

**Original article**

**A comparative study of learning outcomes between video-based and traditional lecture-based teaching in physiology**

Raisa Nazir Ahmed Kazi<sup>1</sup>, Mirfat Mohamed Labib El-Kashif<sup>2</sup>, Manjur Kolhar<sup>3</sup>

**Abstract**

**Background:** -Video-based teaching, a distance learning tools is widely being used in the present COVID-19 pandemic. Present study compares cognitive and affective domains learning outcomes between traditional and video-based physiology lecture. **Methods and material:** -A total of 25 female students of Applied Medical College, Prince Sattam bin Abdul Aziz University, kingdom of Saudi Arabia during 2019 were selected for the study. Physiology course consist of 45 credit hours in a fifteen-week semester. Students were evaluated by various methods for different levels of cognitive and affective domains between traditional method of endocrine physiology lecture session and video-based digestive physiology lecture session. Marks obtained by each student in all the assessment methods of cognitive and affective domains were calculated to get a total mean score and expressed in percentage and compared between the traditional and video-based physiology lecture. **Results:** -The total mean score for all the assessment methods of the cognitive domains in the digestive physiology lecture with video was 70% and endocrine lecture without video was 50%. The total mean score for affective domain in the digestive physiology lecture with video was 80% and endocrine lecture without video was 50%. Cognitive domain show no major difference between traditional endocrine physiology and video-based digestive physiology lecture, while student performance was good for affective domain in the lecture supported by video. **Conclusion:** -Video-based teaching helps the learner to achieve objectives of the different levels of affective domain compared to cognitive domain as well as compared to traditional lecture with no video.

**Keywords:** Physiology; Learning domains; Students; Videos; Teaching

*Bangladesh Journal of Medical Science Vol. 20 No. 04 October '21. Page : 833-839  
DOI: <https://doi.org/10.3329/bjms.v20i4.54142>*

**Introduction:** - Physiology is a basic fundamental science for many medical and para medical health programs. Understanding of human physiology is a necessary subject area and foundation for clinical practice. Majority of the student suggest physiology as a very vast and difficult subject to understand and retain in memory. It brings a greater challenge for the teachers to make understand physiological concept,<sup>1</sup> because of its theoretical nature that requires rational efforts by student to understand the mechanism of the body function.<sup>2</sup> Therefore

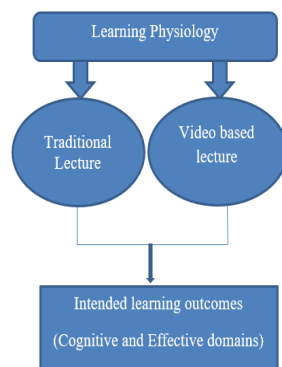
it is essential that student utilize effective learning strategies to overcome these difficulties for better understanding of any subject in order to achieve the course objectives and learning outcome.<sup>3</sup> Physiology teachers need to adopt different teaching-learning strategies that are preferable for helping different students to learn and achieve the course objective effectively.<sup>4</sup> Video-based teaching materials have been sought to offer a promising method in delivering the intended learning content that may not be available in the traditional print-based illustration.<sup>5</sup>

1. Raisa Nazir Ahmed Kazi,, Department of Physiology, Al-Ameen Medical Collège Vijyapura, Karnataka, India and College of Applied Medical Science, Prince Sattam Bin Abdul-Aziz University, Saudi Arabia
2. Mirfat Mohamed Labib El-Kashif, College of Applied Medical Science, Prince Sattam Bin Abdul-Aziz University, Saudi Arabia and Assistant Professor, Maternity, Obstetrics and Gynecology, Nursing Department, Faculty of Nursing, Port Said University, Egypt.
3. Manjur Kolhar, Department of Computer Science, Wadi College of Arts and Science, Prince Sattam Bin Abdul-Aziz University, Wadi ad Dawaser, 11990, Kingdom of Saudi Arabia.

**Correspondence to:** Raisa N Kazi, College of Applied Medical Science Prince Sattam Bin Abdul-Aziz University, Saudi Arabia. Email: raisakolhar@yahoo.co.in

Incorporating videos in traditional lecture will be able to achieve course intended learning outcome, since video is considered as a successful medium, because it links the audio and visual together to provide a multisensory experience for the learner.<sup>6</sup> It is a fact that the visual component is memorable. Based on this fact, Kozma,<sup>7</sup> argued that simultaneous processing of auditory and visual information might aid learning. [Integrating video technology in a physiology courses can enhance the student learning, understanding and retention power. Studies reported that the use of videos have a positive impact on their motivation as well as concentration levels.<sup>8</sup> Video based teaching causes student's satisfaction concerning knowledge. <sup>1</sup> Although video-based teaching in medical education is advanced in its field and brought a constructive influence on the learning outcome, however, in what way the video-based teaching influences different domains of learning outcome need to be recognize.

The Blooms taxonomy mentions that the educational objectives are mainly framed in three learning domains: Cognitive, Affective and Psychomotor.<sup>9</sup> The cognitive domain involves the development of knowledge and skills. The affective domain involves our emotions and attitudes. The psychomotor domain is comprised of motor skills. Cognitive domains can be evaluated at different levels including knowledge, comprehension, application, analysis, evaluation and synthesis. <sup>1</sup>Likewise, the affective domain is evaluated at different levels including, receiving, responding, valuing, organization, characterization. Thus, Present study investigates cognitive and affective learning outcome domains between traditional and video-based physiology lecture (Fig-1). Study lacks the investigation of psychomotor skill due to failure of student to involve in the psychomotor skill due to covid 19 pandemic.



**Figure-1:** Diagrammatic representation of learning methods and intended learning outcome

**Material and Methods-**The participants in the present study are the female Students of Applied Medical Science Prince Sattam bin Abdul Aziz university kingdom of Saudi Arabia. This study involves the assessment of cognitive and affective learning domains between video-based physiology lectures and traditional lecture without video. The study sample comprised of a total of 23 students from a batch who registered for human physiology course in level three during the academic year 2018–2019 after successfully completing level two. All students were informed during the course of action about the study design and aim of the study in order to get better cooperation from the students. Correspondingly informed consent was obtained at the beginning of the study and confidently was maintained. Physiology course has a credit of 45 hours in a 15-weeksemester with three hour each in a week. The course was designed into 10 modules. Each module involves covering the physiological systems that includes cardiovascular, respiratory, urinary, digestive, nervous, blood, endocrine, musculoskeletal and reproductive systems. Endocrine and digestive physiology module was selected to implement the present study. The study involves two lecture, first lecture involves the assessment of cognitive domain between video based digestive physiology and endocrine physiology without video. Correspondingly, second lecture involves the assessment of affective domain between video based digestive physiology and endocrine physiology without video. Each lecture period is divided into two sessions first session involve the teaching of digestive physiology with the help of video and second session of the lecture involves the teaching of endocrine physiology in a traditional manner without any video support relating to the subject. After the end of each sessions of the lecture, students were evaluated for different levels of cognitive and affective learning outcomes domain. The assessment method for cognitive domain includes written exam involving, multiple choice question, true false, match the following, labeling diagrammatic drawings and short notes. Likewise, the assessment method for affective domains involves group discussion, quiz, viva-voci, assignment submission and class room discussion (Table-1). In both the session same teacher and similar group of students are involved in the study. During the assessment methods of the cognitive and affective learning domains the performance or grades of each student in all the assessment methods for cognitive and affective domains in both sessions

of the lecture were sum up to get a total score that is then calculated into mean score and expressed as percentage. The percentage was compared between the two sessions of the lecture. as in figure (2 and 3). The total mean score of all the student in first session of the lecture (digestive physiology with video) for each learning outcome domain were compared with the total mean score in second session of the lecture (endocrine physiology without video). Data was analyzed with the help of Microsoft Excel and is been used to see the difference between the cognitive and affective domains of learning outcome in traditional and video-based sessions.

**Ethical clearance:** This current study was done with ethical clearance from university. Study abided all ethical guidelines of the University and the Kingdom of Saudi Arabia.

**Table-1: Represents learning outcome domains and assessment method.**

SNo	Learning Outcome Domains	Assessment Methods
1	Cognitive	Short tests or written exam which may include, matching; choose the answer, true false and labeling diagrammatic drawings, and short notes.
2	Affective	Group discussion, Quiz, vivovoci, Group discussion, Assignment submission, Class room discussion

**Result and discussion:** - There is an increasing prevalence of technology usage in higher education and video-based teaching plays important role in assisting these developments.<sup>10</sup>The digitally recorded lecture content has sound, animations and motions that will make an easy tool to guide student about the complex educational information about a particular learning area. Trend of video-based lecture are advanced to a greater extent in medical education. Physiology is fundamental to medicine and is a basic science program for many medical and para medical health programs. In-depth understanding of human physiological concept is the foundation for learning pathophysiology, pharmacology, medicine, health assessment in future course of the study in the field of medicine. Video based teaching as one of the strategies for learning physiology has promising result in gaining the intended learning outcome that may be lacking in a traditional lecture class.<sup>11</sup> Some of the feedback response obtained from

students regarding traditional lecture was presented in table2. Due to increase in the tendency of video-based teaching, it would be important to evaluate the impact of these video-based teaching on the different levels of domains of learning outcome and compare it with traditional lecture.

**Table -2-: Student feedback response on traditional lecture and video-based lecture**

Student Response	
Traditional Lecture	Lecture along with videos
Difficult to understand.	Lecture through video will make the subject easy to understand.
More information and difficult to retain the information taught in the lecture.	The course will be more simplified.
More chance of getting distraction from the lecture.	There are more colorful images and animation in video helping to concentrate in the lecture, and retain in the memory.
Difficult to concentrate for more period of time in traditional lecture class.	Less information easy to remember and less distraction of mind away from the lecture.
Difficult to reproduce the previous lecture information in the present lecture.	Easy to recollect the information from previous lecture due to audio visual information.

**Cognitive domain:** -Learning processes in the cognitive domain include a hierarchy of skills involving, processing information, understanding, applying knowledge, solving problems, and conducting research. Further, it involves the development of mental skills and the acquisition of knowledge. According to blooms taxonomy, cognitive domains evaluated at different levels including knowledge, comprehension, application, analysis, synthesis and evaluation.<sup>12,13</sup>In the present study, written exam has been utilized as an assessment method for evaluation of different levels of cognitive domain, written exams involves, multiple choice questions, true false, match the following, labeling diagrammatic drawings and short notes. The lecture is divided into two sessions, in the first session endocrine system was dealt in traditional method of teaching without video and second session of the lecture involve the teaching of digestive physiology as video-based teaching. At the end of each session of the lecture students were evaluated for different levels of cognitive domain through different assessment methods (table-1). The grades obtained by each student in all the assessment methods of the cognitive domain in both sessions of lecture were calculated to get a total mean score. The total mean score for all the assessment methods of the cognitive

domains in the digestive lecture with video was 70% expressed as percentage (Fig-2). The total mean score for all the assessment methods of the cognitive domain in the endocrine lecture without video was 50% expressed in percentage (Fig-2). Hence the difference between two sessions was 70% and 50%, that is the student performance in assessment methods between two sessions. Result shows that there was not much difference in student performance with regards to cognitive domain in both the sessions of the lecture. The different levels of cognitive domain involves student's tendency of recalling important information to solve the questions like true false (remember), explaining important information to solve any short notes (understanding), solving closed ended problems such as true false (apply) and open ended problems like choose the correct answer (analyze), creating unique answers to problems such as match the following (synthesis) and making critical judgment based on sound knowledge such as labelling the diagrammatic drawing (evaluation). All these different levels of cognitive domains were evaluated by the student's performance in the assessment methods. Student's performance for the cognitive domain shows no major difference when compared between two sessions of lecture (Fig-2). The student's evaluations clearly demonstrate that cognitive domain has no major impact when the lecture was supported by video as compared to traditional method without video. However there was an improved performance of the students learning in a video-based lecture compared to traditional lecture, but the difference was not significant.

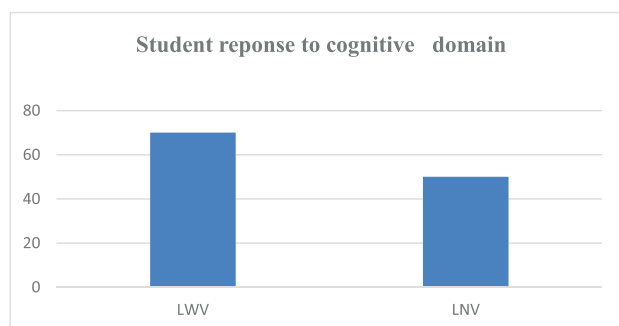


Figure-2: Show the total mean score for cognitive domain between traditional lecture (lecture with no video -LNV 50%) and video-based lecture (lecture with video -LWV 70%).

**Affective domain:** - The affective domain evaluated at different levels includes, receiving, responding, valuing, and organization. This domain includes the

manner in which we deal with the things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes, <sup>14</sup>the affective domain was commonly evaluated using methodologies such as, group discussion, quiz, group discussion, assignment submission, class room discussion. Students assessment for affective domain was done in same procedure as mentioned for the cognitive domain section. Consequently, the affective domain was evaluated in the two session of the physiology lecture first session includes digestive system supported by visual video system and second session includes endocrine lecture without video. The total mean score for all the assessment methods of the affective domain in the digestive lecture session with video was 80% expressed in percentage (Fig-3). The total mean score for all the assessment methods of the affective domain in the endocrine lecture session without video was 50% expressed in percentage (Fig-3). Hence the difference between two sessions was 80% and 50%. Student performance was good with regards to affective domain in the video session of the lecture compared to traditional method. The different levels of affective domain evaluated involves student's willingness to listen (receiving and responding), willingness to be involved (valuing), willingness to be an advocate (organization), willingness to change once behavior (characterization). In the present study receiving level of affective domain was assessed through quiz and viva voci, the receiving level is to hear about a particular topic and respond to it when being assessed, it requires focused attention towards the lecture. In receiving and responding level of affective domain the learner shows active participation, moving from obedient response to enjoyment in responding. It demonstrates active participation of the learner in class room discussions. At this level, the learner must respond in the assessment tool verbally or in writing. Willingness to be involved (valuing) is assessed through their involvement in group discussion, at this level, the learner openly discusses their level of understanding regarding the topic discussed in lecture and hence improve the level of learning. In valuing, the learner describing how they are combining concepts into their work. Willingness to be an advocate (organization) is assessed through the student participation in assignment and enumerate the possible solution achieved to complete the assignments given. Prioritizes time effectively to meet the needs of the organization and explain the role of systematic planning in solving problems. Willingness to change once

behavior (characterization) is assessed through the student participation in class room activities, group discussion. Characterization involves the level of affective domain which controls the behavior of learner through the adjustment in personal, social and emotional behavior. It also involves cooperation in group activities to make a successful team work to solve a problem and shows professional commitments. It also involves to ethical practice to value people and change in behavior in a team work.<sup>15</sup>In the present study, we observed that student performance was more satisfactory in all the levels of affective domain as compared to cognitive domain when the lecture was supported video (fig-3). Further it is reported that the student performance was good in the digestive session of the lecture supported by video compared to traditional method of endocrine lecture without video. Students satisfactorily achieved the objectives of different levels of affective domain in the lecture supported by video as compared to traditional lecture session without video.

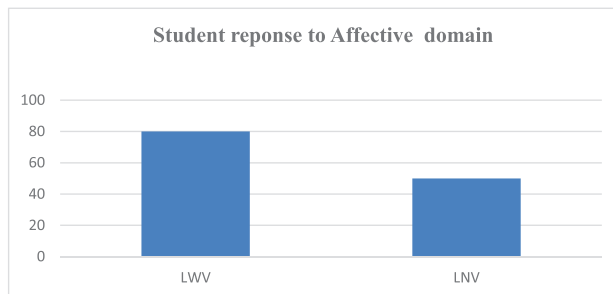


Figure- 3 Show the total mean score for affective domain between traditional lecture (lecture with no video -LNV 50%) and video-based lecture (lecture with video -LWV 80%).

The advantage of video-based learning according to one study which suggested that human brain can process video faster than text in process of learning. Video can grab the attention of the student and keep them attentive during the lecture. This will help them to improve learning and retention of knowledge that was acquired during the video-based lecture. It encourages thinking because the video involves text along with movies, images and sound of a particular physiological mechanism taking place in the human organ system, this will help in better understanding of the subject. Video-based lecture involves use of multiple senses to understand the concept. It allows them to recollect the visual representation of a particular physiological process if they fail to

understand or recollect the text material of the topic.<sup>1</sup>

According to elearningindustry.com, a learner is likely to remember only 10% of textual content, 65% of visual content, but 95% of audio-visual content. Visualization works from a human perspective because we respond to and process visual data better than any other type of data. In fact, the human brain processes images 60,000 times faster than text, and 90 percent of information transmitted to the brain is visual. Since we are visual by nature, we can use this skill to enhance data processing and organizational effectiveness.<sup>16</sup> Some researchers suggest that 70 % to 90% of the information that comes to the brain is visual. Because 40% of the nerve fiber connected to the brain are linked to the retina. The brain process visual information 60, 000 times faster than the process text.<sup>9</sup> 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 are enjoyable, interesting, and would like for video-based lectures to be compulsory. This was in the same line with Ghee and Heng,<sup>17</sup> 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<sup>18</sup>, 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. The results suggest the benefits of using video-based teaching materials in enhancing student learning.<sup>19</sup> Thus, carefully created videos related to the topic can be an effective way in making classroom learning exciting and interactive engagements.<sup>20</sup> The achievement of learning outcome at the end of any effective learning strategies at the end of the course that the learner accomplished is an important milestone in education.<sup>21,22</sup> Hence how video-based lecture affects the different domains of learning outcome is being evaluated in the present study. In the present study we compared the achievements of different domains of learning outcome between traditional lecture and video-based lecture. Our study reported that, video-based lecture is considered valuable in learning and meeting educational outcome within the affective

domain and is powerful medium for conveying the spectrum of human emotions to meet the affective learning objectives.

**Conclusion:** -In the present pandemic covid 19 situations teaching and learning has been shifted to online method. Different levels of cognitive and affective learning outcome were evaluated between a video-based digestive and traditional endocrine physiology lecture without video. Thus, present study reported that video-based teaching more satisfactorily achieved the objective of different levels of affective domains' learning outcomes compared to cognitive domain in a video physiology lecture as well as compared to traditional lecture.

**Authors' statement:**-The present manuscript has not been published previously, that is not under consideration for publication elsewhere, that this publication is approved by all authors who has

contributed significantly and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, without the written consent of the publisher.

**Conflict of interest statement:** We have no financial, consultant, institutional and other relationships that might lead to bias or a conflict of interest.

**Source of fund:** This research is not funded by any resource.

**Authors' contribution:**

**Raisa Nazir Ahmed Kazi:** Data gathering and idea owner of this study, Study design, Data gathering, Writing, and submitting manuscript, Editing and approval of final draft. **Manjur Kolhar:** Data gathering, Study design, Data gathering, Writing, and submitting manuscript, Editing and approval of final draft.

**References:**

1. Anderson LC and Krichbaum KE. Best practices for learning physiology: combining classroom and online methods. *Advances in physiology education* 2017; **41** (3):383-389. <https://doi.org/10.1152/advan.00099.2016>
2. Michael J. What makes physiology hard for students to learn? Results of a faculty survey. *Adv Physiol Educ* 2007; **31** (1): 34-40. <https://doi.org/10.1152/advan.00057.2006>
3. Kazi RN. Active-learning for nonnative-english speaking students. *Euromentor Journal-Studies about education*. 2018;**9**(04):105-11.
4. Dobson JL. Learning style preferences and course performance in an undergraduate physiology class. *Adv Physiol Educ* 2009; **33** (4):308-314. <https://doi.org/10.1152/advan.00048.2009>
5. Donkor F. The comparative instructional effectiveness of print-based and video-based instructional materials for teaching practical skills at a distance. *The International Review of Research in Open and Distributed Learning*, (2010);**11**(1): 96-116. <https://doi.org/10.19173/irrodl.v11i1.792>
6. Mishra AK, Bartram J. Skills development through distance education, Commonwealth of Learning (COL). London:Oasis,2002.
7. Kozma RB. Learning with media. *Review of educational research*,(1991);**61** (2): 179-211. <https://doi.org/10.3102/00346543061002179>
8. El-Sayed REH, El-Hoseiny, S and El-Sayed E. Video-based lectures: An emerging paradigm for teaching human anatomy and physiology to student nurses. *Alexandria Journal of Medicine*2013;49(1): 215-222. <https://doi.org/10.1016/j.ajme.2012.11.002>
9. Pollock JE, and Hensley S. *The I5 Approach: Lesson Planning that Teaches Thinking and Fosters Innovation*. USA:Amazon, ASCD(2017).
10. Bates AW. Teaching in a digital age; Guidelines for designing teaching and learning for a digital age. open. bccampus.ca. (2015). Retrieved from
11. Roberts JK, Chudgar SM, Engle D, McClain EK, Jakoi E, Berkoben M et. al. Digital chalk-talk videos improve knowledge and satisfaction in renal physiology. *Advances in physiology education* 2018;**42** (1):146-151. <https://doi.org/10.1152/advan.00131.2017>
12. Bloom BS, Taxonomy of educational objectives. Cognitive domain, New York: McKay, (1956). 20-24.
13. McDonald M. Systematic assessment of learning outcomes: (2002) Developing multiple-choice exams. Jones & Bartlett Learning.
14. Hoque ME. Three Domains of Learning: Cognitive, Affective and Psychomotor. *The Journal of EFL Education and Research*. 2016;**2**(2):45-52.
15. Yanofsky, S. D., & Nyquist, J. G. Using the Affective Domain to Enhance Teaching of the ACGME Competencies in Anesthesiology Training. *The journal of education in perioperative medicine: JEPM*. 2014;**12**(1): E055.
16. Thermopylae Sciences.t-sciences.com/news/humans-process-visual-data-better
17. Ghee TT and Heng LT. Efficacy of multimedia teaching instruction in elementary Mandarin class. In Proceedings of the third centre for languages studies (CLS) international Conference 2008: 686-97.
18. Choi HJ and Johnson SD. The effect of context-based video instruction on learning and motivation in online courses. *The American Journal of Distance Education*. 2005;**19**(4): 215-227. [https://doi.org/10.1207/s15389286ajde1904\\_3](https://doi.org/10.1207/s15389286ajde1904_3)
19. Salam A, Yaman MN, Hashim R, Suhaimi FH, Zakaria Z and Mohamad N. Analysis of Problems Posed in Problem Based Learning Cases: Nature, Sequence of Discloser and Connectivity with Learning Issues. *Bangladesh Journal of Medical Science*.2018;**17**(3):417-423. <https://doi.org/10.3329/bjms.v17i3.36997>
20. Brame, C. J., Effective Educational Videos, available at <https://cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos/#load>
21. Gupta N, Pandey S, and Anshu A. Innovative Anatomy assessment methods in COVID-19 Pandemic: statistical observations and students' viewpoints. *Bangladesh Journal of Medical Science*. 2020;**21**-S. <https://doi.org/10.3329/bjms.v19i0.47831>
22. Mosalanejad L, Sani MS, Hosseini Y and Abdollahifrad S. Implementation of Serial Workshop by Students Educational Need: Trend to Accountability in Medical Education. *Bangladesh Journal of Medical Science*. 2018;**17** (1): 78-83. <https://doi.org/10.3329/bjms.v17i1.35285>