ORIGINAL ARTICLE

Learner Preference on the Teaching Modalities in Musculoskeletal Anatomy in the New Normal: A Cross-sectional Study Comparing Dissection Educational Videos and Self-directed Manual to Proctor-assisted Cadaver Dissection

Donnel Alexis T. Rubio, MD,[1,2] Jose V. Tecson, III, MD, DHPEd,[1,3]
Rafael C. Bundoc, MD[1,2] and Christopher S. Constantino, MD[1,4]

[1]*Department of Anatomy, College of Medicine, University of the Philippines Manila*
[2]*Department of Orthopedics, College of Medicine and Philippine General Hospital, University of the Philippines Manila*
[3]*Department of Ophthalmology and Visual Sciences, College of Medicine and Philippine General Hospital, University of the Philippines Manila*
[4]*Department of Rehabilitation Medicine, College of Medicine and Philippine General Hospital, University of the Philippines Manila*

ABSTRACT

Background. The COVID-19 pandemic affected all medical education because of the suspension of face-to-face learning and stringent protocols. Various methods of teaching were introduced to augment anatomical learning.

Objective. As we enter the transition period and loosening of protocols for face-to-face learning, we want to know if these modes of teaching are still preferred and suitable or the traditional proctor-assisted dissection is preferable among first year medical students.

Methods. This descriptive cross-sectional study recruited first-year medical students currently enrolled at the University of the Philippines College of Medicine during the Department of Anatomy Learning Enhancement Program (LEAP) from June 13-17, 2022. One station caters to musculoskeletal anatomy. The musculoskeletal station is further divided into four mini stations: a prosected lower extremity cadaver with labels of must know anatomic structures for the proctor-assisted cadaver dissection; a prosected lower extremity with a self-directed manual for the students to follow; a large screen television for the dissection educational videos focusing on the shoulder girdle; and lastly, skeletons for osteology. Thirty minutes were allotted per sub-station in the musculoskeletal station of LEAP. After completing the station, the students were provided with evaluation forms and a 30-item survey to determine the preferred teaching modality in musculoskeletal anatomy.

Results. A total of 145 students out of the 178 students participated and answered the survey and evaluation form. Ninety-nine percent of the students rated the proctor-assisted dissection station great and excellent (13% and 86%, respectively) and that 86% of the students preferred proctor-assisted dissection among the teaching modalities. Additionally, 89% (46% strongly disagreed and 43% disagreed) and 83% (55% strongly disagreed and 28% disagreed) of the students disagreed that they prefer self-directed module or dissection educational videos over traditional dissection, respectively. Most of the students also agreed that the inability of face-to-face dissection will affect their medical education (35% agreed and 64% strongly agreed) and majority of them thinks that cadaver dissection is vital in their medical education and towards becoming a doctor (14% agreed, 86% strongly agreed).

eISSN 2094-9278 (Online)
Published: October 26, 2023
https://doi.org/10.47895/amp.v57i10.7519

Corresponding author: Donnel Alexis T. Rubio, MD
Department of Anatomy
College of Medicine
University of the Philippines Manila
547 Pedro Gil St., Ermita, Manila 1000, Philippines
Email: dtrubio1@up.edu.ph
ORCiD: https://orcid.org/0000-0002-0716-7925

Conclusion. With the plethora of teaching modalities introduced during the pandemic, medical students still preferred the traditional proctor-assisted dissection. However, they see the value of the other teaching modalities as an added armamentarium in enhancing anatomical knowledge.

Keywords: medical education, musculoskeletal anatomy, teaching modalities

INTRODUCTION

The COVID-19 pandemic halted the face-to-face method of teaching in all levels of learning in medical schools including basic sciences such as Anatomy, which traditionally relies heavily on face-to-face methods like dissection and laboratories. Innovative and creative teaching methods were developed to enhance learning with examples being mostly on-line and self-directed learning such as self-directed modules and dissection educational videos. During the pandemic, various learning modalities were introduced and implemented, with variable opinions on their effectivity.[1] Traditional cadaveric dissection, which has been considered the gold standard in teaching Anatomy since the 17th century, forms the foundation of medical education, enabling physicians to develop their clinical skills.[1,2] As we enter the transition period and protocols for face-to-face learning are loosened, we aim to determine the preferred mode(s) of teaching among first year medical students.

METHODS

This was a descriptive cross-sectional study conducted at the University of the Philippines College of Medicine (UPCM) during the Department of Anatomy Learning Enhancement Program from June 13-17, 2022. We recruited first year medical students currently enrolled in the UPCM who attended the program. The study was given an exemption from ethical review by the UPManila Research Ethics Board.

During this activity, 14 stations were prepared wherein prosected cadavers, plastinated cadaver models and organs, anatomic models, bones, histologic specimens for microscopy, and electronic images were organized for the students to rotate and review. Students were divided into 14 groups of 12-13 members and were allotted two hours per station. One station catered to musculoskeletal anatomy. The musculoskeletal station was further divided into four mini stations: a prosected lower extremity cadaver with labels of must know anatomic structure for the proctor-assisted cadaver dissection; a prosected lower extremity with a self-directed manual for the students to follow; a large screen television for the dissection education videos on shoulder dissection and anatomy, and lastly, the skeletons for osteology.

Figure 1. Proctor-assisted dissection sub-station in Musculoskeletal Station during LEAP.

Proctor-assisted Cadaver Dissection

A formalinized cadaver was utilized, and members of the faculty from the Department of Anatomy, who teach musculoskeletal anatomy, prosected the lower extremity. This was done in order to maximize the students' time at the musculoskeletal station, as the LEAP activity was time-bound. Essential anatomical structures were identified and labeled by the faculty-in-charge (DAR). Students examined the prosected lower extremity, attempting to identify as many structures as possible during their time in the substation. They were encouraged to manipulate, touch, and dissect the cadaver, as well as ask about any anatomical structures they were unsure of (Figure 1). A dedicated faculty member was stationed during the activity to guide the students in identifying the anatomical structures, simulating the traditional laboratory sessions from before the pandemic. The role of physical manipulation of prosected specimens may imitate dissection for early learners.[3]

Dissection Educational Videos (DEV)

At this station, the senior co-author (RCB) created high-definition videos focusing on the anatomy of the shoulder girdle, which were divided into four 8-minute segments. These videos were designed to demonstrate the steps of dissection, with essential anatomical structures of the shoulder girdle labeled for clarity. The videos were presented on a large-screen television, allowing students to control the playback (stop, rewind, or fast forward) according to their needs. Following the instructions in the videos, students proceeded to perform dissection on the provided cadaver at their own pace. Importantly, access to the videos was restricted to the duration of their time in the musculoskeletal anatomy station and the videos were not given ahead of time, ensuring all students had an equal starting point for the activity (Figure 2).

Figure 2. Dissection Educational Videos sub-station in Musculoskeletal Station during LEAP.

Figure 3. Self-directed manual sub-station in Musculoskeletal Station during LEAP.

Self-directed Manual (SDM)

A nine-page manual, prepared by one of the co-authors (CSC), was placed beside a prosected lower extremity formalinized cadaver. This cadaver has been prosected by faculty members from the Department of Anatomy that teach musculoskeletal anatomy. The faculty in charge (CSC) identified and labeled important anatomical structures. Similar to the dissection educational videos, the manual was designed to provide instructions on how to dissect and identify essential anatomical structures in the lower extremity. Students followed the steps outlined in the manual while working with the formalinized prosected lower extremity cadaver at their own pace. They were allowed to manipulate, touch, and dissect the cadaver. Access to the manual was limited to their time in the musculoskeletal anatomy station, ensuring a level playing field as it was not distributed in advance (Figure 3).

Thirty minutes were allotted per sub-station in the musculoskeletal station of LEAP and after completing the station, the students were provided with evaluation forms and a 30-item survey to determine the preferred teaching modality in musculoskeletal anatomy. Osteology sub-station was not included in this study.

Data Analysis

The students' attitudes, opinions, and preferences on each teaching modality (dissection educational videos, self-directed manual, and proctor-assisted dissection) were evaluated in a 4-point Likert scale (strongly disagree, disagree, agree, and strongly agree). The students' rating of the quality and content of each teaching modality were evaluated in a 6-point Likert scale (Very bad, bad, okay, good, great, and excellent). The students' perceived value of dissection educational videos and self-directed manual were evaluated by 4-point Likert scale (not necessary when traditional dissection resume, equal to traditional dissection, has advantage over traditional dissection, and open-ended response). Results were presented as frequency and proportions of students' response to each item in the survey. For the open-ended response for perceived value, the most common response was identified. Bar graphs were constructed to visualize the proportion of participants who responded for each Likert scale level.

Data analysis and graph construction was performed using Stata version 17. Missing values were neither replaced nor imputed.

RESULTS

A total of 145 students out of the 178 students participated and answered the survey (Appendix) and evaluation form (Figure 4). Based on the evaluation form, more students generally tend to strongly agree proctor-assisted cadaver dissection compared to dissection education videos and self-directed manual (Figure 5).

When asked to rate the quality and content of the different teaching modalities, generally, more students rated proctor-assisted cadaver dissection with excellent rating than dissection education videos and self-directed manual (items 1 to 6) (Figure 6).

When asked if dissection education videos enhance learning in musculoskeletal anatomy and if dissection education videos has a permanent use in teaching anatomy even after the pandemic, the students tend to agree (items 8 and 9), however, when asked if it can replace face-to-face dissection, if they prefer DEV compared to the other teaching modalities, if by learning anatomy by DEVs alone, will they be confident in facing actual patients, and if DEVs can replace preceptor for dissection, the students tend to disagree (items 10 to 13) (Figure 7).

Similar results were noted when the students were asked regarding self-directed manual with regard to enhancing learning in musculoskeletal anatomy, if self-directed manual has a permanent use in teaching anatomy even after pandemic (item 16), the students tend to agree, however,

EVALUATION FORM FOR OS 203 MUSCULOSKELETAL MODULE

Please complete the activities on the upper extremity and lower extremity modules. Please rate your agreement with the following statements: 1 (strongly disagree), 2 (disagree), 3 (agree), 4 (strongly agree)

Student no: _____ Sex at birth: ___M ___F Premed course: _____

Previous human anatomy course: ____Yes ____No

	Dissection educational videos (Upper Extremity)	Faculty Assisted dissection (Lower Extremity)	Self-directed dissection manual (Lower extremity)
1. Instructions are easy to understand and follow	1 2 3 4	1 2 3 4	1 2 3 4
2. Sustains my interest and attention	1 2 3 4	1 2 3 4	1 2 3 4
3. Knowledge on topic is reinforced and retained	1 2 3 4	1 2 3 4	1 2 3 4
4. Contributed to an enjoyable and pleasant learning experience	1 2 3 4	1 2 3 4	1 2 3 4
5. I will recommend these to other medical and paramedical students	1 2 3 4	1 2 3 4	1 2 3 4

Figure 4. Evaluation form for Musculoskeletal Station.

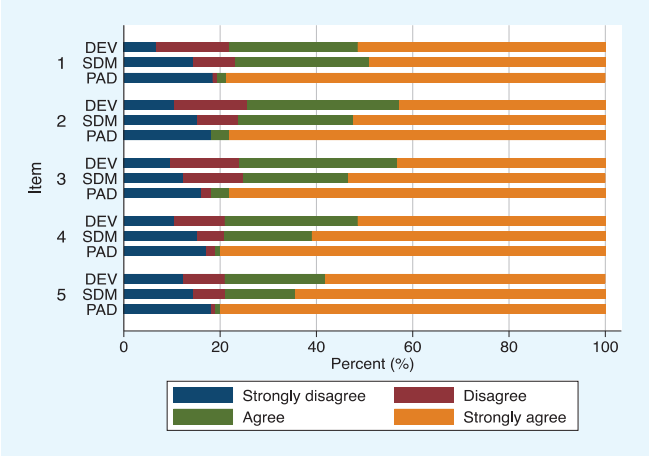

Figure 5. Students' evaluation of the different modes of teaching for the Musculoskeletal Module.

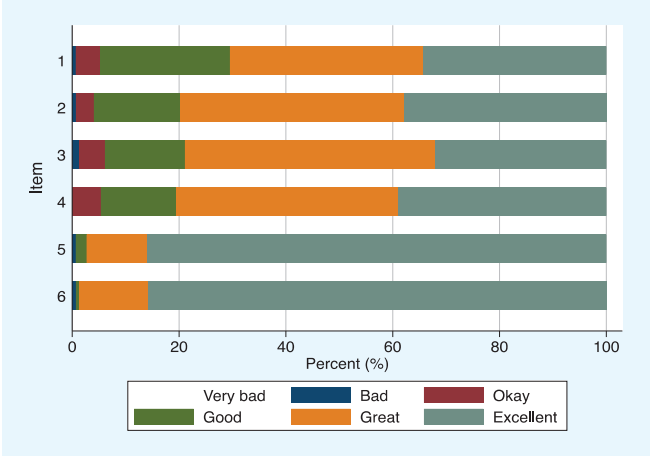

Figure 6. Students' ratings of the quality and content of Dissection educational videos (items 1 and 2 survey form), Self-directed manual (items 3 and 4 survey form), and Proctor-assisted cadaver dissection (items 5 and 6 survey form).

when asked if it can replace face-to-face dissection, if they prefer SDM compared to the other teaching modalities, if by learning anatomy by SDM alone, will they be confident in facing actual patients, and if SDM can replace preceptor for dissection (items 17 to 20), the students tend to disagree (Figure 8).

Most students agreed that proctor-assisted cadaver dissection enhances learning musculoskeletal anatomy and has a permanent use in teaching anatomy even after the pandemic (items 21 and 22). Most of them also preferred proctor-assisted cadaver dissection over the other teaching modalities (item 23). When asked if by learning anatomy by proctor-assisted dissection alone, will they be confident in facing actual patients, if inability to perform face-to-face dissection affect medical education, if cadaver dissection is vital in medical education, and if dissection is relevant in the journey towards becoming a doctor, most of the students answered in agreement (items 24 to 27) (Figure 9).

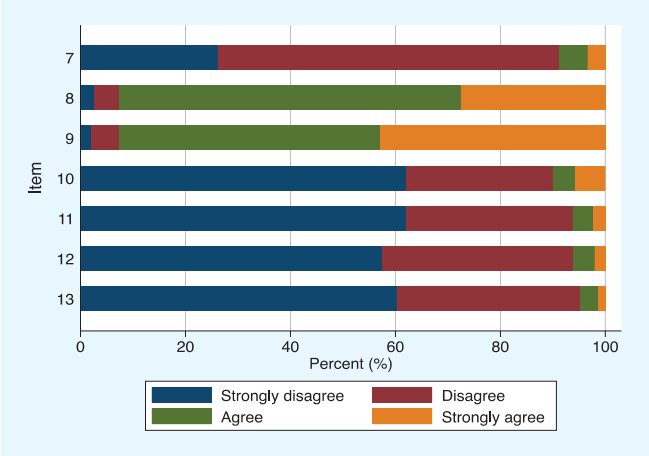

Figure 7. Students' opinion regarding benefit of dissection education videos on musculoskeletal anatomy (items 7-13 survey form).

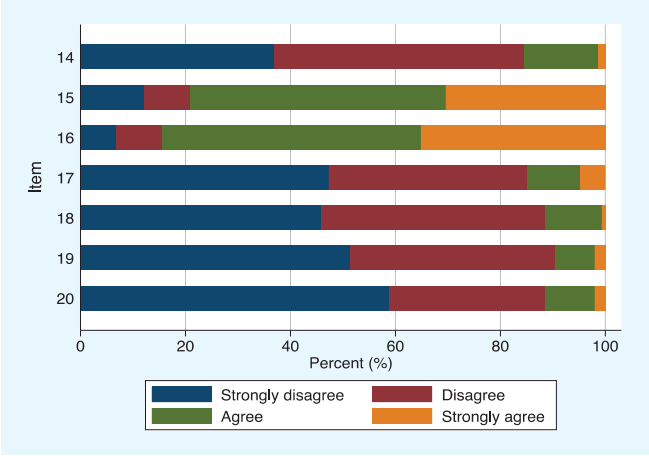

Figure 8. Students' opinion regarding Self-directed manual (items 14-20 survey form).

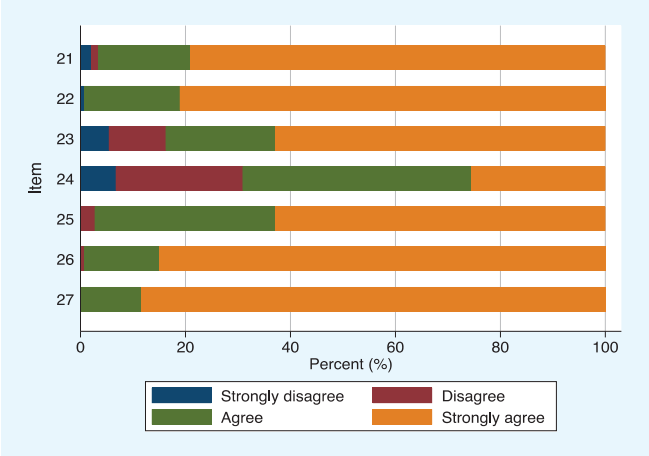

Figure 9. Students' opinion regarding proctor-assisted cadaver dissection (items 21-27 survey form).

Finally, when asked about their opinion if DEV and SDM was not necessary anymore once face-to-face dissection resumes (items 28 and 29), most students disagreed. It seems to be more students perceived DEV and SDM to be of equal or has advantage over traditional dissection than those who said they were not necessary when traditional dissection resumes. However, there were more students who have other opinions regarding DEV and SDM than the given choices of responses. Most of these other opinions said that DEV and SDM were supplementary to traditional dissection.

DISCUSSION

The aim of the study was to determine the preference for teaching modalities in musculoskeletal anatomy among first year medical students. The current study revealed that most of the respondents preferred proctor-assisted cadaver dissection compared to self-directed manual and dissection educational videos. Additionally, the majority of the respondents believed that cadaver dissection is vital in their medical education and essential for becoming a doctor. The study also underscored the importance of self-directed manual and dissection educational videos as adjuncts in learning musculoskeletal anatomy, emphasizing that they are not replacements.

The pandemic opened the plethora of teaching modalities for anatomy because of the restriction imposed on face-to face-activities. Of these, DEV, SDM during the LEAP and other on-line teaching methods were used to augment learning during the pandemic specially during the times when protocols were relaxing. The utilization of technology in teaching anatomy has become increasingly popular because it allows students to learn more interactively.[1] Technologies could also offer alternative teaching modalities to cadaveric dissection if social distancing continues to be mandatory.[4]

Some studies regarding learning from dissection videos revealed that anatomy exam scores are generally no better than historic controls.[5] In most cases, students lean towards video learning and state that it enhances their learning satisfaction. Natsis and colleagues[6] showed that most of their students supported the addition of dissection videos in lecture contents, however they did not indicate if it can stand alone as a teaching modality. There was also no analysis done on the effectiveness on exam performance on their study. Langfield and colleagues[7] indicated the auxiliary role of videos in educational process and they also showed that anatomy videos alone do not enhance student's learning outcomes because they comprise of passive learning. They further stated that videos should be used as active learning tools. In a study of Mustafa and collegues,[8] 60% of the students enjoyed learning anatomy by watching dissection videos, however, only 35% of overall students believed that dissection videos could provide sufficient anatomical knowledge to completely replace traditional lectures. This was also reflected in our study wherein 95% [97/145 (67%) agreed and 41/145 (28%) strongly agreed] of students agreed that watching DEV

enhances learning in musculoskeletal anatomy. However, 87% disagreed [87/145 (60%) strongly disagreed and 39/145 (27%) disagreed] that DEV can replace cadaver dissection. Vast majority of the students agreed that DEVs should be included in the musculoskeletal module but as an augment and not as a replacement to dissection.

There is a notable increase in the use of self-teaching resources in anatomy during the pandemic.[6] These teaching methods provide students of omni-learning (capacity to learn anytime, at your own pace, anywhere).[9] Sabnis[10] concluded that self-directed learning enhances active learning and is useful for students to understand the topic and remember concepts for long time. In the present study, as with the DEVs, students see the value of SDM as an adjunct in learning musculoskeletal anatomy and agreed of its use post-pandemic.

In the current study, the collected data revealed that 99% of students rated the content of the proctor-assisted cadaver dissection station great and excellent [19/145 (13%) and 126/145 (86%), respectively] and that 86% (124/145) of the students preferred proctor-assisted cadaver dissection among the teaching modalities. Additionally, 89% (46% strongly disagreed and 43% disagreed) and 83% [80/145 (55%) strongly disagreed and 41/145 (28%) disagreed] of the students disagreed that they prefer self-directed module or dissection educational videos over traditional dissection, respectively. Most of the students also agreed that the inability of face-to-face dissection will affect their medical education [51/145 (35%) agreed and 93/145 (64%) strongly agreed] and majority of them thinks that cadaver dissection is vital in their medical education and towards becoming a doctor [21/145 (14%) agreed, 125/145 (86%) strongly agreed]. Some of the students wrote in the comment section that "I prefer proctor-assisted cadaver dissection because I learn better when I do actual thing." Another student wrote, "Combining all modes is best, I like the picture style of the self-directed module, the guidance of a professor when we got lost in the proctor-assisted dissection and dissection education videos are good for reviewing."

Cadaveric dissection is an integral part of anatomy education in South East Asian countries.[11] In the US and Canada, medical students are required to participate in cadaveric dissection in 97% of medical schools.[12] Students also recognize the advantage of having dissection and indicate a strong preference to join in cadaveric dissection during anatomy education.[13] A study by Lackey-Cornelison and colleagues[14] compared the effectiveness of learning via dissection or prosection and found no difference. There are a lot of benefit from participating in cadaveric dissection, not just from academic standpoint, but also socially and emotionally. In one medical school in the U.S., medical students treat their cadaver as teacher rather than a patient, which promotes respect and empathy towards cadaver and future patients. Highlighting such humanitarian and ethical values among medical students can promote responsibility and enhance quality of patient care.[15,16] There are other advantages to doing cadaver dissection. First, it helps students understand three-dimensional relationships among anatomical structures and reinforces the contents of textbooks and lectures.[1,17,18] Second, it offers an appreciation for human variability and the uniqueness of individual patterns. Many anatomical variations are significant enough to be of medical importance, anatomical interest, or both. Third, it provides an opportunity to acquire manual dexterity and skills. Fourth, it offers training for purposeful movement and hand-eye coordination. Fifth, small dissection groups encourage teamwork and communication among members. Lastly, dissection offers students the chance to confront the issues of death, dying, and bereavement early in their medical careers.[18]

These advantages were exemplified by the study of Dennis and Creamer, wherein they evaluated learner outcomes of hands-on versus visual examination of prosected cadavers. Students who "manipulate" performed better on laboratory assessments compared those who "did not manipulate." Analysis of the data showed that students who "did not manipulate" are 7.24 times more likely to have with draw grades (DFW grades) which emphasized that students are better trained for laboratory assessments when encouraged to manipulate structures. The role of physical manipulation in enhancing students' learning can be indirectly linked to spatial ability.[3] Anatomic knowledge translates to clinical practice. In a study by Arraez-Aybar and colleagues, they highlighted that anatomical knowledge was considered "fundamental" or "very relevant" for daily clinical activity such as symptom evaluation and physical examination, imaging techniques interpretation or therapeutic procedures, by medical students and by different specialists.[19] This was also reflected in a commentary by Byers and Baumeister wherein anatomy is used by majority of clinicians as they interact with patients through landmarking and surveying for disease. Proper identification of structures is vital for sufficient sensitivity and specificity in physical examination. In-office procedures such as injections and excisions, anatomic knowledge does not remain in the realm of the surgeon.[20]

Limitations of the Study

A potential source of bias in the study was the sequence of exposure. Due to the time-bound nature of the enhancement program, students were introduced to one teaching modality before transitioning to another. This sequence could influence their responses in the survey. Another limitation arises from the focus of dissection educational videos on a different anatomical region, specifically the shoulder girdle, compared to the proctor-assisted cadaver dissection and self-directed manual which covered the lower extremity. This discrepancy in anatomical coverage may impact meaningful comparison of learners' responses, as the difficulty level varies across anatomical regions. Additionally, the study incorporated qualitative data set, it is recommended to employ inductive thematic analysis. This approach may yield fresh insights

and identify additional concerns regarding preferences for musculoskeletal teaching modalities, which future studies should consider.

CONCLUSION

The pandemic provided us with opportunities to use different modalities in teaching musculoskeletal anatomy. With the loosening of COVID-19 protocols, students preferred a proctor-assisted cadaver dissection compared to self-directed module and dissection educational videos. However, all is not lost, because students think that self-directed module and dissection educational videos have still role in teaching musculoskeletal anatomy as an augment for learning post-pandemic.

Recommendations

As there are different medical curricula in the Philippines (Traditional, Module-based, and Problem-based learning)[21], it is recommended to conduct similar studies across different curricula to ensure the results can be generalized in various medical schools.

Acknowledgments

We would like to acknowledge and thank the staff of the Department of Anatomy (Kelly, Racel, Jhun Juhun, and Nelson) for their assistance in preparing the cadavers used in this study. Additionally, we extend our gratitude to Dr. Emilio Villanueva III for his invaluable help with the statistical analysis of our study. Finally, we are thankful to the UPCM class of 2026 for their participation in this research.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

This study was funded by the Department of Anatomy, College of Medicine, University of the Philippines Manila.

REFERENCES

1. Iwanaga J, Loukas M, Dumont AS, Tubbs RS. A review of anatomy education during and after COVID-19 pandemic: Revisiting traditional and modern methods to achieve future innovation. Clin Anat. 2021 Jan;34(1):108-14. doi: 10.1002/ca.23655. PMID: 32681805; PMCID: PMC7404762,
2. Hildebrandt S. Lessons to be learned from the history of anatomical teaching in the UnitedStates: the example of the University of Michigan. Anat Sci Educ. 2010 Jul-Aug;3(4):202-12. doi: 10.1002/ase.166. PMID: 20648596.
3. Dennis JF, Creamer BA. To touch or not to touch: Evaluating student laboratory outcomes of hand-on versus visual examination of prosected cadavers. Educ Sci. 2022;12(8):519. doi: 10.3390/educsci12080519.
4. Longhurst GJ, Stone DM, Dulohery K, Scully D, Campbell T, Smith CF. Strength, weakness, opportunity, threat (SWOT) analysis of the adaptations to anatomical education in the United Kingdom and Republic of Ireland in response to the COVID-19 pandemic. Anat Sci Educ. 2020 May;13(3):301-11. doi: 10.1002/ase.1967. PMID: 32306550; PMCID: PMC7264742.
5. Granger NA, Calleson D. The impact of alternating dissection on student performance in a medical anatomy course: Are dissection videos an effective substitute for actual dissection? Clin Anat. 2007 Apr;20(3):315-21. doi: 10.1002/ca.20359. PMID: 16795027.
6. Natsis K, Lazaridis N, Kostares M, Anastasopoulos N, Chytas D, Totlis T, et al. Dissection Educational Videos (DEVs) and their contribution in anatomy education: a student's perspective. Surg Radiol Anat. 2022 Jan;(1):33-40. doi: 10.1007/s00276-021-02829-z. PMID: 34510249; PMCID: PMC8435165.
7. Langfield T, Colthorpe K, Ainscough L. Online instructional anatomy videos: student usage, self-efficacy and performance in upper limb regional anatomy assessment. Anat Sci Educ. 2018 Sep;11(5):461-70. doi: 10.1002/ase.1756. PMID: 29205947.
8. Mustafa AG, Taha NR, Zaqout S, Ahmed MS. Teaching Musculoskeletal Module using dissection videos: feedback from medical students. BMC Med Educ. 2021 Dec;21(1):604. doi: 10.1186/s12909-021-03036-5. PMID: 34876111; PMCID: PMC8650229.
9. Pears M, Yiasemidou M, Ismail MA, Veneziano D, Biyani CS. Role of immersive technologies in healthcare education during the COVID-19 epidemic. Scott Med J. 2020 Nov;65(4):112-9. doi: 10.1177/0036933020956317. PMID: 32878575.
10. Sabnis AS. Self-directed learning in anatomy. J Human Anat. 2020;4(1):000148. doi: 10.23880/jhua-16000148.
11. Ghosh SK. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. Anat Sci Educ. 2017 Jun;10(3):286-99. doi: 10.1002/ase.1649. PMID: 27574911.
12. Collins TJ, Given RL, Hulsebosch CE, Miller BT. Status of gross anatomy in the U.S. and Canada: Dilemma for the 21st century. Clin Anat. 1994;7(5):275-96. doi: 10.1002/ca.980070509.
13. Whelan A, Leddy JJ, Ramnanan CJ. Benefits of extracurricular participation in dissection in a prosection-based medical anatomy program. Anat Sci Educ. 2018 May;11(3):294-302. doi: 10.1002/ase.1724. PMID: 28881412.
14. Lackey-Cornelison WL, Bauler LD, Smith J. A comparison of the effectiveness of dissection and prosection on short-term anatomic knowledge retention in a reciprocal peer-teaching program. Adv Physiol Educ. 2020 Jun;44(2):239-46. doi: 10.1152/advan.00031.2020. PMID: 32412383.
15. Halperin EC. Preserving the humanities in medical education. Med Teach. 2010 Jan; 32(1):76-9. doi: 10.3109/01421590903390585. PMID: 20095779.
16. Souza AD, Kotian SR, Pandey AK, Rao P, Kalthur SG. Cadaver as a first teacher: A module to learn the ethics and values of cadaveric dissection. J Taibah Univ Med Sci. 2020 Mar;15(2):94-101. doi: 10.1016/j.jtumed.2020.03.002. PMID: 32368204; PMCID: PMC7184209.
17. McLachlan JC, Bligh J, Bradley P, Searle J. Teaching anatomy without cadavers. Med Educ. 2004 Apr;38(4):418-24. doi: 10.1046/j.1365-2923.2004.01795.x. PMID: 15025643.
18. Moore NA. To dissect or not to dissect? Anat Rec. 1998 Feb;253(1):8-9. doi: 10.1002/(SICI)1097-0185(199802)253:1<8::AID-AR6>3.0.CO;2-Z. PMID: 9556018.
19. Arraez-Aybar LA, Sanchez-Montesinos I, Mirapeix RM, Mompeo-Corredera B, Sañudo-Tejero JR. Relevance of human anatomy in daily clinical practice. Ann Anat. 2010 Dec;192(6):341-8. doi: 10.1016/j.aanat.2010.05.002. PMID: 20591641.
20. Byers N, Baumeister P. Cadaveric anatomical education in the 21st century: preserving medical education. UBCMJ. 2019;10.2:23-24.
21. Traditional vs Module-based vs PBL: Philippine Medical school curriculums explained [Internet]. [cited 2023 Oct]. Available from: https://www.youtube.com/watch?v=GZrXoN1ZZUo

APPENDIX

Survey on the Teaching Modalities in Musculoskeletal Anatomy [Dissection Educational Videos (DEV), Self-Directed Manual (SDM), and Proctor-Assisted Dissection/Traditional Dissection (PAD)]

		Very Bad	Bad	Okay	Good	Great	Excellent
							
1.	How will you rate the quality of Dissection Educational Videos (DEV)?	○	○	○	○	○	○
2.	How will you rate the content of Dissection Educational Videos?	○	○	○	○	○	○
3.	How will you rate the quality of the Self-Directed Manual (SDM)?	○	○	○	○	○	○
4.	How will you rate the content of the Self-Directed Manual?	○	○	○	○	○	○
5.	How will you rate the Proctor-Assisted Dissection (PAD)?	○	○	○	○	○	○
6.	How will you rate the content of the Proctor-Assisted Dissection?	○	○	○	○	○	○

		Strongly disagree	Disagree	Agree	Strongly agree
7.	In your opinion, can DEV stand alone in learning musculoskeletal human anatomy?	○	○	○	○
8.	In your opinion, will DEV enhance your learning in musculoskeletal human anatomy?	○	○	○	○
9.	Do you think that DEV has a permanent use in teaching anatomy even after pandemic?	○	○	○	○
10.	Do you think that DEV can replace face-to-face dissection in teaching musculoskeletal anatomy even after pandemic?	○	○	○	○
11.	Will you prefer DEVs over traditional dissection?	○	○	○	○
12.	Do you think in the future, by just learning from DEV, will you be confident in facing actual patients?	○	○	○	○
13.	Do you think DEV can replace preceptor for your dissection activity?	○	○	○	○
14.	In your opinion, can SDM stand alone in learning musculoskeletal human anatomy?	○	○	○	○
15.	In your opinion, will SDM enhance your learning in musculoskeletal human anatomy?	○	○	○	○
16.	Do you think that SDM has a permanent use in teaching anatomy even after pandemic?	○	○	○	○
17.	Do you think that SDM can replace face-to-face dissection in teaching musculoskeletal anatomy even after pandemic?	○	○	○	○
18.	Will you prefer SDM over traditional dissection?	○	○	○	○
19.	Do you think in the future, by just learning from SDM, will you be confident in facing actual patients?	○	○	○	○
20.	Do you think SDM can replace preceptor for your dissection activity?	○	○	○	○
21.	In your opinion, will PAD enhance your learning in musculoskeletal Human Anatomy?	○	○	○	○
22.	Do you think that PAD has a permanent use in teaching anatomy even after pandemic?	○	○	○	○
23.	Will you prefer PAD/traditional dissection?	○	○	○	○
24.	Do you think in the future, by just learning from PAD, will you be confident in facing actual patients?	○	○	○	○
25.	Do you think inability of face-to-face dissection affect your medical education?	○	○	○	○
26.	Do you think cadaver dissection is vital in your medical education towards becoming a doctor?	○	○	○	○
27.	Do you think dissection is relevant in your journey towards becoming a doctor?	○	○	○	○

28. In your opinion, what is the value of DEV?
    a. DEV is not necessary once traditional dissection resumes
    b. DEV is equal to traditional dissection
    c. DEV has advantage compared to traditional dissection
    d. Others _____
29. In your opinion, what is the value of SDM?
    a. SDM is not necessary once traditional dissection resumes
    b. SDM is equal to traditional dissection
    c. SDM has advantage compared to traditional dissection
    d. Others _____
30. Comments: _____