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ORIGINAL ARTICLE

Video-based lectures: An emerging paradigm for teaching human anatomy and physiology to student nurses

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Abstract Video-based teaching material is a rich and powerful medium being used in computer assisted learning. This paper aimed to assess the learning outcomes and student nurses' acceptance and satisfaction with the video-based lectures versus the traditional method of teaching human anatomy and physiology courses. Data were collected from 27 students in a Bachelor of Nursing program and experimental control was achieved using an alternating-treatments design. Overall, students experienced 10 lectures, which delivered by the teacher as either video-based or Power-Point-based lectures. Results revealed that video-based lectures offer more successes and reduce failures in the immediate and follow-up measures as compared with the traditional method of teaching human anatomy and physiology that was based on printout illustrations, but these differences were not statistically significant. Moreover, nurse students appeared positive about their learning experiences, as they rated highly all the items assessing their acceptance and satisfaction with the video-based lectures.

1. Introduction

Nursing education programs are faced with the challenge of finding innovative ways to accommodate the growing interest in nursing programs. Educational programs in nursing are lacking the resources to educate adequately the number of students applying for admission.[1] Understanding of the human body anatomy and physiology is pivotally important for preparing students of nursing for competent clinical practice.[2–4] However, many nursing students experience difficulties in learning and understanding these courses. Some of these difficulties have been attributed to poor levels of academic achievement related to improper teaching and learning strategies employed for human anatomy and physiology courses.[5,6] Dissection of human cadavers is the best to illustrate the required information about the anatomy and physiology of human body systems to nurse students.[7] However, it possesses a challenge, as it is prohibited in some Islamic countries. In this condition, traditional print-based educational materials have been used to teach nurse students about these courses within conventional higher educational institutions affiliated to these countries. Nevertheless, the use of such method has its shortcomings. Video-based teaching materials have been sought to offer a promising alternative in delivering the intended

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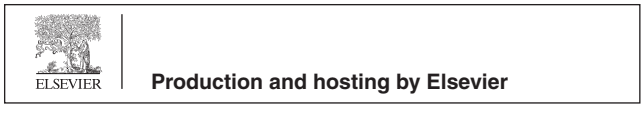

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learning content that may not be available in the traditional print-based illustration.[8] Video-based lectures provide a unique opportunity to present, teach, and internalize information; they are also excellent venues for focusing the students' attention on specific details based on the prepared material itself. Therefore, judicious use of video resources can substantially increase the quantity and quality of time spent on task.[9]

The use of video-based lectures has enriched the educational curriculum in a range of teaching fields that are based on science, such as human anatomy and physiology.[10,11] Video is considered as a successful medium because it links the audio and visual together to provide a multisensory experience for the learner.[12] It is a fact that the visual component is memorable. Based on this fact, Kozma,[13] argued that simultaneous processing of auditory and visual information might aid learning. Thus, video might be superior for learning complex skills because it can expose learners to events that cannot be easily demonstrated.[14,15] More recent study hold the view that ''video allows students to view actual objects and realistic scenes, to see sequences in motion, and to listen to narration''.[16] Even from the students' perspective, video can be a more effective medium than text because it enhances their satisfaction and motivation during the learning process.[17,18] Moreover, from an economic perspective Jung,[19] sees the merit of using video resources in the cost savings expected from reuse.

Dillon,[20], defined ''user acceptance'' in relation to information technology, as the demonstrable willingness within a user of instructional video technology to employ it to learn about practical skills. While, the conceptual foundation of the learner acceptance aspect of the present study was based on the perceived usefulness of video materials as predictors of student's attitude toward video-based lectures as a tool for teaching them about anatomy and physiology of human different body systems.

Learning is not something that happens in isolation, or is just inside the head, but it is shaped by the context, learning environment, and tools in the learning situation.[21] It is believed that mimic near real-life information, and engaged experiences, can make the best learning environments.[22] In particular, constructivists contend that context-based learning through technology will be very effective for the enhancement of learners' knowledge construction, transfer, or application.[23] Among the various technologies that become currently available, video technology is suitable for context-based learning because it can convey the information or knowledge in a more interesting way and allows the portrayal of complicated contexts.[24] In addition, compared with expository materials, stories in video can help learners easily understand and remember the content.[23]

Although, computer assisted learning and multimedia programs have emerged in the form of video-based educational materials inside the university classrooms, there is no clear evidence that such a movement can improve students' learning.[25–28] Moreover, student's acceptance and satisfaction with video-based materials for teaching human anatomy and physiology for nurses have not received much attention in the literature. Accordingly, this study was designed to:

1. Determine the effect of video-based lectures on enhancing nursing students' knowledge versus the traditional method of teaching human anatomy and physiology.
2. Assess nursing students' acceptance and satisfaction with the video-based lectures versus the traditional method of teaching human anatomy and physiology.

1.1. Research hypothesis

1. Use of video-based lectures will enhance nursing students' acquisition of knowledge about human anatomy and physiology.
2. Use of video-based lectures is more acceptable and satisfactory for nursing students' studying human anatomy and physiology.

2. Subjects and methods

2.1. Research design

A quasi-experimental design was utilized.

An alternating-treatment design (video-based and traditional or print-based lectures) was employed for all students.[30] This particular design is a useful technique to examine the effectiveness of two or more treatments, when these are conducted within the same intervention condition with the same individuals but separated in time and presented alternatively.[31]

2.2. Participants

The study sample comprised all students (27) in a Bachelor of Nursing Program who belong to an International College for Medical Science, Al-Madinah Al-monawarrah Branch, Kingdom of Saudi Arabia. They successfully passed to level three and registered for the first time in human anatomy and physiology courses during the academic year 2010–2011. All of them were females and came from the same cultural backgrounds.

2.3. Stimulus materials

Overall, ten lectures were designed and employed for the participants accompanied by instructor's illustration and clarification. The content of these lectures was concerned with studying the structure of human body systems, the shape of body organs, the relationship between each other, how they work and function inside each system. Randomly, five lectures including; musculoskeletal, lymphatic, immune, respiratory, digestive and integumentary systems were designed traditionally as print-based Power Point Presentations, each one consisted of number of slides that contained fixed/ or one dimension photos about the human body organs and systems, while the other five; the blood, the heart, circulatory, nervous, endocrine, urinary, and reproductive systems were based on video clips. The objectives of the lectures, both traditional and video-based, were identical; the only difference between them was in the delivery means.[32]

2.4. Instruments

Data were collected using the following tools:

2.4.1. First tool: a questionnaire sheet
This tool was developed by the researchers to collect data about students' socio-demographic data including; age, residence, and marital status.

2.4.2. Second tool: particularly designed quizzes
The effect of teaching method on students' learning achievement was measured by scoring of particularly designed quizzes to ensure the reliability of data collection across all delivered lectures. Quizzes reflected on the learning objectives of each lecture were constructed from multiple-choice, true–false, and fill-in the missing word questions which were adopted from different anatomy and physiology text books and modified by the researchers for the intervention (immediate post-lecture) and the follow-up exams (first, second and final) for each course. Collectively, 10 immediate post lecture quizzes (carried out interchangeably; one post teaching each of the five print-based lectures and one post teaching the video-based lectures), two first, two second, and two final term written exams contained 100, 50, 50, and 80 equally divided quizzes (i.e. ten, five and four to each lecture taught either by traditional or video-based method), respectively were filled in by each student. Responses to the questions either correct or incorrect were collected and the cut off point for student's success or failure in any exam was determined as 60%, because both anatomy and physiology are main courses in Bachelor of Nursing Program.

2.4.3. Third tool: acceptance and satisfaction likert-type scales
They were composed of 20 items relating to acceptance (Learner Acceptance Scale) and satisfaction (Learner Satisfaction Scale) with video-based teaching materials. The respondents were required to indicate their agreement or disagreement with the scale items on a four-point Likert-type scale. If the traditional five-point scale was used, respondents had the tendency to select responses in the center of the scale.[33–35] The responses for the four-point scale were: strongly agree (4), agree (3), disagree (2), and strongly disagree (1).

Out of the 20, 13 items based on the technology acceptance model (TAM) were used to assess learner acceptance of the video-based teaching materials (Table 5). These items were adopted from King and He, Legris et al., Schepers and Wetzels, and Turner et al.,[36–39] and modified to make them relevant and fit the core of the current study. Moreover, seven items were added to measure learner satisfaction with the video-based teaching materials. They covered overall satisfaction, degree of enjoyment studying by this method, effectiveness of the materials, and students hope to generalize this method of teaching in all of their other courses. All these items were adopted and modified from those used by the Canarie Learning Program, 2004,[40] in evaluating the Virtual Veterinary Medicine Learning Community e-learning modules introduced into the training of Doctor of Veterinary Medicine students across Canada. The seven items of the Learner Satisfaction Scale used for this study appear in (Table 6).

Table 1 Distribution of students according to their socio-demographic characteristics.

Items	N	%
Age/years		
18 to < 20	21	77.8
20–22	6	22.2
Residence		
Urban	25	92.6
Rural	2	7.4
Marital status		
Single	24	88.9
Married	3	11.1

Table 2 The effect of video-based versus traditional lectures on students' scores in the immediate post-lecture exams of human anatomy and physiology.

Immediate post-lecture results	Teaching method				χ^2	*P*-value
	Print based		Video based			
	No.	%	No.	%		
Lecture 1 exam						
Passed	19	70.4	23	85.2	1.714	0.190
Failed	8	29.6	4	14.8		
Lecture 2 exam						
Passed	25	92.3	26	96.3	0.353	0.552
Failed	2	7.4	1	3.7		
Lecture 3 exam						
Passed	22	81.5	26	96.3	3.000	0.083
Failed	5	18.5	1	3.7		
Lecture4 exam						
Passed	23	85.2	24	88.9	0.164	0.685
Failed	4	14.8	3	11.1		
Lecture 5 exam						
Passed	24	88.9	26	96.3	1.080	0.299
Failed	3	11.1	1	3.7		

Table 3 The effect of video-based versus traditional lectures on students' scores in the mid-term follow-up exams of human anatomy course.

Mid-term exam results	Teaching method				χ^2	*P*-value
	Print based		Video based			
	No.	%	No.	%		
First exam						
Passed	25	92.6	27	100	2.077	0.150
Failed	2	7.4	0	00.0		
Second exam						
Passed	24	88.9	25	92.6	0.220	0.639
Failed	3	11.1	2	7.4		

Table 4 The effect of video-based versus traditional lectures on students' scores in the mid-term follow-up exams of human physiology course.

Mid-term exam results	Teaching method				χ^2	*P*-value
	Print based		Video based			
	No.	%	No.	%		
First exam						
Passed	24	88.9	25	92.6	0.220	0.639
Failed	3	11.1	2	7.4		
Second exam						
Passed	23	85.2	26	96.3	1.080	0.299
Failed	4	14.8	1	3.7		

2.5. Inter-rater reliability

Inter-rater reliability is typically measured for assessing the quality of the obtained data.[41] In the current study, the independent two raters (internal experts in education and psychology) in cooperation with the author scored the quizzes from each of the experimental conditions (i.e., intervention, and follow-up). The independent raters were also assigned with scoring the answers from each quiz on a separate data sheet to ensure independent scoring. Total average reliability was 100% across all questions of the quizzes. Reliability of Students' satisfaction was tested in a previous study by Donkor,[42] using Cronbach's alpha reliability test for the Learner Satisfaction Scale. Since the findings of the current study were consistent with previous findings, "these scales have been validated and high reliability reported for each".[43]

2.6. Data collection procedures

1. An approval was obtained from the College Academic Supervisor to implement the study.
2. All students were informed in the beginning of the course that they will be included in the study and the confidentiality was considered.
3. The researcher attended classroom sessions in two days and teach 6 h weekly (one day and 3 h for the anatomy course and the other day and 3 h for the physiology course). The pure time of video clips in the video-based lecturers is ranged from 15 to 35 min.
4. The researcher estimated 3 min of time for each question in any of the intervention, the follow-up exams and Learner Acceptance Scale, and Learner Satisfaction Scale then, she distributed all the study instruments to be completed by the students themselves with no verbal instruction, the researcher scrutinized the questionnaire sheet while handed to ensure that the respondents had properly completed them.

2.7. Data analysis

The collected data were coded and entered in a data based file using the statistical package for social science (SPSS) version 16. Frequency analysis and manual revision were used to detect any errors.

The following statistical measures were utilized:

1. Descriptive measures included frequencies and percentage.
2. Statistical tests including: a Fisher's exact test was used to compare quantitative data that expressed in frequency and percentage, Pearson correlation was used.
3. Non-parametric test such as "Kolmogorov–Smirnov" test (K–S test) is used to compare the sample with the reference probability distribution (one-sample K–S test). As the number of the study sample ($n = 27$) is too small (below 30), we cannot assume that data are normally distributed.

3. Results

Table 1 shows students' socio-demographic characteristics. More than three-fourths (77.8) of the students were aged from 18 to <20 years and most of them were resident at urban and single (92.65%) and (88.9%), respectively.

Table 2 illustrates that in the immediate post-lecture exams, video-based lectures offer more successes and reduce failures among students' scores as compared with the traditional print-based method of teaching human anatomy and physiology, but these differences were not statistically significant, since *p*-value ranged from (0.1–0.7).

Table 3 shows that despite video-based lectures allowed students to achieve more successes in the results of the mid-term first and second follow-up exams of human anatomy course with no failures in the first exam as compared with the traditional print-based teaching method, these differences were not statistically significant. The results of the final term exam of human anatomy course reported that the majority of students (85.2%) were passed, while the minority (14.8%) were failed.

Table 4 reports that although video-based lectures allowed students to achieve more successes in the results of the mid-term first and second follow-up exams of human physiology course as compared with the traditional print-based method, these results did not revealed any statistically significant difference between the two teaching methods. At the end of the semester, most of the students (96.3%) were passed in the final term exam of human physiology course, while the minority (3.7%) were failed.

Table 5 Ratings of items of the students' acceptance of video-based lectures in teaching human anatomy and physiology courses.

Elements of acceptance of video-based lectures as a teaching material	Ratings of learners (n = 27)			
	Mean	SD	K–S test	P-value
1. The clips used in video-based lectures added to the learning content.	3.67	0.68	2.229	0.000
2. The video clips help me understand lecture-teaching material.	3.52	1.12	1.543	0.017
3. The clips used in video-based lectures facilitated my learning.	3.26	0.98	1.521	0.020
4. I feel video clips are an essential part of learning topics that based on imagination.	3.74	0.53	2.426	0.000
5. I feel these video-based lectures have helped improve the intended learning outcomes.	3.37	0.74	1.473	0.026
6. The video-based lectures did not meet my learning needs.	1.67	0.92	2.390	0.000
7. I think video-based lectures are a waste of time.	1.48	0.89	1.669	0.008
8. I would like to generalize the video-based instructional methods on other courses contained practical lessons.	3.11	0.85	2.124	0.000
9. I learned as much in video-based lectures as compared to the traditional method of learning anatomy and physiology.	3.78	0.64	1.557	0.016
10. I feel video-based learning is more effective than the traditional method of learning anatomy and physiology.	3.04	0.71	2.533	0.000
11. I wish if the video-based learning regularly used to teach the whole course contents of human anatomy and physiology.	3.33	0.96	1.720	0.005
12. I can retain more information about human anatomy and physiology from video-based instructional methods.	3.63	0.74	2.098	0.000
13. I think i could fail in anatomy and physiology term exams without the clips used in video-based lectures.	3.22	0.89	2.294	0.000

Table 6 Ratings of items of the students' satisfaction with video-based lectures in teaching human anatomy and physiology courses.

Elements of satisfaction with video-based lectures as a teaching material	Ratings of learners (n = 27)			
	Mean	SD	K–S test	P-value
1. I am satisfied with my learning from the video-based teaching method.	3.74	0.45	1.299	0.068
2. I found the video-based lessons enjoyable.	3.63	0.49	2.571	0.000
3. The video-based lectures have generally contributed to my acquisition of relevant knowledge about human anatomy and physiology.	3.70	0.47	1.730	0.005
4. I found the video-based lecture is more effective in meeting the learning objectives.	3.15	0.91	1.910	0.001
5. I would describe the video-based lectures as being highly interesting than traditional method of teaching anatomy and physiology.	3.81	0.40	1.812	0.003
6. I would rather video-based teaching was compulsory.	2.89	0.80	2.245	0.000
7. The video-based lectures encourage me to spend more time studying human anatomy and physiology.	3.41	0.93	1.317	0.062

Table 5 shows students' ratings about their acceptance of using video-based lectures in teaching anatomy and physiology of the human body. There were highly statistical significant differences that were reported by the respondents among many items, where $p \leqslant 0.000$ that indicating students' acceptance and satisfaction with video-based lectures as a teaching tool.

The results that appear in Table 6 indicate that students rated highly their satisfaction with video-based lectures as a teaching tool. There were highly statistical significant differences that were reported by the respondents among many items, where $p \leqslant 0.000$. It is encouraging to see that the participants in the present study found the video lessons enjoyable, as ''an enjoyable learning scenario is a necessity to effective learning''.

4. Discussion

There is little empirical evidence on the influence of Computer Assisted Learning (CAL) on academic attainment, particularly the use of video-based teaching materials within traditional classroom-based courses. This study found that teaching human anatomy and physiology courses using video-based lectures attained nearly the same exam results. Data from the current study provided an objective illustration that video-based lectures might be a little bit much more effective than the traditional method of teaching human anatomy and physiology for student nurses that did not reveal any significant difference between the two methods. On the other side, students reported that the use of videos improved their understanding

to the topic of the lecture and that videos had a positive impact on their motivation as well as concentration levels. Replication is the essence of believability in research. Data from this experiment come in agreement with other studies wherein different quantitative research methodologies were employed, adding to the evidence of the effective use of videos in learning.[26,44–46]

In agreement with two studies conducted by King and He,[36] and Schepers and Wetzels,[38], the results of the current study came to show high students' acceptance and satisfaction with the use of video-based lectures, as the participants generally appeared positive about their experiences of using the video lessons as a teaching material to learn about human anatomy and physiology courses. This was also supported by Kalwitzki et al.,[47] who were studying the acceptance and benefits of video-based teaching in pediatric dentistry among students, they were asked by means of a questionnaire. 95.5% welcomed the use of video in pediatric dentistry. Out of four didactical means, video gained the highest vote, followed by seminars, lectures, and slides. So that, the use of video-based teaching material is a valuable didactical means that should be considered in teaching undergraduate students.

Overall, students' satisfaction with the use of video-based lectures was very high as compared with the traditional method of teaching human anatomy and physiology courses. Furthermore, the participants found the video-based lectures enjoyable, interesting, and would like if video-based lectures were compulsory. This was in the same line with Ghee and Heng,[48], who illustrated that, students found the video lessons enjoyable and mentioned that "enjoyable learning scenario is a necessity to effective instruction". In addition, Choi and Johnson,[49], were equally supported that the learners found the video-based materials to be relevant and effective. This is because relevant and effective materials enable students to acquire specific skills, knowledge, and attitudes. On the other side, this was contradicting with Williams et al.,[50], who stated that although students rated the video-based lectures as accepted and recommended its use as a teaching resource, with their perception is that attendance at these lectures lead to a greater increase in knowledge acquisition, it suggests that sometimes students do not know what is good for them.

Finally, it has been well documented that different teaching styles and/or approaches may have a diverse influence on student academic performance.[51] Specifically, it has been suggested that learning technology may enhance the student-learning pattern [52]; yet in problem-based learning (PBL), an approach highly used in current educational practice.[29,53] Moreover, e-learning environments and generally online courses designed to meet the increasing demands for distance learning have already benefited from the extensive use of video-based teaching material and web-based video streaming services, even from using YouTube videos.[54,55] As universities worldwide adopt and promote their use, educators should follow the rapid technological evolutions and re-consider other technologies that could facilitate better the acquisition of knowledge of important courses within educational programs.[29,56]

5. Limitations of the study

1. The participants' number was small, because the educational institution in which the study was carried out follows the system of credit hours and the law of Saudi Ministry of Higher Education which does not permit any teaching class to exceed more than 30 students.
2. Although students were in level three they were imperfect in English so the researchers mix between English and Arabic languages in the beginner lectures till the terminology is been confirmed in the students' minds.
3. Adjustment of the intended learning objectives of the courses to be similar to the previously prepared video clips.

6. Conclusion

In this study, teaching human anatomy and physiology courses to student nurses using video-based lectures was related to higher exam results, which represents the objective approach to measure actual usage of the video-based instructional materials. The results suggest the benefits of using video-based teaching materials in enhancing student learning. Thus, carefully constructed videos can be an efficient supplement to current practices releasing the classroom time for even more exciting and interactive engagements. Besides the objective approach, the subjective one was used in the current study, as it is based on the opinion of the respondents through a self-completion questionnaire. Therefore, academic educators can use video-based lectures in teaching human anatomy and physiology courses, as it seems that this teaching strategy can facilitate knowledge transfer to the students for acquiring more skills. Furthermore, video-based lectures can become a cost effective teaching method in that they can be created once, and then saved in libraries to be used by a large number of academic educators.

7. Recommendations

1. Further research is needed to investigate retention of the taught knowledge over longer period of time especially whether this learned knowledge has been transferred effectively to a practical situation.
2. Investigation of using different media to deliver similar teaching material would facilitate the structure of online courses for students who depend on distance learning.
3. Replication with additional students and implementation of video-based lectures at different nursing institutions may increase the generality of the present results.

8. Implication for Practice

Conduction of video-based lectures at different educational levels may increase the students' academic performance. Practitioners must strive to produce teaching materials of high quality for the teaching process that learners find them useful, easy, and enjoyable. So that for subsequent use, important considerations regarding the design or selection of video clips to confirm with the intended learning outcomes of specific course, in addition to clear pronunciation of the used language of the instructional materials should be the prime concern so the learners would be satisfied with them.

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