

Dissection videos as a virtual veterinary anatomy peer learning tool: Trialled at the University of Tehran during the Covid-19 pandemic

Javad Sadeghinezhad 

Department of Basic Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

Correspondence

Javad Sadeghinezhad, Department of Basic Sciences, Faculty of Veterinary Medicine, University of Tehran, P.O. Box: 14155-6453, Tehran, Iran.
Email: sadeghinezhad@ut.ac.ir

Abstract

The Covid-19 pandemic forced universities around the world to use online education instead of face-to-face teaching. Veterinary anatomy training was also affected, and laboratory classes were disrupted by this transition. To reduce the effects of virtual education on students' anatomy learning, peer learning using dissection videos was introduced at University of Tehran. This study describes the design and implementation of this method and evaluates the students' perceptions regarding this programme. The opinions of 98 students were examined using a questionnaire. The data showed that dissection videos were one of the main sources of anatomy study (67.3%). Among students who used videos, 69.6% students became more interested in anatomy and 73% learned anatomy better with this approach. Students used these videos to review anatomy (88.7%) and even learn new content (87.6%). Most surveyed students used laptops (73%) and cell phones (14.6%) to watch videos. In this study, 19.1% of respondents were estimated to be low users, 68.5% medium users and 12.4% high users. A large number of students (83.1%) trusted their peer teacher in providing the lesson. Dissection videos play an important role in conveying a three-dimensional understanding of anatomical structures, and peer teaching is also effective in learning because of the strong connection between tutors and tutees. This study supports students' acceptance of the use of peer dissection videos for learning online veterinary anatomy.

KEYWORDS

Covid-19, dissection videos, online learning, peer teaching, veterinary anatomy

1 | INTRODUCTION

Teaching of anatomy is one of the most important parts of the medical and veterinary education programme. Anatomical knowledge is vital for interpreting radiologic images, performing diagnosis, learning clinical procedures and carrying out surgery (Plendl et al., 2009; Sagoo et al., 2021).

Although alternative methods such as plastination of specimens, prosections and 3D reconstruction methods are available for teaching medical and veterinary anatomy (Ghosh, 2017; Saber et al., 2016),

dissection is still the gold standard (Dua et al., 2021). The benefits of using a cadaveric dissection are enormous. It provides a three-dimensional understanding of body structures, the relationships between these structures and promotes self-growth, collaboration and teamwork (Dua et al., 2021; Greene, 2020).

The Covid-19 pandemic affected education systems globally; to prevent its spread, face-to-face training was discontinued and quickly replaced with online education. Although lecture-based classes are easily adapted to the online method, practical and laboratory-based classes are disrupted by this transition (Cuschieri

& Calleja Agius, 2020). Moreover, anatomy is a three-dimensional subject that requires an understanding of the relationship between structures and is therefore difficult to learn only by screen-based platform (Thom et al., 2021). On this basis, the impact of the Covid-19 outbreak on anatomy education has been studied in the literature, focussing on the lack of practical training and deep understanding of anatomical structures (Franchi, 2020; Mahdy & Sayed, 2022; Pather et al., 2020; Ross et al., 2021; Saber, 2021). However, the disruption has also provided an opportunity to develop alternative methods.

At the University of Tehran, ordinary classes were cancelled on 23 February 2020 following an announcement from the government; anatomy education for students in the Faculty of Veterinary Medicine had subsequently been conducted online as of the submission of this study. Students in the faculty study for 6 years to get a Doctor of Veterinary Medicine degree. In total, there are 222 credit units. Theoretical and practical units include one and 2 h of lessons per week, respectively. Each academic year has two semesters that last 16 weeks each. The gross anatomy programme includes systematic anatomy 1 (2 lecture credits and 1 practical credit), systematic anatomy 2 (2 lecture credits and 1 practical credit) and topographic anatomy (1.5 lecture credits and 1.5 practical credits). Systematic anatomy 1 and 2 are offered in the first and second semesters, but topographic anatomy is taught from the third to the seventh semester (during the pre-clinical phase). Systematic anatomy 1 covers the locomotor system, central nervous system, special sensory organs and common integument, with comparison between different species. Systematic anatomy 2 covers the digestive system, respiratory system, cardiovascular system and urogenital system between different species and also covers avian anatomy. Topographic anatomy includes regional anatomy of the head and neck, thoracic and pelvic limb, thoracic, abdominal and pelvic cavities and also the peripheral nervous system.

In general, professors' booklets, which are summarized from veterinary anatomy textbooks, are used for teaching. Before Covid-19, theoretical sessions were given in person, and practical sessions were held in the dissection hall in small groups of students under the supervision of an anatomy professor. Animals used for dissection include horses, cows, sheep, dogs and birds. The final assessment is made at the end of each semester and is taken in writing for the theoretical part and as a spotter test for the practical part. During the lockdown period, theoretical classes were conducted online using the university platform with PowerPoint presentations as well as textbook and atlas uploads. To mitigate the effects of virtual education on students' anatomy learning, peer learning using dissection videos was introduced at our department.

Simply put, peer learning means that each student helps other students learn. It has been introduced in both medical and veterinary anatomy education curricula as a learning approach that is effective owing to strong communication between tutors and tutees (Agius et al., 2018; Janczyk & Plendl, 2010).

Digital media are available through smartphones and other mobile devices, and access to information is possible anytime and anywhere, and are therefore used as learning tools by the new

generation of students. Because a combination of words (spoken or written) and images (illustrations, photographs, animations or videos) has a greater impact on learning than any of them alone, dissection videos are widely used in anatomy education (Golenhofen et al., 2020; Nation et al., 2020; Sagoo et al., 2021).

This study describes the design and implementation of this method and evaluates the students' perceptions regarding this programme during Covid-19 pandemic period. Anatomy training will continue in person after the Covid-19 lockdown, and it is important to evaluate the approaches used during this time for their possible use in future face-to-face learning or hybrid education.

2 | MATERIALS AND METHODS

2.1 | Survey implementation

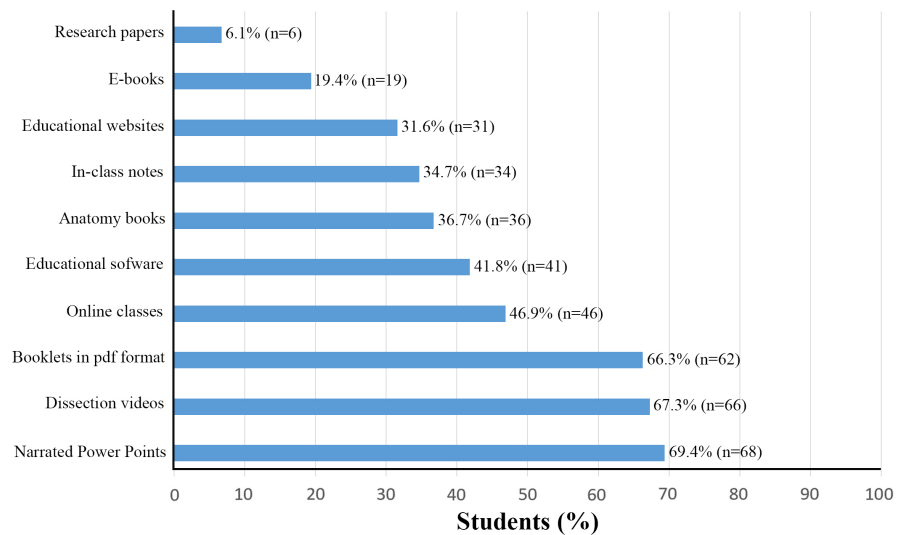
This study was conducted in the first semester of the academic year 2021–2022 during the presentation of a Systematic Anatomy 1 course to first-year students at the Faculty of Veterinary Medicine of the University of Tehran. This course covers the comparative anatomy of the locomotor system, central nervous system, special sensory organs and the common integument. At the beginning of the semester, one of the faculty members explained the peer teaching and gave an overview of the programme to the students. After that, interested students who lived in Tehran were invited to participate in the programme as peer teachers and prepare videos.

Peer teachers were selected and then given time to study the theory. In each practical session, two students were present in the dissection hall, and the professor supervised and assisted the students with the dissections to prepare them for presenting the information to their peers. Each peer teacher was in charge of a maximum of four classes.

The students then recorded the dissection videos using their mobile phones. The videos were imported into Camtasia® version 2019.0.10 (TechSmith Corp., Okemos, MI) for trimming and splitting of the video content, editing audio and inserting text or markers. The final product was shared via the Telegram group (Telegram FZ-LLC) of the class after review and approval by the professor. A total of 38 videos were prepared, with an average length of 5 minutes and 40 seconds. The videos cover the muscles of the thoracic and pelvic limbs, head, neck and trunk. They also include the anatomy of the brain and spinal cord, eye and common integument.

At the end of the dissection course, an electronic questionnaire was prepared using Google Forms to evaluate the students' perceptions, and its link was sent to the students through Telegram. The questionnaire was designed by the author with reference to previously published articles evaluating the use of technology and peer teaching in anatomy education (Agius et al., 2018; Golenhofen et al., 2020). Data evaluation was focussed on peer learners, and peer teachers were therefore excluded. The survey was available from February 26 to March 7, 2022, and students were encouraged to complete it for an additional credit.

FIGURE 1 Different sources used by students ($n = 98$) for learning veterinary anatomy during Covid-19. Data were shown based on the percentage of total responses.



The questionnaire contained six sections, which included a total of 15 items. It consisted mainly of closed-ended questions, with two open-ended questions. Section A consisted of two questions about the students' sex and age. Section B focussed on the sources that students thought were effective in learning anatomy using a multi-select multiple-choice question. Section C examined students' usage of dissection videos using four single-selection questions (devices for watching videos, use or non-use, number of times used and how long videos are used). Section D consisted of four questions that assessed the degree of the impact of dissection video peer teaching on learning using four-point Likert scale (learning new anatomy content, reviewing anatomy content, interesting content in anatomy, learning anatomy better and preparing better for the final examination). In section E (three items), students were asked to express their views on presentations by peer teachers (confidence in the accuracy of the video content and explanation of the anatomy contents) and the quality of the dissection videos by four-point Likert scale. The final section (F) focussed on the weaknesses and strengths of the programme and also participants' suggestions for the programme using open-ended free-text questions.

2.2 | Ethical considerations

This study was approved by the scientific research ethics committee of the Faculty of Veterinary Medicine of the University of Tehran (IR. UT.VETMED.REC.1401.002). The purpose of this project was mentioned at the beginning of the questionnaire, and the anonymity and optionality of its completion were also explained.

2.3 | Data analysis

Data analyses were completed using the Statistical Package for Social Sciences (SPSS), version 25 (IBM Corp., Armonk, NY). Descriptive data were presented based on the percentage of total

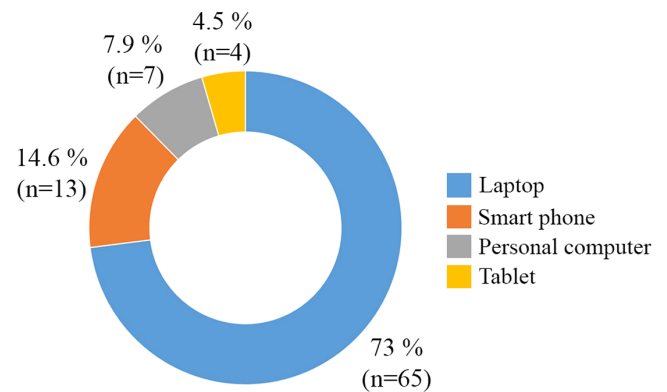


FIGURE 2 Different devices used by students ($n = 89$) for studying online veterinary anatomy. Data were shown based on the percentage of total responses.

responses. The data of the Likert scale questions were converted into numbers (strongly disagree = 1, disagree = 2, agree = 3 and strongly agree = 4) and expressed as mean \pm standard deviation (Mayer & Gaschke, 1988). Based on the data related to students' usage of dissection videos, participants were classified into three groups by calculating the product of usage number (5 categories) and duration (5 categories), as follows: low users (1–8), medium users (9–16) and frequent users (17–25). Students' comments on the open-ended question were categorized and listed according to theme (Kuckartz, 2019).

3 | RESULTS

Of 127 students who participated in the class, 98 (77.1%) completed the questionnaire. Among these students, 53.5% were female students and 46.1% were male students. The percentage of female and male students who responded to the survey was approximately equal to the percentage of female and male students who participated in the programme. The age of students was 19.5 ± 1.66 years.

From the students' point of view, the professor's narrated PowerPoints (69.4%), dissection videos (67.3%), and professor's booklets in pdf format (66.3%) were the most appropriate sources for online anatomy learning. Other convenient sources used by students included online classes (46.9%), anatomy software (41.8%), anatomy books (36.7%), in-class notes (34.7%), educational Websites (31.6%), e-books (19.4%) and research papers (6.1%) (Figure 1).

A total of 90.8% of students ($n = 89$) used peer dissection videos while learning anatomy online. Students who did not use the videos cited forgetfulness ($n = 5$), lack of time ($n = 2$), and the use of other digital resources ($n = 2$) as reasons why.

In the next sections of the questionnaire, the students who used the videos were asked questions and the answers were analysed as follows. Most students used laptop to watch videos (73%), while some used mobile phones (14.6%), personal computers (7.9%) and tablets (4.5%) (Figure 2). Only 21.4% of students watched the videos few times. Almost half of the students (47.2%) watched the videos up to 20 times, and the rest (31.4%) very frequently during the semester. Only 10.1% watched the videos in less than 15 minutes, but the rest used more than that each time (Table 1). Based on these data, low, medium and frequent users constitute 19.1%, 68.5% and 12.4% of surveyed students, respectively.

The majority of respondents (87.6%, $n = 78$) believed that they learned new anatomical content from the videos, and 88.7% ($n = 79$) stated that they could review the anatomy by watching the videos. The videos motivated most students (69.6%, $n = 62$) to study anatomy, and subsequently, 73% of students ($n = 65$) learned anatomy better using the videos. Evaluation of students' opinions showed that the quality of videos was acceptable (94.3%, $n = 84$) and the anatomy was well explained (80.8%, $n = 72$). In addition, most students (83.1%, $n = 74$) were confident in the accuracy of the content presented in the videos (Figure 3).

The students' answers to the open-ended question included their views on the strengths and weaknesses of the programme

(Table 2). The most important benefits cited by the students were the three-dimensional perception of the structures, better learning from their classmates, the possibility of reviewing the lesson and increasing the motivation to learn. High-speed narration, lack of direct contact with samples and difficulty seeing the details of some structures were cited as drawbacks. Many participants also thanked the anatomy team for running this programme and suggested that the videos be uploaded to Aparat for more access (Aparat is an Iranian online video sharing and social media platform such as YouTube).

4 | DISCUSSION

Anatomy is usually offered in the first year of study, and students with different learning styles are faced with a large amount of content and new vocabulary (Plendl et al., 2009). It is also a course that requires a three-dimensional understanding of structures, and it was difficult to convey these concepts online during the Covid-19 pandemic (Wilhelm et al., 2022). To deal with these challenges, peer learning and dissection videos have been utilized in veterinary anatomy programme.

Our study showed that dissection videos, along with narrated PowerPoints and professors' booklets in pdf format, were the most important resources for students studying anatomy. As access to books in the Covid-19 period was not possible for all students due to long distances between themselves and the university (Singal et al., 2021), the professors' booklets in pdf format and narrated PowerPoints have been welcomed by the students. Dissection videos, which provide a three-dimensional understanding of structures (Nation et al., 2020), were also used to learn the practical part of anatomy during Covid-19, when practical classes had been discontinued. A more recent study also reported dissection videos as the main resource for anatomy study by veterinary students during online learning (Mahdy & Sayed, 2022). In contrast, in the face-to-face training period before Covid-19, the use of traditional resources (dissections and textbooks) was more frequent than that of e-learning resources (software and videos) (Agius et al., 2018; Chapman et al., 2013; Choi-Lundberg et al., 2016).

Cadaver dissection is a gold standard for anatomy education (Dua et al., 2021), and many studies have emphasized that even advanced learning tools cannot completely replace it. It provides a means of learning the 3D orientation of anatomical structures, promotes professionalism and builds leadership skills (Ghosh, 2017). In this regard, it has been reported that the most important difference between live dissections and videos is that the video camera imposes a rigid point of view, while a live dissection provides numerous angles, and thus, student can sweep the specimen to get stereotaxic information (Theoret et al., 2007). However, cadaver dissection remains a challenge in distance learning (Cheng et al., 2021). On the contrary, anatomy laboratory teaching also has limitations such as the time commitment and financial resources required, dealing with increased class sizes and emotional concerns and ethical controversies

TABLE 1 Distribution of usage number and duration of dissection videos by students ($n = 89$)

	Students 'usage, n (%)	Category
Usage number/semester (n)		
1-5	3 (3.4)	1
6-10	16 (18)	2
11-20	42 (47.2)	3
21-50	19 (21.3)	4
>50	9 (10.1)	5
Usage duration (min)		
1-5	2 (2.2)	1
6-15	7 (7.9)	2
16-30	34 (38.2)	3
31-60	33 (37.1)	4
>60	13 (14.6)	5

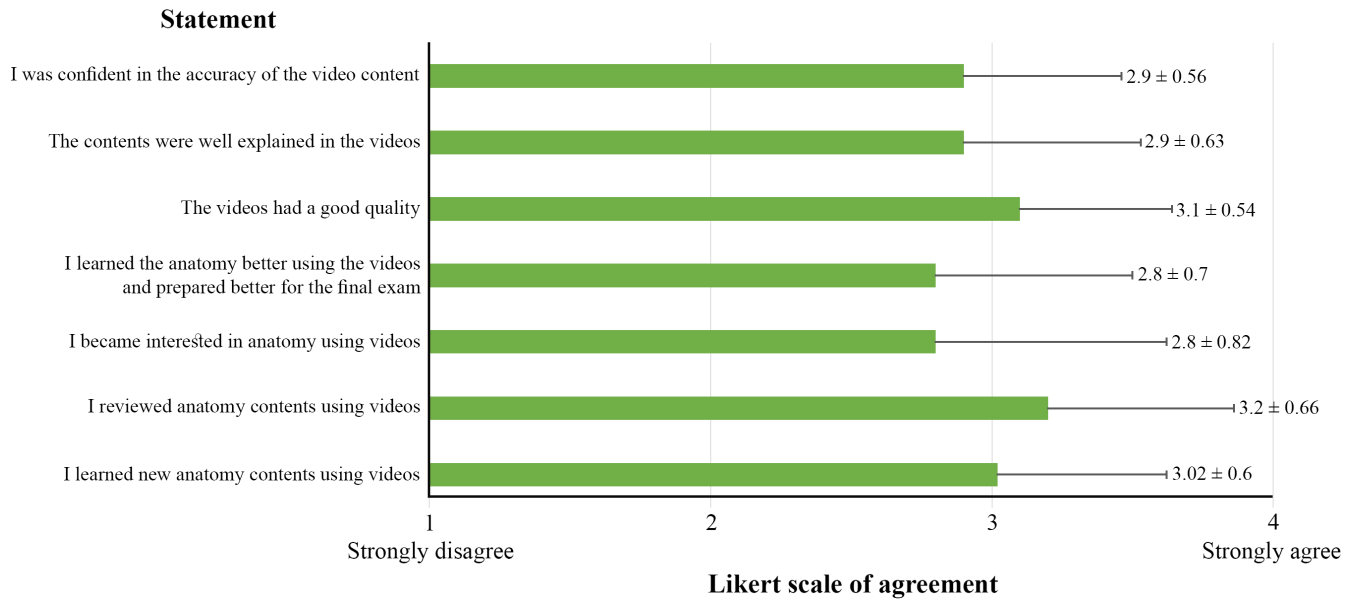


FIGURE 3 Students' opinions ($n = 89$) on peer dissection videos based on four-point Likert scale agreement (1: strongly disagree, 2: disagree, 3: agree and 4: strongly agree). Data are reported as means \pm standard deviations.

TABLE 2 Students' comments on peer dissection videos

Theme	Description	Representative comment
Benefits		
3D visualization	Three-dimensional understanding of structures	The structures in the video are seen in three dimensions and they were easier to learn
Learning	Better learning from peers	It was easier to learn a lesson from my classmate
Review	Ability to review the lesson	I could easily review the lesson anytime, anywhere
Motivation	Increase motivation for learning	I became interested in learning anatomy by watching dissection videos of my classmates
Challenges		
Speed of narration	High-speed narration in video	The speed of explanation was high in some parts
Physical touch	Absence of contact with the specimens	The video was great and helps learning in this situation, but to learn better I have to touch the specimens and do the dissection
View details	Difficulty seeing the details of the structures in the video	The details of some of the structures were not clear in the video
Suggestion		
Aparat	Use Aparat to upload videos	Videos will be more available if uploaded to Aparat

which affect education even in ordinary training (Nation et al., 2020; Theoret et al., 2007). In various studies, the lack of three-dimensional understanding of structures and dissection techniques has been reported as important problems of online education from students' perspectives (Mahdy & Sayed, 2022; Singal et al., 2021; Wilhelm et al., 2022). Based on the opinion of the students in this survey, it seems that peer dissection videos can solve this problem to a large extent, in order that students might become more interested in anatomy and learn anatomy better using this approach. Students also mentioned increased motivation as an advantage of this strategy in the open-ended question. Similarly, in previous studies, motivation and satisfaction have been reported with peer teaching (Agius

et al., 2018; Salomäki et al., 2014) and video dissection (DiLullo et al., 2006; Granger, 2004; Mustafa et al., 2021; Topping, 2014).

Students noted that they could use peer dissection videos to review anatomy and even learn new content. Mobile learning tools have also been reported to be useful for preparing students for lessons and reviewing previous content (Golenhofen et al., 2020). The use of digital resources is recommended for the long-term preservation of medical knowledge (Noll et al., 2017). In practical anatomy classes, dissection videos have been introduced as a guide for students to dissection, which has led to a reduction in scheduled teaching time and increased examination scores (Topping, 2014).

Most surveyed students used laptops and cell phones to watch videos. In the international survey, laptops and mobile phones were also reported to be the tools most used by veterinary students, and it was pointed out that the electronic devices used are important for designing e-learning resources and ensuring that their contents are received correctly (Gledhill et al., 2017). Therefore, computers and laptops that have a larger screen and better image quality are recommended when using electronic anatomy sources (Golenhofen et al., 2020; Singal et al., 2021).

Students' use of peer dissection videos was high in this study, and as mentioned earlier, they were satisfied with their learning. In a previous study, a significant positive relationship was reported between the number of uses of anatomical audio-visual sources and students' examination scores (Choi-Lundberg et al., 2016). By consent, frequent users of the computer-aided application scored higher than non-users in the gross anatomy course (McNulty et al., 2009). A similar result has been reported for mobile learning tool users in anatomy examination outcomes (Golenhofen et al., 2020). It should be noted that some studies did not confirm the association between the assessment score and the use of the digital resources (Meyer et al., 2016; O'Byrne et al., 2008), which may be due to differences in methodology and tools.

Most of the students commented that the quality of the videos was good, and the content was well explained in the videos. One of the positive points of this method was the students' trust in their peer teachers to present anatomy content. Their peers' lack of experience and students' subsequent distrust in them have been identified in some studies as weaknesses of peer-assisted learning (Bulte et al., 2007; Salomäki et al., 2014). Therefore, the importance of adequate training and monitoring of the peer teachers that has been done in the present study is emphasized (Salomäki et al., 2014; Weyrich et al., 2008).

A few students commented that some of the details of the structures in the videos were not clear. This technical problem can be solved by recording video from different angles of the samples and focussing on certain structures. Lack of physical contact with the samples was another challenge that students mentioned in the open-ended question. Physical touch of the cadavers in the dissection hall creates a practical experience for students that unfortunately is not easily transmitted through computer-based methods (Wilhelm et al., 2022). Despite the lack of dissection videos to impart practical skills to students, it is a homogeneous form of instructional material, and students can choose the rhythm of learning and access an instructional resource to learn and review at any time and place (Theoret et al., 2007).

Finally, students also suggested sharing these videos online. The online format of the dissection videos allows students to watch them several times (Greene, 2020). In addition, social media has been introduced as a useful tool for teaching anatomy in medicine and veterinary medicine due to its popularity and availability (Barry et al., 2016; Mahdy & Sayed, 2022).

This study evaluated students' views on the use of peer dissection videos to learn veterinary anatomy through e-learning. This

study has some limitations. The number of students whose views were examined was small. In addition, the relationship between students' examination scores and the use of peer dissection videos was not examined. In this survey, only the opinions of tutees were evaluated, and the perceptions of tutors were not taken into account.

In general, students' satisfaction is an important indicator of the success of the educational method. This study supports students' acceptance of the use of peer dissection videos for learning veterinary anatomy online. Peer learning has also been identified as an effective approach to anatomy learning and is also helps to foster confidence and professionalism. As a result, the integration of peer teaching and dissection videos using can improve students' satisfaction.

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CONFLICT OF INTEREST

None.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Javad Sadeghinezhad  <https://orcid.org/0000-0003-0735-8788>

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