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Effectiveness of an Interactive Educational Video on Knowledge, Skill, and Satisfaction of Nursing Students

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Abstract

***Objectives*:** Nursing education requires innovative teaching strategies for learning fundamental nursing skills to develop proficient nurses for the future. However, nursing educators face challenges in teaching and retaining the skill competency and knowledge of the nursing students given shortages of nursing faculty and scarcity of opportunities for clinical practice. Therefore, this study aimed to compare the interactive educational video-based strategy versus traditional general demonstration for teaching a basic nursing skill. ***Methods*:** This cross-sectional comparative study followed 55 nursing students enrolled in a fundamentals of nursing laboratory course during the Spring 2020 semester, at the College of Nursing of Sultan Qaboos University, Oman. The control group was subjected to traditional general demonstration-based teaching of the oral medication procedure, while the experimental group learned the same skill through an interactive educational video. The knowledge, skill competency and satisfaction levels of both groups were assessed post-intervention using standardized questionnaires. ***Results*:** There was no statistical difference between the two groups in knowledge level and skill competency scores.

Regarding satisfaction, 92% of the students were satisfied with video learning and 87% with the traditional approach. ***Conclusion*:** It is evident that the interactive video learning strategy for learning fundamental nursing skills is as effective as the traditional face-to-face general demonstration-based approach.

***Keywords*:** Nursing, Video, Knowledge, Satisfaction, Education, Teaching, Oman.

Advances in Knowledge

- Using an interactive video as a strategy for learning a nursing skill is as effective as the traditional face-to-face general demonstration-based approach although further studies are required to confirm these findings.
- Interactive videos to learn fundamental nursing skills support learning and promote students achievement and satisfaction.
- In such times, where the spread of COVID-19 is still a threat, using technological strategies such as videos are of utmost importance so nursing students can learn the necessary skills anytime and anywhere.

Application to Patient Care

- Watching interactive videos before coming to class allows students to better prepare for the class, thus reducing time for lectures and giving more time for practice and feedback.
- Therefore, using interactive videos could enhance nursing clinical skills, which are critical for patient care.
- Ensuring high level of competency in learning medication administration skills may reduce medical errors and healthcare costs and enhance patient safety.

Introduction

Nursing students are equipped with basic nursing skills in the fundamentals of a nursing laboratory course. These skills are often reviewed during their course of study and as nurses in the clinical setting. The quality of patient care and patient safety can be compromised when such basic skills are not learned properly[1] and can, in severe cases, cause permanent disability or even endanger patients' lives.

General laboratory-based demonstrations of skills are the most common strategies used to teach basic nursing skills to nursing students. The approach involves explaining the procedure, showing students how to perform it step by step, and supporting students in practicing the skill to acquire knowledge and competency.[2-4] However, as new teaching methods are evolving every day, the approaches to training of nursing students also must be upgraded. Technology has made everything easier and faster and is attractive to this millennial generation of nursing students.[5] One such technology, which is gaining greater attention in the educational field, is the use of interactive educational video.

Interactive educational video is an innovative teaching approach to teach fundamental nursing skills to the undergraduate nursing students who live their daily lives equipped with highly advanced mobile technology.[6] Interactive educational video, when used as a complementary method along with face-to-face education, is found to improve students' competencies as well as their learning.[7] Nurse educators are encouraged to use various forms of technology to enhance the learning experiences of nursing students, as emphasized in the Vision Statement of the American National League for Nursing.[8]

Branigan[9] has remarked that more and more educators are embracing video as an instructional tool because of the rise in the number of multimedia enabled computers at colleges and the lower cost of video editing equipment and software. A growing trend of active usage of social media for networking and communication is observed among today's youth.[10] A systematic review has revealed that highly informative educational videos with authoritative speakers that posed questions had a positive impact on the learning interest of students and their self-reported knowledge gains.[11] Students have expressed that educational videos improve their memory of new information and provide better intelligibility.[10] Videos also provide greater opportunities for students with diverse learning styles to learn at their own pace when taught in the context of a flipped classroom (an instructional strategy where students listen to the lectures at home and engage in active learning during class time) for instance.[12]

Interactive educational videos can increase the learning-related self-confidence and self-motivation of nursing students.[13,14] Student satisfaction and skill competencies were improved in

a study conducted among Korean nursing students that compared the use of educational video with traditional methods.[15] Additionally, nursing students' knowledge has been shown to improve when educational videos were used for theory and clinical learning.[16] Overall, educational videos are considered an adequate teaching approach for students to learn the skills independently and freely at their own pace.

Educational videos convey information to the learner through aural and visual sensory channels simultaneously, which may result in better learning outcomes.[17] In addition, videos are more consistent (in terms of the steps used in teaching nursing skills) than demonstrations of skills by different nursing faculty.[9]

In spite of the numerous advantages of educational videos, nursing faculty and nursing students have been reluctant to adopt this approach because of a misconception that the traditional method of general demonstration results in better student outcomes.[18] However, the traditional method of teaching nursing skills in a fundamentals of nursing course consumes nursing faculty's time and other resources. Clinical instructors may need to repeat their explanation many times, as students have different levels of understanding. Clinical instructors are generally restricted to use only a single technique to explain the concept and skill, as they do not have adequate time to deliver the information using multiple methods, which may not ensure the understanding of the students. The use of interactive educational videos can solve most of the problems faced by nursing students and clinical instructors of a fundamentals of nursing course, as doing so will save resources and time.

A review of the literature has revealed a dearth of studies on the use of interactive educational videos for learning fundamental nursing skills in this region. Therefore, the aim of this study was to compare the effectiveness of using interactive educational videos versus the traditional laboratory demonstration methods of teaching fundamental nursing skills in Oman.

Methods

Settings

This study aimed to compare the knowledge, skill, and competency of learning administration of oral medication procedure among fundamentals of nursing students taught using either an

interactive educational video or the traditional general demonstration. The topic was chosen because errors in administering medication are common among nursing students in the clinical setting worldwide.[19] Moreover, this study sought to describe the satisfaction levels of students with both strategies for learning fundamental nursing skills.

Study design

A quantitative comparative research design was used to compare interactive educational video strategy with traditional general demonstration in teaching a fundamental nursing skill.

Participants

This study was conducted at the College of Nursing, Sultan Qaboos University in Muscat, Oman among the second-year nursing students enrolled in the fundamentals of nursing laboratory course in the spring 2020 semester. The nursing college offers Baccalaureate of nursing (BSN) and Master of nursing (MSN) programs to students from various parts of Oman. As the college has faculty from the international arena, the interactive educational video technology could be beneficial to the new faculty who are joining the course to have a uniformity in teaching the skill. There are two laboratory groups already existing for this course based on students' enrolment in the course. Investigators randomly assigned one group (n=30) to the control group and they learned medication administration skills using a traditional demonstration method. Students from the other group (n=25) were the experimental group who learned the same procedure by watching an interactive educational video prepared by the faculty. This meets the requirements of sample size for a study with a 95% confidence interval of a sample size of 50 participants. Using G power analysis, a sample size of 54 students is needed (27 in each group) with the medium effect size of (d=0.5) and power of 0.70. Overall, 55 nursing students were included in this study.

Traditional Demonstration – Control Group

Students in the control group came to the laboratory on Sunday and Monday of one week for eight hours each day. They were exposed to face-to-face laboratory demonstrations of oral medication administration performed by the experienced clinical instructor of the fundamentals of nursing laboratory course. The demonstration started with an overview of medication administration using Microsoft office PowerPoint 2016, followed by a face-to-face general demonstration in the laboratory by an expert course faculty. The demonstration was followed by the faculty answering students' questions and clarifying doubts. Then, students performed the procedure in front of their group clinical instructors and they were evaluated using the procedure checklists.

Interactive educational video – Experimental Group

The experimental group came to the laboratory on Wednesday and Thursday of one week for six hours each day. Students watched an interactive video about the medication administration skill on their own time at home and came to class prepared to perform the procedure. After they had reached the laboratory, an overview of the procedure was presented to the students with the same PowerPoint as the control group and their questions were answered for clarification. Then, students performed the procedure in front of their group clinical instructors and they were evaluated using the procedure checklists. After the procedure demonstrations, both groups of students filled up a survey on satisfaction using standardised questionnaires.

Preparation of the interactive educational video

An interactive educational video is defined as a teaching strategy that uses a digital video that contains interactions via gestures, voice, and touch.[20] In our study, the interactive educational videos were developed based on the nine events of instruction for designing an instructional material outlined by Gagné and Gagné.[21] As cited by Picciano,[22] Gagné's events are to (1) gain attention, (2) describe the goal, (3) stimulate prior knowledge, (4) present the material to be learned, (5) provide guidance for learning, (6) elicit performance, (7) provide feedback, (8) assess performance, and finally (9) enhance retention and transfer. When video materials match these steps, higher levels of achievement in student learning outcomes and learner engagement can be achieved.[23]

The interactive educational video was developed by the experienced course coordinator and uploaded to Moodle version 3.11.2 (the learning management system accessed by students) two

days before their laboratory session. The same faculty performed the demonstration face-to-face and in the video for consistency. The video was created with the help of the technical support team at the college of nursing, and it did not cost anything except the manpower. The video was recorded in the skill laboratory at the college of nursing where the faculty performed the administration of oral medications on a trained standardised patients using all the equipment available in the laboratory and following a checklist developed for this course. The video was recorded in one session which lasted around two hours. In addition, a concise voice narration was recorded to help clarify the demonstration in the video. The technical team used the program Adobe Premiere to edit the video and sync it with the voice over. The video was divided into three parts, each six minutes long. The parts consisted of an overview of medication administration as a recorded PowerPoint presentation, demonstration of the oral medication administration on a standardised patient, and a discussion of the aftercare and other policies to be considered while administering oral medications in the clinical setting. The final version of the oral medication video was shared with two professors from the Fundamentals of Nursing course and two clinical instructors to verify the accuracy and the quality of the video, before it was released to the students participating in this study.

Measurements

A knowledge questionnaire regarding the oral medication administration procedure was developed based on the National Council Licensure Examination (NCLEX) pattern multiple-choice questions (MCQs) by the course coordinator and peer reviewed by two experts. Five questions were scored, with a score of 5 indicating an excellent level of knowledge, 3 and 4 a good level of knowledge, and 1 and 2 a poor level of knowledge. The test–retest reliability scores were 0.8, indicating high reliability.

A performance checklist for an oral medication administration was developed for the objective structured clinical examination (OSCE) exam by the course team based on the textbook[27] for the fundamentals of nursing course and approved by the department board. The mean inter-rater score was 0.9, indicating high reliability.

Satisfaction with the interactive educational videos was measured with the "Evaluation of Satisfaction for the Video-based Interactive Education Method in Professional Skills Training"

questionnaire developed by Arslan. [24] It consists of 17 items designed to assess every stage of the learning processing, starting with watching the videos. For each item, the participant could choose 1 (disagree), 2 (neutral), or 3 (agree) as their level of satisfaction, with 17 the minimum and 51 the maximum possible score. Afterwards, the total score was converted to a percentage; a result of 60% or above indicates a high satisfaction level. Cronbach's alpha was 0.9 indicating very good internal consistency and showing the tool's high reliability.[24]

The student evaluation of educational quality (SEEQ) questionnaire was used to assess students' satisfaction levels after general demonstration of the skill. It is a 5-point Likert scale developed by Coffey and Gibbs,[25] anchored by 5 (strongly agree) and 1 (strongly disagree), and consists of 12 items enquiring about the classroom demonstration. The resulting scores were converted to percentages, and a score above 60% was considered satisfactory. The SEEQ questionnaire has a high level of reliability, with Cronbach's alpha ranging from 0.88 to 0.97.[26]

Data Collection and Analysis

The control group had general demonstration and hands-on practice of the procedure on the first day. Re-demonstration of the procedure as OSCE was evaluated by two nursing faculty with the help of the checklist after students had answered the knowledge quiz. Finally, participants were asked to complete the SEEQ survey to evaluate their satisfaction levels.

The experimental group watched the interactive educational video recording of oral medication procedure and came to the laboratory for practice. They completed a knowledge quiz after a brief review of the procedure in the video. Students performed the procedure in the laboratory which was evaluated by two teams of faculty. The questionnaire regarding satisfaction with the video-based interactive education was completed by the students at the end of the laboratory session, during the scheduled laboratory hours with the permission of fundamentals of nursing course coordinators. They could complete in six hours as they had saved the time of demonstration by watching the interactive educational video.

The collected data was checked for completeness and scores were calculated and entered by two investigators to ensure the accuracy of the entered data. Data analysis was performed with

Statistical Packages for Social Sciences (SPSS) v.24. Independent sample t and chi-square tests were used to compare the scores of skill competency and knowledge of both groups of students. Level of satisfaction for both groups was calculated and presented as frequency, percentage, and mean scores but not compared as the two questionnaires were different.

Ethical Considerations

Ethical approval was obtained from the college research and ethics committee and permission was received from the fundamentals of nursing laboratory course coordinators. The procedure was explained to the students in detail and written informed consent was provided by participants in both groups. Data confidentiality was maintained. Names and identification numbers of the students were coded, and the collected data were stored in a locked cabinet in the researcher's office. Permission to use the questionnaires was obtained from their respective authors. The interactive educational video on oral medication administration was shared with both groups (control and experimental) after the completion of the study period, so both could benefit equally from the interactive educational video.

Results

The study participants were enrolled in the BSN program of the college of nursing and had registered in the fundamentals of nursing lab course for the spring 2020 semester. The majority 34 (61.81%) of the students were females and 21 (38.19%) were males and aged between 19 and 21 years old.

The first objective was to compare the knowledge of both groups (control and experimental) regarding appropriate oral medication administration procedures. Knowledge was assessed using five MCQs developed by the course experts. Scores were assigned as 1 or 2 (poor), 3 or 4 (good), and 5 (excellent). Table 1 revealed that the majority 36 (65.45%) of students had a good level of knowledge regarding oral medication administration, and that there was no significant difference between the control and experimental groups, $\chi 2(2,55)=2.626$, p value= 0.269.

The second objective was to compare the skill competency scores of both groups. Skill competency of the participants in performing oral medication procedure was evaluated by two

evaluators using a standardized checklist; the average was the final score of the participants. Scores below 40% were classified as poor performance, 40–80% as good performance, and above 80% as excellent performance. Table 2 revealed that the majority 35 (63.64%) of students had good performance scores, and none were in the poor performance category. There was no significant difference in the skill performance of both the groups, $\chi 2(1,55)=0.262$, p value= 0.609.

The third objective was to describe the satisfaction level of the students who learned the procedure by the traditional demonstration method (the control group). These students were asked to rate their satisfaction with the general demonstration using a 5-point Likert scale anchored by 1 (strongly disagree) and 5 (strongly agree). Table 3 shows that students in the control group were satisfied with the demonstration, with mean scores above 3.5 for all items. Figure 1A revealed that 26 (86.70%) students in the control group considered that traditional demonstration is highly satisfactory.

The fourth objective was to describe the satisfaction level of students who learnt the procedure by interactive educational video. Table 4 reports the video satisfaction scores of the experimental group participants who rated the videos using a 3-point Likert scale. A mean score of 2.5 and above on the items indicated a high level of satisfaction. The video recordings are very important in understanding the procedure steps (M = 2.56); The procedure steps in the videos were very clear (M=2.64), I can control the video easily (to watch the steps again, to advance, to rewind) (M=2.48), The use of different learning materials (video) increased my learning (M=2.48), and the video showing advanced my learning (M=2.56). Figure 1B revealed that 23 (92%) students in this experimental group were highly satisfied with the interactive educational video learning strategy.

Discussion

The advanced technologies accessible to the new generation of nursing students have created opportunities for nurse educators to use interactive educational video recording as a teaching strategy to learn and practice nursing skills. The current study aimed to assess the effectiveness of interactive educational video over traditional demonstration on students' knowledge gain, clinical skills competency, and level of satisfaction. The results revealed no statistical differences

between the knowledge, skill competency scores, and satisfaction levels of groups, indicating that both teaching strategies have similar student outcomes. This is similar to the findings of the studies on video learning for basic nursing skills among Turkish nursing students[24] and also when teaching subcutaneous injection administration procedure using face-to-face demonstration versus computer assisted learning among Turkish nursing students.[28] Vicdan[4] has repeated the study using Instagram to teach intramuscular injection administration for students enrolled in a fundamentals of nursing course. The results showed no statistical difference of knowledge and competency scores between groups. Interestingly in all these studies, the results indicate that the results of interactive video learning for learning nursing skills were as good as the traditional face-to-face demonstration method. This is a positive signal, suggesting interactive videos may appropriately be integrated into fundamental nursing skills courses. Indeed, another study revealed that educational video learning was better than traditional general demonstration for learning a urinary catheterization procedure, with knowledge and competency scores significantly improved.[13]

Nursing students in the experimental group were satisfied with all aspects of the experience, and indicated higher satisfaction levels with several items, including clarity of the procedure's steps, feasibility to watch at their own pace or many times, and the enhancement of their interest to learn through advanced technology. These findings are similar to those of studies carried out among nursing students learning web-based medication application skills.[15,29,30] Another study conducted among students on antenatal examination revealed significantly higher levels of knowledge and competency scores in groups of students subjected to online videos,[31] suggesting that this approach may be appropriately implemented in other courses.

Nevertheless, the control group of students who had traditional classroom general demonstration also exhibited high satisfaction levels. As they are second-year nursing students and it is their first experience of learning skills, they may appreciate face-to-face student–faculty interactions and value the opportunity to ask questions in the classroom. While students preferred the social presence of the faculty during the demonstration of skills, they were satisfied with the encouragement they received in discussion at the end of the sessions. This may encourage faculty to introduce a flipped classroom approach among fundamentals of nursing students when

learning basic skills. This approach may improve their critical thinking, clinical judgment, learning motivation, communication, and teamwork skills.[12] Moreover, in our study the experimental group had a six-hour laboratory each day for two days while the control group had an eight-hour laboratory each day for two days. Because nursing students in the experimental group watched the interactive educational videos at home, a total of four hours was gained and reduced from the face-to-face laboratory session. Interactive educational video could be used to save time in the classroom and this time used to build on the previously acquired knowledge.

Our study is not without limitations. First, our results cannot be generalized, as the study was conducted at a single institution in Oman and on a single nursing fundamental skill. Furthermore, research should be done among different courses in the Bachelor of Nursing program with larger sample sizes, and including more than one institution. A more rigorous research design, like a randomized controlled trial, is recommended to control the effect of confounding variables on future studies' findings.

Conclusion

In conclusion, our study shows that interactive educational video is an easily adopted approach for undergraduate nursing students for learning basic nursing skills, as it is as effective as traditional methods in achieving student learning outcomes. In future studies, a combination of technology (using interactive educational videos to demonstrate nursing skills) and face-to-face, hands-on demonstration should be investigated and used if it yields better outcome. However, our study shows that when face-to-face meetings are not possible (as in the recent COVID-19 pandemic), a switch to online interactive educational videos could be carried out without fear of falling short of necessary program outcomes.

Conflict of Interest

The authors declare no conflicts of interest.

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Authors' Contribution

JN designed the study and supervised the project. ZSS, SSH, DKH, ANK and IMM conducted the experiment and collected the data. JN and MAJ analysed and interpreted the results. MAJ designed and prepared the tables and figures. JN and MAJ drafted the manuscript. All authors approved the final version of the manuscript.

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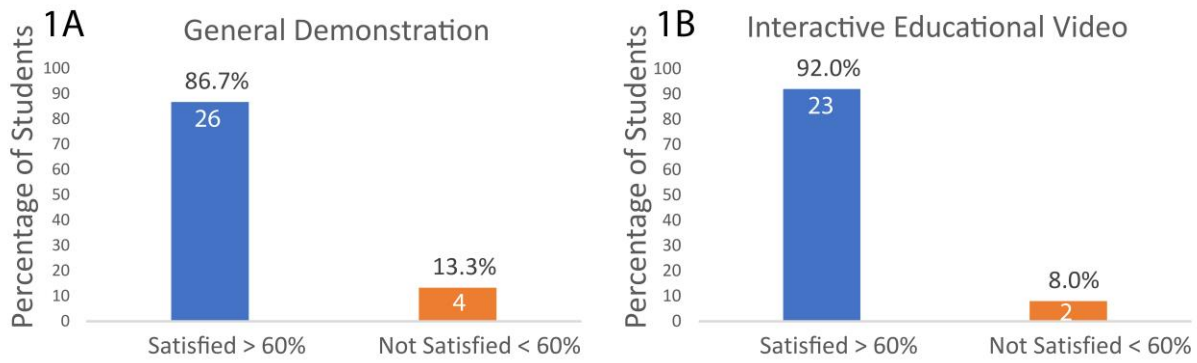

Figure 1: Percentage (and frequency) of students' satisfaction with the skill general demonstration (1A) and with the interactive educational video strategy (1B).

Table 1: Comparison of medication administration knowledge scores among the control and experimental groups

Knowledge scores	Group		Total			
	Experimental Group N(%)	Control Group N(%)	Frequency	Percent	Ҳ2	P value
Excellent (5)	2 (100%)	0	2	3.64	2.626	0.269
Good (3 & 4)	15 (41.67%)	21 (58.33%)	36	65.45		
Poor (1 & 2)	8 (47.06%)	9 (52.94%)	17	30.91		
Total	25 (45.45%)	30 (54.55%)	55	100.0		

Table 2: Competency scores of oral medication administration skill for the control and experimental groups

Skill performance	Group		Total			
	Experimental Group N(%)	Control Group N(%)	Frequency	Percent	X^2	P value
Excellent performance (Above 80%)	10 (40%)	10 (33.33%)	20	36.36		
Good performance (40-80%)	15 (60%)	20 (66.67%)	35	63.64	0.262	0.609
Total	25 (100%)	30 (100%)	55	100.0		

Table 3: Control group satisfaction scores with the general demonstration

General demonstration satisfaction items 5-point Likert Scale	Mean	Standard Deviation
Class size is appropriate.	3.33	.994
The class activities were engaging.	3.77	1.073
The class environment was inviting.	3.63	1.066
The class was fun.	3.90	1.213
I was bored in the class.	3.50	1.106
I enjoyed going to class.	3.73	1.143
I felt comfortable to voice my opinion during class.	3.73	1.081
I learned from my peer experiences.	3.63	1.129
I felt my presence was valued in the class.	3.67	.994
I felt comfortable approaching the instructor.	3.90	1.062
The instructor encourages the class discussion.	4.13	1.137
I recommend this teaching method to be continued for future.	3.97	.765

Table 4: Experimental group satisfaction scores with the interactive educational video

Video satisfaction scores of the experimental group 3-point Likert Scale	Mean	Standard Deviation

The video recordings are very important in understanding the procedure steps.	2.56	.651
The use of video was important for continuing interest in the course.	2.20	.577
Watching the videos prior to the lab session was beneficial in my preparing for the laboratory session.	2.40	.764
The "important points" stated for skills in the videos are very valuable.	2.32	.690
I would like there to be videos for all of the skills.	2.28	.792
The videos decreased my stress during the laboratory.	2.04	.676
The sounds/ images of the videos were very clear.	2.08	.812
The explanation of the skills steps in the videos helped me to pronounce the terms correctly	2.36	.700
The procedure steps in the videos were very clear.	2.64	.638
I can control the video easily (to watch the steps again, to advance, to rewind).	2.48	.823
The use of different learning materials (video) increased my learning.	2.48	.586
I prefer educational video when compared with traditional laboratory explanation.	2.20	.707
I feel more responsibility in learning through video when compared to the traditional way.	2.24	.663
The video showing provided for me to access knowledge more rapidly	2.40	.645
The video showing advanced my learning.	2.56	.651
I was entertained while learning with the video showing.	2.44	.712
Narrating explanation for the skills steps during the video helped me to understand the procedure.	2.44	.651