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Balancing Tradition and Innovation: Rethinking the Dichotomy in Anatomy Teaching

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Keywords:
anatomy teaching, cadaver dissection, COVID-19, digital technology, holistic learning, medical education, professionalism, teaching traditions

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This review critically examines the dichotomy between traditional and innovative teaching methods in anatomy education, questioning the assumption that traditional methods hinder progress in modern healthcare. The findings suggest that changes in medical education are primarily influenced by organizational issues, which frequently result in incomplete or insufficient adoption of new teaching approaches. This inconsistency in both application and definition makes it difficult to compare and assess their effectiveness, highlighting the necessity for randomized controlled trials and longitudinal studies in this field.

Rather than discarding traditional approaches, integrating them with technological tools and emerging pedagogical approaches may offer a balanced, effective framework for developing future doctors' technical skills and humanistic qualities.

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Introduction

Over the past century, changes in health policy priorities, and an increased need for healthcare professionals, along with unprecedented technological innovation and emerging research in biomedical and education sciences, has led to the constant evolution of medical education (Densen, 2011; Thoma et al., 2023). As enhancing the quality of medical education has always been of key importance, the transformative changes in recent decades have raised questions about the impact of innovations in teaching methods and curriculum reforms on the professional development of future doctors. Are there elements of traditional anatomy teaching that are essential and cannot be eliminated without significant loss of quality or prestige?

Innitiated through the LEANBODY project (*LEAN in Medical Education*, 2021), this review aimed to explore these issues through the perspective of anatomy — a fundamental component of medical curricula globally and a subject that has been significantly influenced by changes in course structure and teaching methods (Jalali et al., 2020). We started by examining the underlying causes of these changes, which should ideally be guided by research evidence and tailored to meet specific societal needs. The World Federation for Medical Education (WFME) recognizes that social factors often shape medical education more than the results arising from research. To address this, its global standards for quality improvement encompass broad areas such as student support and curriculum development but without mandating specific methods, thus allowing institutions to adapt the guidelines to their unique cultures, resources, and goals (*World Federation for Medical Education | Enhancing Quality Worldwide*, 2017). However, increasing organizational challenges often prompt changes that can compromise educational quality. For example, factors such as the shortening of courses (Samarakoon et al., 2016), increasing student enrolment (Abualadas & Xu, 2023), the lack of qualified anatomists, decreased funding and limited access to cadavers (McMenamin et al., 2014) have all contributed to the declining role of traditional cadaveric dissection in many anatomy programs. A meta-analysis found that student performance on knowledge-based exams was comparable, regardless of whether students had engaged in cadaveric dissection or learnt anatomy through alternative methods such as prosection, digital media, models, or hybrid approaches (Wilson et al., 2018). However, while building a strong foundation of basic knowledge is essential in preparing students for clinical practice, the ultimate goal of medical education extends beyond short-term knowledge retention and academic performance. It is the development of competency across various professional domains that truly defines their readiness for the demands of their future careers in medicine. In this context, some researchers have raised concerns about the potential loss of unique benefits associated with cadaveric dissection, especially the "hidden curriculum" that fosters non-technical skills such as professionalism, empathy, and ethical awareness (Wu et al., 2022).

Therefore, one of the specific aims of this review was to critically evaluate the perspective that traditional didactic methods in medical education, particularly in anatomy teaching, are ineffective and hinder progress in meeting the challenges of global healthcare in the 21st century (Majumder et al., 2023). This viewpoint argues that traditional methods should be replaced by innovative educational approaches to better prepare students for the complexities of modern medical practice. Through this review, we aimed to assess whether these claims are substantiated by evidence and to explore whether a balance between traditional and innovative methods might provide the most effective framework for medical education.

The Long History of Anatomy: What is Traditional Anatomy Teaching?

As evident from the etymology of the word "anatomy," which is derived from the Greek, *anatome* meaning "to cut" or "to cut repeatedly" (Malomo et al., 2006), dissection has been an integral part of anatomy teaching throughout history. Dissection typically followed theoretical instruction, offering students a hands-on, immersive experience where they could observe the organization of the human body and appreciate the texture of tissues (Dissabandara et al., 2015). This method also allowed students to understand the relationships between anatomical structures, recognize anatomical variations, and develop the necessary technical skills that are essential for their future professional practice (Ghazanfar et al., 2018).

A "traditional" anatomy course is typically described as being delivered through in-person lectures, studying from anatomy textbooks, and performing hands-on cadaveric dissection in the laboratory (Abualadas & Xu, 2023). All these combine to enable medical students to achieve their learning objectives by gaining a detailed and comprehensive understanding of the structure of the human body (Suárez-Escudero et al., 2020)

Traditional lectures help students to develop a theoretical foundation for understanding anatomy, and offer the context for what they will observe in cadaveric dissection. These lectures primarily focus on transmitting knowledge from the lecturer to the students (Bell et al., 2019), where the lecturer describes anatomical structures as well as explaining their functional and clinical significance (Turney, 2007).

Therefore, traditional teaching is often associated with passive learning, whereas modern curricula are increasingly moving toward active learning and teaching strategies that focus on student-driven knowledge construction, such as flipped classrooms, problem-based learning and team-based learning (Singh et al., 2019).

Moreover, traditional, topic-based curricula primarily focus on delineating the content that educators are expected to teach, whereas constructive alignment has now become a crucial aspect of quality assessment. This approach, as a form of outcomes-based teaching and learning, ensures that both instructional strategies and assessments are connected to the intended learning outcomes, which specify what students are expected to do with the knowledge they acquire (Biggs & Tang, 2015).

However, when assessing the effectiveness of traditional methods in anatomy education, it is important to consider the historical and contextual factors surrounding their use and development . Before the mid-20th century, access to educational resources such as textbooks and anatomical atlases was quite limited. As a result, lectures became the main source of anatomical knowledge for students, while prosections and cadavers were the primary tools for visualizing three-dimensional structures. The lack of technological resources required students to adopt a more proactive and self-directed approach to learning, encouraging a strong sense of initiative. Since atlases were not readily available, students often collaborated in small groups, which facilitated teamwork and peer learning. In many medical schools, practical work was assessed periodically throughout the term, providing students with ongoing feedback on their understanding and highlighting areas needing improvement. Passing these assessments was often a requirement for continuing with dissection.

Over time, the hands-on approach evolved to include a broader range of active learning methods, such as peer learning and reflective discussions. With increased availability of practical materials and reducing lecture time, these strategies encouraged students to engage directly with the material and

learn from each other, often in small groups, effectively blurring the lines between traditional and modern educational practices. (Hildebrandt, 2010). Therefore, concepts such as peer-teaching and active learning are not recent innovations; they have origins in the 19th century and have been further enriched by technological advancements in anatomical education (Sugand et al., 2010). Interestingly, recent research indicates that traditional lectures are adaptable and can be effectively integrated into a student-centred unit design that is both research-informed and evidence-based. This suggests that creating a dichotomy between traditional lectures and active learning is misguided, as it hinders a nuanced exploration of the full range of possibilities and generates bias in research agendas (Dietrich et al., 2022).

This division risks creating an either-or scenario that overlooks the strengths of different approaches. For instance, cadaveric dissection, a hallmark of traditional anatomy education, is often reduced to merely a method of teaching detailed structural knowledge. However, this focus on the cognitive domain seriously overlooks its broader educational value, such as fostering professionalism, empathy, and ethical awareness in the affective domain. By framing the debate as traditional versus modern, we risk losing valuable pedagogical tools from the traditional model that contribute to the holistic development of medical students.

Technological Advances in Anatomy Education: Lessons Learned from the COVID-19 Pandemic

Increasing technological advances have led to the introduction of numerous digital tools such as virtual cadaveric dissection, online 3D models and videos into anatomy classrooms (Abualadas & Xu, 2023), offering alternatives to traditional face-to-face teaching methods.

However, while such digital tools provide new ways for students to engage with the material, they also bring challenges, in particular cognitive overload. This occurs when the learning environment presents more information than the brain can effectively process and retain at the same time. Anatomy is inherently complex, requiring students to integrate their knowledge of systems, structures, and clinical relevance. When advanced technology is not managed appropriately, it can overwhelm students and exceed their cognitive limits, especially when they are trying to learn basic anatomy and simultaneously navigating a new tools interface (Touliopoulos et al., 2022). There is also the risk of passive learning behaviours, such as rewatching video lectures or merely browsing through slides without actively engaging with the content.

In addition, many novel digital tools do not allow or encourage students to work in a team. Most virtual reality (VR) modalities are only designed for a single user, which contrasts starkly with situations arising in a healthcare setting. As good teamwork is a key factor in the success of healthcare management. The use of modalities such as virtual worlds to create scenarios that require teamwork and communication should be more widely explored (Jiang et al., 2022).

Reported negative feedback from online learners, such as screen fatigue and isolation, highlight the importance of addressing these challenges with targeted interventions and strategies to improve the quality and effectiveness of online education (Abualadas & Xu, 2023; Rahmani et al., 2024). As the logistics of organizing cadaveric dissection remain a significant challenge, emerging digital tools for 3D visualization of the human body offer promising alternatives for learning anatomical structures and developing manual skills (Adnan & Xiao, 2023). Although the COVID-19 pandemic posed major challenges for educational organization in recent years, it also provided an opportunity to assess and compare online with in-person classes.

The recency of the pandemic has meant that currently available research in this area is mostly supported with evidence from students' academic performance and satisfaction rates, while longitudinal data on the long-term effects of different teaching models on learning outcomes are still lacking. Nonetheless, important implications for the future can be drawn from the recent literature.

The systematic review compared the educational effectiveness of online anatomy teaching and traditional (“face-to-face”) teaching methods, showing comparable academic performance with no statistical difference between the two teaching methods. However, students reported a higher level of satisfaction with face-to-face teaching (Abualadas & Xu, 2023).

The finding that a multi-modal learning approach that combines online with face-to-face educational modalities for medical students could be efficient and successful (Abualadas & Xu, 2023; Papa et al., 2022) is especially interesting with regard to the logistical challenges of course organization for a large number of students and the future of hybrid courses (Banovac et al., 2023). Nevertheless, the vast majority of undergraduate students found anatomical dissection and practical work in general to be the most important aspect of teaching, which, in their opinion, could not be replaced by online learning (Banovac et al., 2021). Interestingly, current research redirects the debate from cadaveric dissection as one of the anatomy teaching tools to its importance in developing professionalism of future doctors. While this had been recognized in previous educational research, it was extensively

revisited during the COVID-19 pandemic, as many medical schools that had used in-person cadaveric dissection were forced to abandon it. Direct involvement with dissection during undergraduate training, besides learning anatomical knowledge , also provides students with an opportunity to practice and refine non-technical skills, such as communication and collaboration, while simultaneously promoting the development and formation of their professional identity (Brassett et al., 2021; MacPherson & Lisk, 2022).

Courses that are well-designed and balance technological tools with traditional practices can provide a comprehensive framework for anatomy education, fostering both technical skills and essential humanistic qualities in medical students. The gradual, progressive introduction of technology alongside hands-on learning and collaborative experiences can maintain student engagement and reinforce learning without causing cognitive overload. As most schools have transitioned from a purely traditional cadaver-based curriculum to adopting more interactive, custom-made approaches that better suit the learning strategies of new generations, more specific research is required into the best ways of integrating digital tools into the anatomy course.

Emerging Pedagogies in Anatomy Education: The Roles of Students and Teachers

With the rapid expansion of medical knowledge, a debate has arisen regarding the extent to which anatomy should be taught , emphasizing a clinical anatomy model that focuses on students as future healthcare professionals rather than anatomists (Suárez-Escudero et al., 2020).

In a time of heightened accountability in the education profession, teachers are responsible for ensuring that all graduates are fully prepared for practice. Consequently, competency-based medical education (CBME) has become a key focus for medical education planners, outlining essential competencies for graduates and ensuring these are taught, assessed, and acquired (Frank et al., 2010).

CBME advocates favour a curriculum organized around competencies rather than extensive lists of knowledge objectives. They argue that objective-based methods often overemphasize knowledge, neglecting skills, attitudes, and the integration of knowledge necessary for medical practice (Frank et al., 2010). As a result, many schools are shortening the length of their anatomy courses, with some institutions adopting more integrated curricula and moving away from standalone anatomy courses (Husmann, Gibson, & Davis, 2020). The shortage of qualified educators in pre-clinical disciplines has also influenced the transition toward integrated curricula, as clinicians are often recruited to teach these subjects on medical courses.

While Competency-Based Medical Education (CBME) was introduced as an effective response to the organizational challenges and demands of contemporary medical education, its inherently practical focus may lead to the exclusion of content or experiences that do not directly contribute to program outcomes. This approach risks reductionism, potentially causing learners to concentrate more on achieving milestones rather than pursuing excellence (Frank et al., 2010). Nonetheless, frameworks such as the CanMEDS Physician Competency Framework aim to align physician competencies with societal needs, defining exceptionally high standards for physician competencies, which include being a medical expert, communicator, collaborator, health advocate, lifelong learner, manager, scholar (Thoma et al., 2023).

The traditional placement of gross anatomy education at the start of medical training, which provides a foundation for clinical practice (Turney, 2007), raises questions about the optimal timing for delivering anatomy courses in the context of CBME. Cognitive neuroscience shows that adolescence is a period of significant brain development, with many functions maturing into the mid-20s, aligning with the typical age of students entering higher education (Petanjek et al., 2011). This suggests that early exposure to anatomy may still be relevant, despite the shift toward integrated curricula. Therefore, while CBME emphasizes practical outcomes and societal needs, maintaining foundational subjects like anatomy early in medical education could support comprehensive development and ensure that learners are well-prepared for clinical practice.

Historical figures in anatomy education, such as Franklin Paine Mall and Drago Perović, emphasized the significance of anatomical institutes and early exposure to the scientific method (Dolinar, 1969; Hildebrandt, 2010). They also highlighted the importance of interpersonal relationships between students and teachers in forming professional attitudes (Martin et al., 2002). This supports the idea that traditional anatomy education in the first year of medical training can benefit students by introducing them to the scientific and professional aspects of medicine during a critical period of cognitive maturation.

However, adapting educational approaches to meet the needs of Generation Z students, who have grown up in a technology-driven world, is essential (Romero Reveron, 2020). Generation Z's unique expectations and learning styles align well with student-centred pedagogies. While emerging methods like flipped classrooms and problem-based learning (PBL) have certain advantages, randomized controlled trials are required to validate their effectiveness. Variability in PBL implementation and students' learning habits complicate the evaluation of this method (Zheng et al., 2023). Similarly, high heterogeneity in flipped classroom formats with varied instructor implementations presents limitations in the research. In addition, addressing publication bias is crucial for obtaining reliable results (Cui et al., 2023). The hidden curriculum, although not well-defined, plays a crucial role in medical education by promoting professional development in areas such as ethical mindsets and social skills. However, the problem of the hidden curriculum has not been solved by the transition from a teacher-centred education to a student-centred educational model that takes the student's experience as the starting point of learning. On the contrary, some authors propose that the hidden curriculum can be made explicit in higher education when the teacher recognizes and lives out their teaching; and that the student's experience of the learning process is not merely an individual one, but emerges through their interpersonal relationship with the teacher (Orón Semper & Blasco, 2018).

Therefore, educators must understand cognitive development and adapt their pedagogical methods in order to address the needs of the current generation of students. Nonetheless, the traditional role of teachers remains important, as role modelling plays a significant role in developing medical students' professional identities and sense of belonging (Spaans et al., 2023). Strategically integrating anatomy education within medical curricula is essential for supporting both foundational knowledge and the development of professional competencies. When planning an anatomy course that includes dissection as a learning tool, it is important for educators to recognize that the learning experience is not uniform and that participants may require diverse learning tools (Winkelmann, 2007).

Conclusion

The findings elaborated in this manuscript demonstrate a consistent aim throughout the history of medical education to improve the quality of anatomy teaching by evolving pedagogical techniques and addressing organizational challenges and societal needs. We conclude that it is challenging to distinguish between traditional and modern methods of teaching anatomy. Therefore, the shift towards modern methods should be seen as part of a continuum to improve teaching strategies, rather than a stark division between traditional and modern approaches.

Although research in this field is evolving, new generations of medical students continue to require the best possible education during their formative years. In our view, traditional didactic methods are still capable of addressing the challenges of the healthcare system in the 21st century. The maintenance of traditional detail-oriented anatomy teaching through cadaveric dissection adds value to medical education as it fosters personal and professional growth in future doctors by immersing them in a learning environment that promotes both technical expertise and humanistic qualities. Instead of abandoning traditional methods, integrating them with technological tools and emerging pedagogical approaches may offer a balanced, effective framework for quality professional development of future doctors.

References

Abualadas, H. M., & Xu, L. (2023). Achievement of learning outcomes in non-traditional (online) versus traditional (face-to-face) anatomy teaching in medical schools: A mixed method systematic review. *Clinical Anatomy (New York, N.Y.)*, *36*(1), 50–76. https://doi.org/10.1002/ca.23942

Adnan, S., & Xiao, J. (2023). A scoping review on the trends of digital anatomy education. *Clinical Anatomy (New York, N.Y.)*, *36*(3), 471–491. https://doi.org/10.1002/ca.23995

Banovac, I., Katavić, V., Blažević, A., Bičanić, I., Hladnik, A., Kovačić, N., & Petanjek, Z. (2021). The anatomy lesson of the SARS-CoV-2 pandemic: Irreplaceable tradition (cadaver work) and new didactics of digital technology. *Croatian Medical Journal*, *62*(2), 173–186. https://doi.org/10.3325/cmj.2021.62.173

Banovac, I., Kovačić, N., Hladnik, A., Blažević, A., Bičanić, I., Petanjek, Z., & Katavić, V. (2023). In the eye of the beholder—How course delivery affects anatomy education. *Annals of Anatomy = Anatomischer Anzeiger: Official Organ of the Anatomische Gesellschaft*, *246*, 152043. https://doi.org/10.1016/j.aanat.2022.152043

Bell, F. E., Neuffer, F. H., Haddad, T. R., Epps, J. C., Kozik, M. E., & Warren, B. C. (2019). Active Learning of the Floor of Mouth Anatomy with Ultrasound. *Anatomical Sciences Education*, *12*(3), 310–316. https://doi.org/10.1002/ase.1839

Biggs, J., & Tang, C. (2015). Constructive Alignment: An Outcomes-Based Approach to Teaching Anatomy. In L. K. Chan & W. Pawlina (Eds.), *Teaching Anatomy: A Practical Guide* (pp. 31–38). Springer International Publishing. https://doi.org/10.1007/978-3-319-08930-0_4

Brassett, C., Chilvers, N., Lloyd, R. G. C., Fletcher, P., Fay, I. H. H., Spear, M., & Taylor, H. L. (2021). *Maintaining cadaveric dissection in the COVID era: New perspectives in anatomy teaching and medical education*. https://doi.org/10.17863/CAM.64932

Densen, P. (2011). Challenges and Opportunities Facing Medical Education. *Transactions of the American Clinical and Climatological Association*, *122*, 48–58.

Dietrich, H., Evans, T., Dietrich, H., & Evans, T. (2022). Traditional lectures versus active learning – A false dichotomy? *STEM Education*, *2*(4), Article 2767-1925_2022_4_275. https://doi.org/10.3934/steme.2022017

Dissabandara, L. O., Nirthanan, S. N., Khoo, T. K., & Tedman, R. (2015). Role of cadaveric dissections in modern medical curricula: A study on student perceptions. *Anatomy & Cell Biology*, *48*(3), 205–212. https://doi.org/10.5115/acb.2015.48.3.205

Dolinar, Z. J. (1969). [In memoriam Prof. Dr. Med. Drago Perović (1888-1968)]. *Acta Anatomica*, *73*(1), 1–3.

Ghazanfar, H., Rashid, S., Hussain, A., Ghazanfar, M., Ghazanfar, A., & Javaid, A. (2018). Cadaveric Dissection a Thing of the Past? The Insight of Consultants, Fellows, and Residents. *Cureus*, *10*(4), e2418. https://doi.org/10.7759/cureus.2418

Hildebrandt, S. (2010). Lessons to be learned from the history of anatomical teaching in the United States: The example of the University of Michigan. *Anatomical Sciences Education*, *3*(4), 202–212. https://doi.org/10.1002/ase.166

Jiang, H., Vimalesvaran, S., Wang, J. K., Lim, K. B., Mogali, S. R., & Car, L. T. (2022). Virtual Reality in Medical Students' Education: Scoping Review. *JMIR Medical Education*, *8*(1), e34860. https://doi.org/10.2196/34860

LEAN in Medical Education: Reaching for Quality Management Tools to Teach Human Anatomy Effectively in a Multicultural and Multilingual Learning Space. (2021).

https://erasmus-plus.ec.europa.eu/projects/search/details/2021-1-HU01-KA220-HED-000027542

MacPherson, E., & Lisk, K. (2022). The value of in-person undergraduate dissection in anatomical education in the time of Covid-19. *Anatomical Sciences Education*, *15*(4), 797–802. https://doi.org/10.1002/ase.2186

Majumder, M. A. A., Haque, M., & Razzaque, M. S. (2023). Editorial: Trends and challenges of medical education in the changing academic and public health environment of the 21st century. *Frontiers in Communication*, *8*. https://doi.org/10.3389/fcomm.2023.1153764

Malomo, A., Idowu, O., & Osuagwu, F. (2006). Lessons from History: Human Anatomy, from the Origin to the Renaissance. *International Journal of Morphology*, *24*. https://doi.org/10.4067/S0717-95022006000100018

Martin, J., Lloyd, M., & Singh, S. (2002). Professional attitudes: Can they be taught and assessed in medical education? *Clinical Medicine (London, England)*, *2*, 217–223. https://doi.org/10.7861/clinmedicine.2-3-217

McMenamin, P. G., Quayle, M. R., McHenry, C. R., & Adams, J. W. (2014). The production of anatomical teaching resources using three-dimensional (3D) printing technology. *Anatomical Sciences Education*, *7*(6), 479–486. https://doi.org/10.1002/ase.1475

Orón Semper, J. V., & Blasco, M. (2018). Revealing the Hidden Curriculum in Higher Education. *Studies in Philosophy and Education*, *37*(5), 481–498. https://doi.org/10.1007/s11217-018-9608-5

Papa, V., Varotto, E., Galli, M., Vaccarezza, M., & Galassi, F. M. (2022). One year of anatomy teaching and learning in the outbreak: Has the Covid-19 pandemic marked the end of

a century-old practice? A systematic review. *Anatomical Sciences Education*, *15*(2), 261–280. https://doi.org/10.1002/ase.2162

Petanjek, Z., Judaš, M., Šimic, G., Rasin, M. R., Uylings, H. B. M., Rakic, P., & Kostovic, I. (2011). Extraordinary neoteny of synaptic spines in the human prefrontal cortex. *Proceedings of the National Academy of Sciences of the United States of America*, *108*(32), 13281–13286. https://doi.org/10.1073/pnas.1105108108

Rahmani, A. M., Groot, W., & Rahmani, H. (2024). Dropout in online higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education*, *21*(1), 19. https://doi.org/10.1186/s41239-024-00450-9

Romero Reveron, R. (2020). Human anatomy in the G=generation Z"s medical studies. *MOJ Anatomy & Physiology*, *7*, 12–13. https://doi.org/10.15406/mojap.2020.07.00281

Samarakoon, L. B., Vithoosan, S., Kokulan, S., Dissanayake, M. M., Anthony, D. J., Dissanayake, V., & Jayasekara, R. (2016). Anatomy of Teaching Anatomy: Do Prosected Cross Sections Improve Students Understanding of Spatial and Radiological Anatomy? *Anatomy Research International*, *2016*, 8984704. https://doi.org/10.1155/2016/8984704

Singh, K., Bharatha, A., Sa, B., Adams, O. P., & Majumder, M. A. A. (2019). Teaching anatomy using an active and engaging learning strategy. *BMC Medical Education*, *19*(1), 149. https://doi.org/10.1186/s12909-019-1590-2

Spaans, I., de Kleijn, R., Seeleman, C., & Dilaver, G. (2023). 'A role model is like a mosaic': Reimagining URiM students' role models in medical school. *BMC Medical Education*, *23*(1), 396. https://doi.org/10.1186/s12909-023-04394-y

Suárez-Escudero, J. C., Posada-Jurado, M. C., Bedoya-Muñoz, L. J., Urbina-Sánchez, A. J., Ferreira-Morales, J. L., & Bohórquez-Gutiérrez, C. A. (2020). Teaching and learning

anatomy. Pedagogical methods, history, the present and tendencies. *Acta Medica Colombiana*, *45*(4), 48–55. https://doi.org/10.36104/amc.2020.1898

Sugand, K., Abrahams, P., & Khurana, A. (2010). The anatomy of anatomy: A review for its modernization. *Anatomical Sciences Education*, *3*(2), 83–93. https://doi.org/10.1002/ase.139

Thoma, B., Abbott, C., & Snell, L. (2023). The future of the CanMEDS physician competency framework. *Canadian Medical Education Journal*, *14*(1), 1–3. https://doi.org/10.36834/cmej.77098

Touliopoulos, E., Ives, R., Chan, S., Lohit, S., Reis, I., Sinha, S., Nehru, A., DeYoung, V., Mitchell, J., Brewer-Deluce, D., Sonnadara, R., & Wainman, B. (2022). The Cognitive Load of Learning Anatomy in a Virtual World. In *The FASEB Journal* (Vol. 36). https://doi.org/10.1096/fasebj.2022.36.S1.R6184

Turney, B. (2007). Anatomy in a Modern Medical Curriculum. *Annals of The Royal College of Surgeons of England*, *89*(2), 104–107. https://doi.org/10.1308/003588407X168244

Wilson, A. B., Miller, C. H., Klein, B. A., Taylor, M. A., Goodwin, M., Boyle, E. K., Brown, K., Hoppe, C., & Lazarus, M. (2018). A meta-analysis of anatomy laboratory pedagogies. *Clinical Anatomy (New York, N.Y.)*, *31*(1), 122–133. https://doi.org/10.1002/ca.22934

Winkelmann, A. (2007). Anatomical dissection as a teaching method in medical school: A review of the evidence. *Medical Education*, *41*(1), 15–22. https://doi.org/10.1111/j.1365-2929.2006.02625.x

World Federation for Medical Education | Enhancing Quality Worldwide. (2017, February 21). https://wfme.org/

Wu, A., Xiao, Q. Y., McWatt, S., Utomo, R., Talis, A., Saraci, K., Brassett, C., Sagoo, M. G., Wingate, R., Chien, C.-L., Traxler, H., Waschke, J., Vielmuth, F., Yamada, Y., Sakurai, T.,

Zeroual, M., Olsen, J., El-Batti, S., Viranta-Kovanen, S., … Noël, G. P. J. C. (2022). The Anatomy Course During COVID-19: The Impact of Cadaver-Based Learning on the Initiation of Reflection on Death. *Medical Science Educator*, *32*(5), 1033–1044. https://doi.org/10.1007/s40670-022-01609-7

Zheng, Q.-M., Li, Y.-Y., Yin, Q., Zhang, N., Wang, Y.-P., Li, G.-X., & Sun, Z.-G. (2023). The effectiveness of problem-based learning compared with lecture-based learning in surgical education: A systematic review and meta-analysis. *BMC Medical Education*, *23*(1), 546. https://doi.org/10.1186/s12909-023-04531-7