



Evaluation of an interactive web-based nursing course with streaming videos for medication administration skills



Azizeh K. Sowan^{a,*}, Jamila Abu Idhail^b

^a Department of Health Restoration & Care Systems Management, School of Nursing, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA

^b Maternity, Child and Family Health Nursing Department, School of Nursing, Hashemite University, Jordan

ARTICLE INFO

Article history:

Received in revised form

17 May 2014

Accepted 20 May 2014

Keywords:

Streaming videos

Web-based learning

Fundamentals of nursing skills

Medication administration

Student satisfaction

Self-efficacy

ABSTRACT

Purpose: Nursing students should exhibit competence in nursing skills in order to provide safe and quality patient care. This study describes the design and students' response to an interactive web-based course using streaming video technology tailored to students' needs and the course objectives of the fundamentals of nursing skills clinical course.

Method: A mixed-methodology design was used to describe the experience of 102 first-year undergraduate nursing students at a school of nursing in Jordan who were enrolled in the course. A virtual course with streaming videos was designed to demonstrate medication administration fundamental skills. The videos recorded the ideal lab demonstration of the skills, and real-world practice performed by registered nurses for patients in a hospital setting. After course completion, students completed a 30-item satisfaction questionnaire, 8 self-efficacy scales, and a 4-item scale solicited their preferences of using the virtual course as a substitute or a replacement of the lab demonstration. Students' grades in the skill examination of the procedures were measured. Relationships between the main variables and predictors of satisfaction and self-efficacy were examined.

Results: Students were satisfied with the virtual course (3.9 ± 0.56 , out of a 5-point scale) with a high-perceived overall self-efficacy (4.38 ± 0.42 , out of a 5-point scale). Data showed a significant correlation between student satisfaction, self-efficacy and achievement in the virtual course ($r = 0.45\text{--}0.49$, $p < 0.01$). The majority of students accessed the course from home and some faced technical difficulties. Significant predictors of satisfaction were ease of access the course and gender ($B = 0.35$, 0.25 , $CI = 0.12\text{--}0.57$, $0.02\text{--}0.48$ respectively). The mean achievement score of students in the virtual class (7.5 ± 0.34) was significantly higher than that of a previous comparable cohort who was taught in the traditional method (6.0 ± 0.23) ($p < 0.05$). Nearly 40% of the students believed that the virtual course is a sufficient replacement of the lab demonstration.

Abbreviations: SVs, streaming videos; IV, intravenous; SC, subcutaneous; IM, intramuscular.

* Corresponding author at: Department of Health Restoration & Care Systems Management, School of Nursing, University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, MC 7975, San Antonio, TX 78229-3900, USA. Tel.: +1 210 567 5799; fax: +1 210 567 1719.

E-mail addresses: sowan@uthscsa.edu, azizehsowan@yahoo.com (A.K. Sowan).

<http://dx.doi.org/10.1016/j.ijmedinf.2014.05.004>

1386-5056/Published by Elsevier Ireland Ltd.

Conclusions: The use of multimedia within an interactive online learning environment is a valuable teaching strategy that yields a high level of nursing student satisfaction, self-efficacy, and achievement. The creation and delivery of a virtual learning environment with streaming videos for clinical courses is a complex process that should be carefully designed to positively influence the learning experience. However, the learning benefits gained from such pedagogical approach are worth faculty, institution and students' efforts.

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1. Introduction

Innovations in multimedia applications and the availability of high-speed bandwidth Internet have increased the utilization of streaming videos (SVs) in health education, specifically for learning complex clinical procedures. In this study we transformed part of the fundamentals of nursing skills course into an interactive web-based course using SV technology tailored to student needs and course objectives, and described student experience of the new pedagogical approach.

At our School of Nursing, fundamentals of nursing skills course is offered for first year undergraduate students. Typical methods of teaching the course are based on an instructor demonstrating nursing procedures using non-interactive mannequins for a group of students in the lab, followed by supervising student practice. Major shortcomings of teaching the course include the: (1) inability of students to comprehend the procedures as a whole because they are demonstrated as fragmented and interrupted steps; (2) inability of the course to facilitate easy transition to hospital settings; and (3) limited lab time and crowded curriculum impede practicing the procedures by each individual student, promoting problem-based learning and documenting the procedures. Additionally, students have no other resources through which to learn if they have missed a lab session. Although some of the market videotaped-procedures are available in our school, our students underutilize them because of their busy academic schedules and difference in equipment and consequences of the steps compared to their manual. Moreover, the high cost of the market procedures restricts their availability at our school. Due to these learning and educational constraints, it became necessary to supplement the traditional lab-demonstration technique with more interactive online multimedia educational resources.

SV technology (digital video, video podcast or webcast) refers to audio-visual files that are streamed on the Internet or distributed in a digital format. In clinical health courses, SVs have been used as: supplementary materials to demonstrate the ideal practice of procedures [1–5]; tools for self-assessment and reflection on one's own practice [6,7]; and resources to help student prepare for the clinical examinations [8,9]. Others have used SVs to orient residents and students to the operations of certain hospital departments [10] or for continuing medical education [11]. In clinical practice, SVs have been integrated into the Electronic Medical Record to expedite information exchange of medical images among hospitals [12].

Despite the learning benefits of SVs, integrating SVs into health education remains a challenge. "Technical problems" in terms of viewing SVs have been cited as a major barrier

[4,13–15]. Given the large size of digital video files, this application requires high-speed broadband Internet connection to run smoothly with acceptable audio-visual quality. Additionally, many students are skeptical about the value of SVs and remain in favor of lectures [16]. In a study that used SVs for theoretical lectures in a medical school, SVs were sparingly utilized, with 60% of all students ($N=284$) viewing less than 10% of the 145 available lectures [17]. Furthermore, the majority of students reported that they preferred to use SVs as a supplement rather than a replacement of face-to-face lectures or lab sessions [2,14,18]. Inconsistent results were also reported regarding the impact of SVs on scores of knowledge and skill tests [1,3,4,17].

Methodological concerns in SV studies are also evident. In a recent systematic review on the use of SVs in education, mixed results were reported on the effect of SVs on attitude, behavior and performance of students. The main methodological concerns were insufficient description of SVs, small sample size, and the absence of reporting reliability and validity estimates of the data collection tools [19]. Actually, most of the available literature on SVs in clinical nursing courses has used a sample size ranging from 6 (in qualitative studies) to 40 students (in quantitative studies) [1,2,9,20,21].

The outcomes and inconsistency in research results are profoundly related to the design of the course and contents of the SVs, specifically since SVs are designed differently in every study. Additionally, SVs were rarely used in creative and innovative ways [4,22] and the majority of studies have limited the use of SVs to demonstrate "ideal" performance of a clinical procedure.

In order to respond to the gaps in research, we created an innovative, interactive web-based course that was based on SVs for medication administration nursing procedures for a large sample of first year undergraduate nursing students at a school of nursing in Jordan ($N=120$). The main purpose of this study was to describe student experience in terms of satisfaction, self-efficacy and achievement in the new pedagogical approach. Self-efficacy and student satisfaction are important indicators of learning success [23,24].

More specifically, this study was undertaken to address the following research questions:

- (1) Are students satisfied with the virtual learning course for fundamentals of nursing procedures?
- (2) What are the levels of student self-efficacy in performing the procedures after using the virtual learning course?
- (3) Do students prefer to use the virtual course as a supplement or a substitute of the lab demonstration of the nursing procedures?

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