognitive skills and increased their ability to problem solve (Connors et al., 2002; Garrett & Callear, 2001). In this pilot test, 10 students (71%) indicated that the VCE helped them to apply critical thinking in a patient assessment. However, three students (21%) chose either neutral or indicated no opinion while one student (7%) did not agree that VCE helped with critical thinking.

Nursing students need to demonstrate proficiency and accuracy in the collection and the interpretation of patient information to deliver appropriate care (Garrett & Callear, 2001). Thirteen students (92.8%) reported strong agreement that case studies were helpful in practicing data collection to assess a patient's health status.

Session Three VCEQ Results: The Nursing Process, Physical Examination and Vital Signs, Activity and Mobility

There is evidence in the literature to suggest that a significant increase in critical thinking ability occurs only after nursing students' graduate and gain professional nursing experience (Becker & Neuwirth, 2002; Maynard, 1996). The VCE allows students to function independently in a virtual clinical environment without the fear of causing harm to patients. Therefore, this may facilitate an increase in the critical thinking ability of nursing students.

The Nursing Process

In this section twelve students (86%) identified that they could assess a patient's health care needs and 100% (*N*=14) of the students agreed or strongly agreed that they were able to view data to select appropriate nursing diagnoses. Only 43% (*n*=6) reported they were able to prioritize care. Two students (14.3%) disagreed and six (42.8%) remained neutral. Nine students (64%) indicated they could develop an appropriate plan of care, but only six (43%) reported they could evaluate the care provided in the VCE. The majority of the participants (*n*=9, 64.3%) agreed that the VCE helped them to understand how to apply the nursing process in the delivery of patient care while two students (14.3%) disagreed and three (21.4%) remained neutral.

Physical Examination and Vital Signs

In this section, nine students (64%) agreed that they demonstrated psychomotor skill competency for vital signs to complete the VCE exercises. One student (7%) disagreed and four (28%) remained neutral. All the students (*N*=14) agreed that vital signs provided outcome measurement to indicate a patient's response to nursing interventions. Thirteen students (93%) also agreed that they were able to recognize abnormal vital signs and one student (7%) did not answer the question.

Activity and Mobility

All students (*N* = 14) responded that the VCE helped them to identify the effects of immobility on the body. However, only ten students (71%) agreed that the VCE helped them to identify the effects of exercise on the body and four students (29%) remained neutral. Only four students (28%) agreed that the VCE helped them to learn proper techniques to position patients. Nine students (64%) were neutral in their response and one student (7%)

disagreed. Although five students (36%) agreed that they were able to assess the need to use assistive devices, seven students (50%) remained neutral and two students (14%) disagreed.

Session Four VCEQ Results:

Principles Applied in Care of the Older Adult

In this section, there was an increase in the number of neutral responses given by the students. The reason is unknown. However, the fact these nursing students have not completed any clinical placements or provided nursing care to patients, has to be taken into consideration. Of the 14 participants, only eight students (57%) agreed that the VCE provided relevant examples linking the introduction to nursing course content and care of the older adult. While 11 students (79%) agreed that the VCE helped them to assess safety risks for the older adult, ten students (71%) responded that the case studies help them to prepare for caring for the older adult, as well as learning the difference between Alzheimer's Disease, delirium, and dementia. Upon the completion of the VCE, 50% ($n = 7$) reported having increased confidence in their ability to provide care to the older client. Although six students (43%) agreed they were more prepared to begin their gerontology rotation; six students (43%) remained neutral and two (14%) disagreed.

VCEQ Results of General Questions about the VCE

A formative evaluation of any instructional learning tool needs to capture user attitude by asking specific questions about the methodology used to evaluate the tool as well as the tool itself (Northrup, 1995). This section included nine dichotomous questions designed to provide definitive answers regarding the VCE workbook, exercises, assignments and the VCE learning experience. There was also a space designated for comments. All students ($N = 14$) affirmed that the facilitator was a valuable resource for the sessions but only 11 students (79%) agreed that the workbook provided clear directions. Eight students (57%)

reported that the VCE exercises were based on the class content taught in the introductory nursing course and thirteen students (93%) indicated that the reading assignments were helpful in completion of these exercises. Seventy-nine percent (*n*=11) reported that the VCE provided a realistic learning experience while two students (14.3%) replied no and one (7%) did not answer the question. Two negative responses came from the student who had been employed as a personal care attendant and the other from the student who had never been employed in health care. Thirteen students (93%) indicated that the VCE was a positive learning experience. This result included the student who reported he/she did not enjoy working with computers. Although only seven students (50%) agreed that it was easy to complete the VCE exercises, 11 students (79%) said that the VCE was a great way to learn. Thirteen (93%) of the students reported that they would recommend the VCE as a valuable learning tool.

VCEQ Results from the Comment Section

following General Questions about VCE

A thorough evaluation of an educational tool needs to include students' perceptions of their learning, and only students can tell you what works for them (Brookfield, 1995). This section was poorly answered on the questionnaire with only three (21%) students providing responses. One of the students remarked, "I really enjoyed it." Another student commented, "The program taught me how to read and understand charts**,"** but also noted that "it was very difficult for a first year nursing student." The third student felt that the program was "good" but "it was difficult to understand how to prioritize clients. This program could help with the gerontology program and may be good for second year after a real life base knowledge was applied."

VCEQ Results from Short Answer Questions

This section consisted of four short answer questions with a section for comments. All fourteen students (100%) wrote responses to these questions. Eight themes emerged for Questions 1 and 2 (see Table 2).

The last two questions were based on the purpose of the project. In response to the question "Has the VCE impacted on your ability to transfer knowledge in relation to critical thinking in simulated lab practice?" 11 students (79%) had positive responses. One student (P04) wrote, "It gave me a better understanding of why critical thinking is important in caring for your patient effectively." A second student (P09) noted that the VCE, "Taught me theory and the importance of it…actual information needs to be obtained by own experience and learning." The comment from student (P14) stated, "It made me think how we learned to do things and why it was important to do it a certain way."

The remaining three students (21%) were more critical in their comments. One student (P02) expressed, "I would benefit more from hands on." Student (P03) stated, "Unable to know how accurate applications were on the computer." A third student (P11) wrote, "No, I don't feel comfortable in transferring knowledge in relation to critical thinking. I don't feel the program was very helpful in this section."

Question four asked, "Has the VCE impacted on your ability to transfer knowledge in relation to psychomotor skills in simulated clinical lab practice?" Increasing patient acuity and patient safety concerns are driving educators to clinical simulation to prepare novice nurses for clinical practice (Feingold et al., 2003). The VCE received positive endorsement from 10 students (71%). One student (P04) said it "impacted my knowledge of psychomotor skills by showing me different patients and their abilities and disabilities." Another student (P06) reported that it "has given me the ability to think and relate my knowledge to my

hands on skills before I implement the techniques." One student (P13) also commented, "I have to find out my own information to make sure it is right."

Four students (29%) responded that VCE did not help them with psychomotor skills competency. One student (P01) stated, "Not a great deal. Whether reading or seeing on a computer screen, hands on experience is better." Another student (P02) also remarked, "Can't replace actual experience." The student participant (P03) wrote, "Not really, I knew a lot of things they were doing." This student was not one of the two who had been employed in health care. The fourth student (P10) remarked, "No, I don't feel comfortable transferring knowledge in relation to psychomotor skills."

VCEQ Results from the Comments in the Short Answer Section

Of the three students (21%) who wrote comments in this section of the questionnaire, two participants expressed positive experiences with VCE. One student (P01) said, "It was good to view vital signs, charts and nursing charts about the patient. I have a good idea on what they look like, how to write them and how to understand." The second student (P06) replied that it "offered a valuable amount of experience with a variety of topics that I would not have been exposed to if it wasn't for the study." The third student (P12) noted that it was "a little out of my current scope of practice."

Table 2 Themes from VCEQ comment section

	Realism	Charting	Stress Free	Application of Knowledge
Participants P01 – P14	P03 "The reality of the program." P04 "It demonstrated a realistic chain of events that can occur from one problem." P10 " Realistic, interesting." P13 " Introduction into what clinical would be like." P14 "I liked seeing a patient."	P 01 "Charts and client information were accessible." P02 "I was able to read and understand patient charts." P05 "I liked learning what was in the charts." P10 "Shows hospital documentation." P12 "ability to navigate through charts and recognize conditions." P14 "I liked being able to read the chart."	P06 "VCE offered a stress- free environment." P09 "Being able to attempt giving medication to patients knowing I won't hurt them."	P06 "VCE offered educational environment." P07 "It made me more confident for clinical placement." P08 "I liked applying learned knowledge to virtual patients." P11 "Made me apply skills from text." P13 "a look into the nursing process."

Question 1: What did you like most about the VCE learning experience?

Table 3
Themes from VCEQ comment section

	Question 2: What did you like least about the VCE?			
Participants P01 – P14	Degree of Difficulty of Program	Time Issues	Medication administration	Use of computer
	P01 "A bit overwhelming right now." P04 "Some exercises were hard." P05 "Questions in workbook were difficult." P06 "Some workbook questions difficult to understand." P07 "Left some instruction out." P09 "Level of difficulty of some of the questions." P10 "Terminology too advanced for 1st year, 1st semester." P14 "I needed to do things a couple of times to get it right sometimes."	P08 "the program timing you and ending your session, sometimes I needed more time."	P03 "Could only be evaluated for assessment and medications." P04 "Didn't know how to administer drugs." P11 "Hard to administer drugs." P12 "Administering medication and calculating medication." P13 "Giving out medication. I often gave the wrong medication and I didn't understand the names."	P02 "Not a fan of computer (virtual reality) programs."

Evaluations Generated by the Computer Software

Medication Scorecard

The medication administration exercise was included in the detailed tour to provide students with a comprehensive view of the virtual hospital. The medication room and the dispensing of medications play a central role in clinical practice. This was the only session that required students to administer medications to their patients. However, these students had only received instruction regarding the three checks and five rights of medication administration for the purpose of administering rectal suppositories to patients in LTC. This skill is beyond their present competency level. The medication scorecards yielded little information regarding the transfer of knowledge for critical thinking or psychomotor skills.

Examination Report

The examination report recorded the time that the student checked the patient's vital signs. It also generated a checklist of the patient systems that were checked during the student's evaluation of the patient. The student's list was printed with a comparison list of a baseline Expert Nurse Assessment and a focused Expert Nurse Assessment for comparison purposes.

These first year students have not studied anatomy, physiology, or physical assessment. They have received some basic assessment skills related to assessment of activities of daily living (ADL's), self-care deficits, and physiological changes related to aging. The introductory nursing course included a brief overview of dementia, delirium, and Alzheimer's disease in preparation for the clinical gerontology rotation.

The patient information section of the examination reports indicated that each student checked the vital signs at least once during the patient evaluation. The analysis of the

physical examination section showed that students either checked every system, no system or randomly chose body systems that had no correlation to those examined by the expert nurse assessments. These reports yielded no concrete evidence to infer that the transfer of knowledge in relation to critical thinking or psychomotor skills had been supported by the VCE.

Workbook Exercises

The Study Guide accompanying the VCE software program provided the necessary instructions on how to use the VCE simulations. The workbook exercises for the specific modules contained self-directed learning activities for nursing students. Ideally, students have the opportunity to repeat exercises until they achieve satisfactory results. However, due to a time limitation during this pilot test, the allotted schedule for each session did not allow students to try an exercise more than once.

The results of the workbook exercises cannot be considered reflective of the students' ability to transfer knowledge in relation to critical thinking skills and psychomotor skills to a practice environment. There were multiple variables that affected the students' performance. The environmental conditions in the nursing lab were, at times, uncomfortably warm. This necessitated the door to the corridor remaining open and the extraneous noise and interruptions from other nursing students were distracting. The sessions were long and students completed them in addition to a full slate of classes. Students had difficulty completing exercises within the time allotted by the software. During the pilot, there was one week during which the students also had the extra stress of midterms. Moreover, participants were in their first term of their nursing program and may have been overwhelmed by the commitment required by this pilot.

Facilitator Log

An observational log was kept by the facilitator to record student attendance, interaction, timely completion of sessions, questions, comments, concerns and to note any challenges or difficulties encountered in using the software or computers. The facilitator participated in the VCE sessions as an observer and a resource person. This allowed the facilitator to note student behavior and record any verbal exchange in the group. Each session was completed by all students (N=14). The sessions averaged between three and four hours in length. The students chose not to have a scheduled break because they did not want to increase the length of the sessions. Students were encouraged to break at their convenience, but only one or two students per session left the room for a maximum of fifteen minutes.

The facilitator role was important in order to record the group dynamics and comments during the weekly sessions. Each week the group interaction increased and participants seemed to be more comfortable sharing thoughts related to the VCE. The openness and frankness displayed by the students contributed to the value of the observational data.

Limitations and Recommendations

Limitations

There were several limitations identified in this pilot study. One limitation is that the sample size was small consisting of only 14 first year nursing students. Therefore, only descriptive statistics were used in the data analyses and the results are not generalizable. Secondly, while these nursing students volunteered to participate in this project, it may have been difficult for them to evaluate a learning tool for knowledge transfer for several reasons.

They were adjusting to their first year course load, as well as to the role of a nursing student. In addition, these nursing students were completing the introduction to nursing course at the same time as the project. In reference to the VCE software program which was implemented (Potter & Long, 3.0 version, 2006), this software was American and the accompanying textbook was Canadian (Potter & Perry, 2006). Although the syllabus to guide the students through each session was designed to accommodate this difference, there may have been some discrepancies between the VCE exercises and the Canadian textbook. Another limitation is self-reporting, since a questionnaire was used as the evaluation tool. Students may have provided socially acceptable responses, or they may not have felt comfortable documenting any negative comments. Finally, the questionnaire was not pretested for validity and reliability due to time constraints.

Recommendations

Several recommendations were identified from the results of the data for the evaluation components of the pilot test. They include the following:

- The VCE be utilized as a teaching strategy or a resource in the first year of the nursing program to assist student learning, enhance their critical thinking and decision making skills.

- If the VCEQ is used in the future, the evaluation tool be reviewed and revised appropriately based upon the students' feedback. The questionnaire should be pretested to establish validity and reliability.

- Further testing of the VCE be conducted involving a sample of nursing students from the second and third year of the nursing program. Participants complete relevant VCE exercises before their clinical rotation and then complete the VCEQ during the pre-clinical and post-clinical phases.

Conclusion

There were no definitive results to demonstrate the impact of VCE on knowledge transfer in relation to critical thinking and psychomotor skills in first year nursing students. While students did comment they did not see VCE as a replacement for actual hands on experience in clinical practice, the students did self-report that VCE as an enjoyable and valuable way to learn information. With the growing interest in virtual learning in nursing education, and the increasing competition for clinical placements; VCE is a creative teaching strategy that should be considered to assist in enabling nursing students to apply theory to practice.

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Virtual Clinical Excursion Questionnaire

Virtual Clinical Excursion Questionnaire (VCEQ)

Code Number _____

Instructions: This questionnaire consists of questions that require a YES/NO answer, Likert-type questions and short answer questions. Please complete questions as per instructions above each section. There are two sections for comments, one following the session questions and the second following the short answer questions.

Session 1 Orientation ***Instructions:*** Please circle either YES or NO to indicate your answer to the corresponding question.		
Sample Question (YES/NO): A square always has four equal sides.	(YES)	NO
I was aware the pilot project was to evaluate the VCE for knowledge transfer in relation to critical thinking skills and	YES	NO
psychomotor skills for patient care in a virtual environment.	YES	NO
▪ The quick tour provided adequate direction to navigate through the virtual hospital.	YES	NO
▪ The detailed tour was needed to provide adequate direction to navigate through the virtual hospital.	YES	NO
▪ I understand the concept of virtual learning following the completion of the VCE orientation.	YES	NO
▪ The syllabus provided a detailed framework for me to follow in each session.		
Session 2 **Critical Thinking and Nursing Judgment**		
C ***Instructions:*** Please complete Likert-type questions by circling your level of agreement for each statement. Indicate strongly disagree (SD, 1), disagree (D, 2), neutral (N, 3), agree (A, 4), strongly agree (SA, 5).		

Sample Question (Likert-type):	SD	D	N	A	SA
Most registered nurses will be employed in the community and not in hospitals in the near future.	1	2	3	4	(5)
▪ The VCE helped in the application of my critical thinking skills in a patient assessment.	1	2	3	4	5
▪ The case studies required me to practice data collection to assess a patient's health status.	1	2	3	4	5

Session 3 The Nursing Process; Physical Examination and Vital Signs; Activity and Mobility					
	SD	D	N	A	SA
▪ In the VCE, I was able to assess a patient's health care needs.	1	2	3	4	5
▪ In the VCE I was able to view data so I could select appropriate nursing diagnosis/diagnoses for my client.	1	2	3	4	5
▪ In the VCE I was able to prioritize patient care.	1	2	3	4	5
▪ In the VCE I was able to develop an appropriate plan of care for my patient based on desired patient care outcomes.	1	2	3	4	5
▪ In the VCE I was able to evaluate the care I provided to my patient.	1	2	3	4	5
▪ The VCE helped me understand how to apply the nursing process to deliver patient care.	1	2	3	4	5
▪ I demonstrated psychomotor skill competency of vital signs to complete the VCE workbook exercises.	1	2	3	4	5
▪ I realize that vital signs provide outcome measurement to indicate a patient's response to nursing interventions.	1	2	3	4	5
Indicate strongly disagree (SD, 1), disagree (D, 2), neutral (N, 3), agree (A, 4), strongly agree (SA, 5)					
▪ I was able to recognize	SD	D	N	A	SA

abnormal vital signs.	1	2	3	4	5
▪ The VCE helped me identify the effects of immobility on the body.	1	2	3	4	5
▪ The VCE helped me identify the effects of exercise on the body.	1	2	3	4	5
▪ The VCE helped me learn proper techniques to position patients.	1	2	3	4	5
▪ The VCE helped me assess the need to use assistive devices to ambulate a patient in a safe manner.	1	2	3	4	5
Session 4 **Principles Applied in Care of Older Adults**					
▪ The VCE provided relevant examples that helped me connect the Introduction to Nursing course material and care of the older adult	SD 1	D 2	N 3	A 4	SA 5
▪ The VCE helped me in the assessment of safety risks as they apply to the older adult.	1	2	3	4	5
▪ The VCE case studies were helpful in preparation for caring for the older adult.	1	2	3	4	5
▪ The VCE helped me learn the difference between Alzheimer's Disease, Delirium and Dementia.	1	2	3	4	5
▪ After completing the VCE I feel more confident in my ability to administer competent patient care for the older adult in a clinical setting.	1	2	3	4	5
▪ I feel I am prepared to begin my gerontology clinical placement after completing the VCE exercises that involved providing care to an elderly patient.	1	2	3	4	5

Instructions: Please circle either YES or NO to indicate your answer to the corresponding question.

General Questions about the VCE		
▪ The VCE workbook provided clear directions to help me complete the VCE	YES	NO
▪ The VCE exercises are based on the same class content taught in the Introductory to Nursing course.	YES	NO
▪ The facilitator was a valuable resource during the VCE sessions.	YES	NO
	YES	NO
▪ The reading assignments were helpful to complete the text book exercises.	YES	NO
▪ The VCE provided a realistic learning experience.	YES	NO
▪ The VCE provided a positive learning experience for me.	YES	NO
▪ It was easy to complete the VCE exercises.	YES	NO
▪ The VCE was a great way to learn.	YES	NO
▪ I would recommend the VCE as a valuable learning tool.		

*Comments*_____

_____

_____

_____

_____

_____

_____

Short Answer Questions *(Please provide a brief example or explanation)*

1. What did you like most about the VCE learning experience?

_____

_____

2. What did you like least about the VCE experience?

_____

_____

3. Has the VCE impacted on your ability to transfer knowledge in relation to critical

thinking in simulated clinical lab practice? (Provide a brief explanation)

_____

_____

_____

4. Has the VCE impacted on your ability to transfer knowledge in relation to psychomotor

skills in simulated clinical lab practice? (Provide a brief explanation)

_____

_____

Comments_____

_____

_____

_____

Nursing Student Profile- *please provide the following information.*

1.Gender: A) male   B) female

2. Age: A) 18-25 years   B) 25-30 years   C) 30-35 years   D) 35-45 years

3. Computer Use: (check all that apply)

      A)____email   B)___internet searches

      C)___school work   D)___games

      E) ___other, such as _____

4. Estimate number of hours spent logged on to a computer per week_____hrs

5. Do you enjoy working with computers?   A) YES   B) NO

6. Level of Education   A) First year university   B) University degree

              C) Other_____

7. Have you been employed in Health Care?   A) YES   B) NO

8. If answered *YES* to question 7, what position did you have?

     A) Licensed Practical Nurse   B) Personal Care Attendant

     C) Other_____

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