IJMS INTERNATIONAL JOURNAL of MEDICAL STUDENTS

Original Article

Sculpting the Science: Teaching Anatomy of the Facial Muscles to Medical Students

Toni Chiappini,[1] Janine C. Correia,[2] Adam M. Taylor,[3] Jan van der Merwe,[1] Quenton Wessels.[1]

Abstract

Background: Clay-modeling in anatomy education is an engaging activity that complements cadaveric dissections. The post-COVID-19 cadaver shortage further necessitates alternative practical modalities. **Methods:** A student-centred clay-modeling practical activity was developed towards the study of the muscles of facial expression due to a shortage of cadaveric material. Student feedback in the form of a questionnaire with closed- and open-ended questions. **Results:** Thematic analysis was manually performed to generate the primary and secondary themes associated with the open-ended questions. Four themes were generated: fun, collaboration, active learning, and bittersweet. Closed-ended questions revealed that respondents found the activity motivational and enjoyable. Feeling around the disassembly of students' anatomical models was of particular interest. Some students expressed emotions of sadness and others stated that they felt devastated. **Conclusion:** The outcome of this study presents the opportunity for further work to link discussions around the humanistic considerations of anatomy and the study of human remains, utilizing clay modelling as a crucial resource.

Introduction

The muscles of facial expression are particularly difficult to dissect, as well as time-consuming to study in formalin embalmed cadavers.[1] This holds particularly true in instances where cadaveric material presents with decreased skeletal muscle mass, central adiposity,[2] and facial fat atrophy.[3] Furthermore, the global shortage of cadaveric material due to the COVID-19 pandemic necessitates alternative approaches to the delivery of anatomy as a subject.

One such alternative is clay-modeling.[4] Studies have shown that teaching anatomy through art activities increases the observational skills and memory of students as well as encourages engagement in the learning process.[5] An 8-week first-year course of 'Art in Medicine' has been implemented at Brighton and Sussex Medical School and has proven successful according to student feedback.[5] Clay models are especially used as an alternative to classical cadaveric dissections or as an adjunct[2]. Globally, there are institutions without access to cadaveric material and animal specimens, are used for routine dissections and surgical training.[6] Furthermore, dissection is not a uniform learning experience and complementary innovative learning methods, such as clay modeling, should be incorporated.[7]

The use of clay-modeling helps students to broaden their horizons past the traditional methods of dissecting and written tests. Studies have shown that the use of clay-modeling helps enhance the students' self-confidence, participation, and memory of anatomical musculature.[8] The use of clay-modeling has also shown an increase in learners' ability to understand spatial relationships as well as understand the relationships and transition between 3D to 2D structures, such as converting clay models into cross-sectional anatomical images.[9,10] Furthermore, Correia et al,[4] found that students perceived that collaborative learning in clay-modeling enhanced their skills, such as problem-solving, communication and creative thinking. Another alternative to the traditional methods is the use of laboratory animals which was demonstrated in 2009. In this study, Motoike et al, employed 181 students and demonstrated that clay-modeling is more effective compared to cat dissections for the delivery of anatomy.[11] It is important to note that using animal models within the current context is an alternative to human cadaveric material.

The purpose of anatomical clay-modeling is to mimic anatomical visualization in a similar way to what would be seen during dissections and to gain a three-dimensional understanding of the human body. Clay-based modeling is a unique learning tool and the experience gained from physically constructing, rather than destructing an anatomical model is invaluable.[4] Kooloos and colleagues found that students performed better in anatomical knowledge assessment when they had an opportunity to build clay models compared to those who only watched a video tutorial on the same topic.[2] The rationale for students' improved

[1] Division of Anatomy, School of Medicine, University of Namibia, Windhoek, Namibia.

[2] Division of Clinical Anatomy, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Stellenbosch University.

[3] Clinical Anatomy Learning Centre, Lancaster Medical School, Faculty of Health and Medicine, Lancaster University, Lancaster, United Kingdom.

About the Author: *TONI CHIAPPINI is a sixth-year and final-year M.B.Ch.B. student at the University of Namibia. This project forms part of her required undergraduate research project.*

Correspondence:

Janine C Correia.

Address: Private Bag X1, Matieland, 7602, Stellenbosch, Western Cape, South Africa

Email: jcorreia@sun.ac.za

Submission: Feb 15, 2024
Revisions: Jul 7, Sep 16, 2024
Responses: Jul 11, Nov 25, 2024
Acceptance: Feb 8, 2024
Publication: Mar 27, 2024
Process: Peer-reviewed

performance relates to their increased concentration, engagement, and the novel aspect of cognitive stimulation.[2] Furthermore, Oh and colleagues noted that the majority of students who participated in clay-modeling as a supplement to conventional study modes reported a positive experience. Students' positive experiences were related to their improved understanding of the three-dimensional structure, improved interest and active participation.[9]

The current study presents a cost-effective and participatory innovation to the practical learning of the muscles of facial expression through clay-modeling. Furthermore, the study also explores the value of clay-modeling as a potential alternative to cadaveric dissection to facilitate students' learning of the muscles of facial expression.

Methods

A cross-sectional study design was followed involving second-year medical students at the University of Namibia. The intervention was presented as part of students' practical laboratory session on the muscles of facial expression and was necessitated by a shortage of cadaveric material due to the COVID-19 pandemic. White concrete skulls were made after obtaining silicone cake molds ***(Figure. 1).*** The silicone molds were first secured in wet sand, serving as a master mold and to prevent distortion, before the cement slurry was added ***(Figure. 1).*** Once cured, the casts were removed and sprayed with white paint ***(Figure. 1).***

The practical sessions followed theoretical lectures on the embryology of the face and muscles of facial expression. During the practical session, groups of students were provided with one concrete skull cast between them, a practical worksheet, and resources ***(Figure. 1).*** The resources consisted of an anatomy atlas, and a laminated worksheet with the respective muscles, their functions, and origins and insertions. Artistic sculpting clay (circa 400g) was provided for each group of four students. A total of nine groups (73 students in total) participated in the practical sessions. The first cohort of 36 students was tasked with a practical laboratory session to model the muscles of facial expression ***(Table 1).*** This activity was duplicated for the second cohort on the same day and totaled 37 students (one group had 5 students). An outline of each session and the duration of each phase is provided in ***Table 1*** and each session lasted one hour and 50 minutes. This afforded all staff 10 minutes to prepare for the next session. Lecturing staff served as facilitators during each practical session and rotated among the groups of students

Student feedback in the form of a questionnaire with closed- and open-ended questions was used. The questionnaire used was developed to promote critical reflection ***(Table 2).*** Only volunteering participants, after recruiting and providing written consent completed the questionnaire. Ethical approval for the data collection was obtained through the Namibian Ministry of Health and Social Services (Ref#TC2022). Data associated with the closed-ended questions were analyzed for measures of central tendency. Next, responses to the open-ended questions were subjected to thematic analysis. An inductive approach for latent themes was followed.[12] Thematic analysis (TA) was manually performed to generate the primary and secondary themes associated with the open-ended questions.[13] The generation of

Figure 1. Practical Clay-Modeling Setup.

Legend: A: Casting cement slurry into a silicone cake mold. B: The cured concrete skull after being sprayed with white paint. C: Students working in groups during the practical laboratory session. D: Work-in-progress demonstrating the muscles of facial expression and muscle fascicle direction.

Table 1. An Outline of the Practical Session and Expected Outcomes.

Phase (duration)	Activity
Phase 1 (10 minutes)	Familiarization with the practical task and planning.
Phase 2 (70 minutes)	Execution: *Use the resources provided to model the muscles of facial expression.* *Model the branches of the facial nerve.* *In a table, indicate which specific branch of CN VII innervates which muscles.*
Phase 3 (10 minutes)	Peer assessment and feedback (informal)
Phase 4 (10 minutes)	Disassembly and cleaning of the workstations.

Table 1. Survey Questions Assessing Medical Students' Perceptions of the Facial-Muscle Clay-Modeling Activity.

Do you feel that the activity allowed you to perform the tasks independently?
Did you find the activity motivational? In what way? If not, please explain.
Did you find the activity enjoyable? In what way? If not, please explain.
Were the resources provided adequate? If so, in what way? If not, please explain.
Did you find the activity was easy to follow independently? Please explain.
Would you recommend the activity? Why or why not?
Did you find this to be an effective learning experience? In what way? If not, please explain.
Did you learn something new?
Would you like to do something similar when studying anatomy?
Do you think the students will benefit from modeling in clay? In what way? If not, please explain.
What could change? What would you do differently next time?
What were your thoughts and experiences when you had to dismantle the model? i.e. remove the clay?

primary and secondary themes followed a similar approach to the work of Radzi et al.[14] TA was used to identify and analyze patterns of meaning within the questionnaire responses by identifying latent themes and to understand the attitudes and perceptions of first-year medical students' first exposure to a cadaver.[12,13,15] A reflexive approach was adopted where the researchers were immersed in data familiarization, coding, and theme development, rather than coding reliability and using a codebook approach.[13,16]

Results

A total of 21 students completed the questionnaire, yielding a response rate of 27.8%, and all provided written informed consent. The majority of participants (21/22; 95%) reported being able to perform the tasks independently, while one respondent (5%) indicated limited hands-on participation due to working in a group setting. All participants (22/22; 100%) found the activity to be both motivational and enjoyable. Most respondents (21/22; 95%) considered the available resources sufficient; one participant noted that the paper-based diagrams were less helpful without access to accompanying textbooks. Similarly, 21 participants (95%) stated they had learned something new through the activity, while one participant, although not identifying new knowledge, acknowledged gaining appreciation for the anatomical complexity of facial expression. All respondents (22/22) expressed positive feedback overall, with several suggesting the extension of this activity format to other anatomical regions, such as the muscles of the hand.

The themes generated from the students' responses are shown in ***Figure 2*** and four themes were generated: Fun, Collaboration, Active Learning, and Bittersweet.

Theme 1: Fun

Respondents overwhelmingly commented that the practical session with clay modeling was enjoyable. Students also noted that they were actively playing while learning the muscles of facial expression.

"It showed that learning could be fun instead of stressful"

"It was motivational as it gave me the chance to learn as well as have fun at the same time"

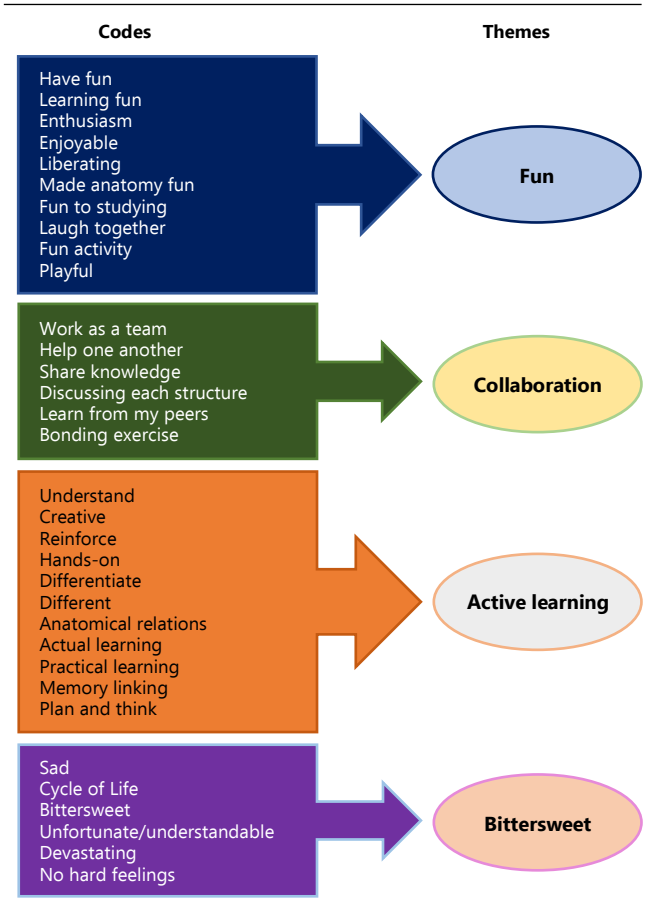
"It triggered my creativity and enthusiasm"

"We had the opportunity to link having fun to studying in a way"

A participant also mentioned that they wanted to spend more time on the activity.

Participants self-declared that the clay-modeling session inspired their creative side and felt that they were actively playing and having fun while learning the muscles of the face. Clay-modeling permitted creativity and allowed students to put theory into practice and form linkages.

Figure 2. The Four Themes that were Generated were Based on Thematic Analysis of the Open-Ended Survey Questions.



Theme 2: Collaboration

Collaborative learning experiences, in the form of practical teams, helped encourage communities of practice in learning and foster deeper learning approaches.

"I had the opportunity to learn from my peers"

"It allowed us to work as a team, share knowledge, and laugh together"

"The teamwork, having to plan and think creatively was very fun"

Respondents perceived the group work as being valuable in their learning experience. The participants recognized that such strategies increased their motivation and enhanced their engagement while learning anatomy.

Theme 3: Active Learning

The students perceived that the active and engaging learning strategy of clay-modeling can be used as a constructive learning tool in anatomy.

"It was a new experience learning about the muscles from a superficial to deep layer"

"It helped me differentiate between the different facial muscles from deep to superficial"

"It was different from just looking at 2D pictures in a textbook"

"It helps a student to think about the anatomy of the muscles (in relation to each other)"

Some participants commented on the fact that creating the anatomical clay models reinforced the learning of that structure. Students can physically manipulate and mold the clay to create a more accurate representation, which can help them remember the structure better.

"By modeling the muscles and learning their anatomical relations to one another, it makes it easier to retain the knowledge"

"Now there will also be a memory linking the information which will make it memorable"

The clay models also allowed the students to express their creativity and artistic abilities while learning about anatomy.

"Learn the muscles of the face in a more creative manner"

"Express my creativity and gave me a platform to freely learn without any external pressure"

Participants commented on the fact that creating the models allowed them to learn through hands-on experience. This can be particularly helpful for students who are tactile learners and prefer to learn by doing.

"it was a hands-on exercise and that makes it hard to forget"

"(...) practical way of learning facial muscles and not just memorizing them from an atlas"

"I find I prefer hands-on learning more than just being told about it"

In a learning system of parrot-fashion memorization, muscle actions, origin and insertion of facial muscles have little context and, thus, are less relevant to students and become difficult to learn and remember. Rather, interacting in a hands-on manner with clay-based modeling can help students better visualize the facial muscle.

Theme 4: Bittersweet

The students had conflicting emotions regarding the building and the breaking down of the clay models after the session was completed.

"It was a bittersweet moment"

"It felt emotional because we put in a lot of effort"

"I was sad because my group and I worked hard on it. We even named our clay model"

A participant even stated that the clay-modeling process of building and breaking down reminded them of the cycle of life and death.

Discussion

Clay-based modeling is the construction of anatomical models that emulate the three-dimensional structure of an organ or system.[9] Through this hands-on, interactive approach, the building of clay models allows for an improved understanding of spatial relationships between structures and the precise location of structures. This form of anatomy teaching is creative and fun, allowing students to actively enhance their long-term retention of anatomical knowledge in an enjoyable, positive environment.

Student involvement was increased during this study and students' grasp of the anatomical relationships in the human body was improved by using clay-modeling, an active, tactile learning tool.[4] Research has shown that, for effective learning, students must actively participate in the learning process.[17] Furthermore, in this study, the active learning process was employed when the students were required to build and manipulate the models.[18] However, research suggests that clay-modeling does not improve anatomical knowledge compared to students who only employed video material.[2] The most important pedagogical advantage of clay-modeling, as noted by Kooloos and colleagues, is active involvement.[2]

The building of anatomical clay models additionally adds a tactile approach to learning, which offers an alternative approach to the comprehension and retention of information. Furthermore, respondents from the current study also commented that they would prefer different colors of clay. According to Akle et al, adding color-coding structures may also supplement the learning effect as there have been correlations between color recognition and the recall of information.[19] A possible solution within the current context would be to add a color pigment to the clay. Furthermore, on a technical note, we found that artistic clay is excellent compared to plasticine in that it is easy to clean from the casts and workstations. This in turn optimizes the time students can spend learning and reduces the time between sessions spent by staff on recalibrating stations, enabling them to focus on other aspects of student learning, such as questions.

Other, more pragmatic factors make clay models a useful educational tool. For example, clay specimens are convenient to store, odorless, easy to handle and relatively cost-effective.[20] Clay modeling allows students to construct models rather than spend hours dissecting and potentially damaging important structures, which is of benefit in an educational climate that is seeing reduced contact hours for anatomy education.[21,22] Furthermore, clay-modeling allows for the re-use of both the clay and skull

template. The proposed concrete alternative as presented in the current study serves as a cost-effective modality in resource-constrained settings. This alternative has the potential to permit students to model the muscles of facial expressions remotely and thus serve as an extracurricular activity. Therefore, to a degree, clay models make an excellent complement to traditional dissection and a potential alternative where cadaveric material is not feasible due to scarcity or affordability issues. However, Curlewis and colleagues noted that clay-modeling cannot serve as a complete substitute for human tissue as it lacks detailed anatomy.[18]

Other potential advantages, such as students being able to work on the anatomical variability that occurs with muscle and nerve courses. The dissection room provides exposure to some of these normal variants, but it is not always present in each donor cohort and therefore clay modeling may provide a useful adjunct to students looking to convert the 2D presentation they see in textbooks into 3D resources. The challenges of observing nerves such as the facial nerve, or chorda tympani in the dissecting room are well documented and clay-modeling may present a resource that enables students to visualize the course and relationship with neighboring structures without having to dissect for prolonged periods in the hope that they can observe all the necessary structures and their relationships.[23] The importance and value of clay in increasing student performance on peripheral nervous structures has been shown by DeHoff and colleagues in undergraduate anatomy class.[17] One possible drawback within the current study relates to the anatomical accuracy of the casts that were used. However, staff ensured that the necessary anatomical landmarks were present, and all students found them identifiable enough to permit completion of the task at hand, as evidenced by student feedback, with no reference to issues relating to origin or insertion points.

This study shows the value of clay-modeling for medical students in their learning of anatomy. It has also recently been shown that clay-modeling is a valuable tool to postgraduate students as a revision resource to increase their confidence in pelvic anatomy knowledge amongst obstetrics and gynecology residents, demonstrating that clay-modeling has longevity in learning and revision across the healthcare spectrum.[20]

Our findings also highlight the importance of collaboration among students. The importance of collaborative learning in anatomy is well-documented and includes students' ability to learn communication and leadership skills.[24] From our findings, we noticed that students were forced to plan in a group during the planning phase of the activity, grappling with translating theoretical knowledge into practice. They had to think of the layering of the muscles (superficial to deep) and the associated origin and insertion of each. The alignment and portrayal of muscle fascicles was another element students had to compete with and portray in their clay model. The peer assessment and feedback phase provided a further opportunity for collaboration. The sharing of knowledge, though informal, is encouraged and is advantageous even if not formally included in the learning outcomes.[25] In hindsight, a formal peer-assessment checklist could be used to further foster collaborative learning and could include specifics such as muscle fascicle orientation, anatomical accuracy for the origin and insertion, and muscle layering.

Finally, and certainly an interesting finding, students' experiences associated with the disassembly of the models revealed feelings of loss and grief among some respondents. Dueñas and colleagues highlight the lack of research on coping strategies employed by students and staff when faced with stressors within an anatomy practical laboratory.[26] Our findings reflect varied responses associated with the activity of disassembly of students' clay models. Gross anatomy laboratories elicit emotional responses, and much understanding has been gained around students' first experience with death.[27–29] It should be noted that students within the current study have had prior exposure to cadavers and cadaveric material. However, the varied emotional responses ranging from "sad" to "devastating" further support the need to bolster humanistic considerations in anatomy education. The emotional responses from our respondents were associated with clay-modeling and not linked to the cadaveric material. These responses highlight the need to be actively cognizant of students' emotional well-being at all times. The incorporation of reflective writing is one possible approach to better understanding students' emotional responses and personal experiences within the gross anatomy laboratory.[30] An interdisciplinary and formal approach to dealing with death is not new and exists within many anatomy programmes.[31,32]

Critical reflection by the participants presents the opportunity for further work to link discussions around the humanistic considerations of anatomy and the study of human remains, such as "ownership", morality, ethics, loss, and grief. Clay-modeling presents a resource which can allow for the development of multiple skills as well as knowledge acquisition in the presence and absence of traditional cadaveric dissection.

Summary – Accelerating Translation

Main Problem to Solve:

Traditional methods of studying facial muscles, such as cadaveric dissections, are time-consuming, resource-intensive, and affected by global shortages of cadaveric material due to the COVID-19 pandemic. Finding effective alternatives to teach anatomy, particularly the intricate muscles of facial expression, is crucial.

Aim of Study:

This study aimed to assess the effectiveness and student perceptions of using clay modeling as an alternative method for learning the muscles of facial expression among medical students. The study also sought to explore the emotional responses associated with this learning approach.

Methodology:

A cross-sectional study design was employed involving second-year medical students at the University of Namibia. Due to a shortage of cadaveric material, white concrete skull casts were made using silicone molds. Practical sessions were conducted where students, working in groups, modeled the muscles of facial expression using artistic sculpting clay. A questionnaire with closed- and open-ended questions was used to gather feedback from participants.

Results:

Twenty-one students participated in the study, with overwhelmingly

positive feedback. Participants found the activity motivational, enjoyable, and conducive to learning. The themes from the responses included enjoyment, collaboration, active learning, and bittersweet feelings associated with disassembling the clay models.

Conclusion:
Clay modeling emerged as a cost-effective, enjoyable, and effective method for teaching facial muscle anatomy. It fostered collaboration, active learning, and creativity among students. The emotional responses observed during the disassembly phase highlight the need for considering students' emotional well-being in anatomy education. Clay modeling shows promise as a valuable complement or alternative to traditional cadaveric dissections, particularly in resource-constrained settings or during times of cadaveric material shortages.

References

1. Cotofana S, Lachman N. Anatomy of the facial fat compartments and their relevance in aesthetic surgery. J Dtsch Dermatol Ges. 2019;17(4):399–413.
2. Kooloos JGM, Schepens-Franke AN, Bergman EM, Donders RART, Vorstenbosch MATM. Anatomical knowledge gain through a clay-modeling exercise compared to live and video observations. Anat Sci Educ. 2014;7(6):420–429.
3. Talmor M, Hoffman LA, LaTrenta GS. Facial atrophy in HIV-related fat redistribution syndrome: anatomic evaluation and surgical reconstruction. Ann Plast Surg. 2002;49(1):11–18.
4. Correia JC, Baatjes KJ, Meyer I. Student-perceived value on the use of clay modelling in undergraduate clinical anatomy. Adv Exp Med Biol. 2022;1388:153–170.
5. Bell LTO, Evans DJR. Art, anatomy, and medicine: is there a place for art in medical education? Anat Sci Educ. 2014;7(5):370–378.
6. Aboud E, Suarez CE, Al-Mefty O, Yasargil MG. New alternative to animal models for surgical training. Altern Lab Anim. 2004;32 Suppl 1B:501–507.
7. Ghosh SK. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. Anat Sci Educ. 2017;10(3):286–299.
8. Nicholson LL, Reed D, Chan C. An interactive, multi-modal anatomy workshop improves academic performance in the health sciences: a cohort study. BMC Med Educ. 2016;16(1):7.
9. Oh C-S, Kim J-Y, Choe YH. Learning of cross-sectional anatomy using clay models. Anat Sci Educ. 2009;2(3):156–159.
10. Remmele M, Martens A. Using stereoscopic visualizations as templates to construct a spatial hands-on representation—is there a novelty effect? Adv Physiol Educ. 2019;43(1):93–98.
11. Motoike HK, O'Kane RL, Lenchner E, Haspel C. Clay modeling as a method to learn human muscles: a community college study. Anat Sci Educ. 2009;2(1):19–23.
12. Burnard P, Gill P, Stewart K, Treasure E, Chadwick B. Analysing and presenting qualitative data. Br Dent J. 2008;204(9):429–432.
13. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.
14. Radzi S, Chandrasekaran R, Peh ZK, Rajalingam P, Yee Yeong W, Mogali SR, et al. Students' learning experiences of three-dimensional printed models and plastinated specimens: a qualitative analysis. BMC Med Educ. 2022;22(1):1–10.
15. Joffe, H. Thematic Analysis. In Qualitative Research Methods in Mental Health and Psychotherapy: A Guide for Students and Practitioners; Harper, D., Thompson, A.R., Eds.; Wiley-Blackwell: Oxford, UK, 2011; pp. 209–223.
16. Braun V, Clarke V. Reflecting on reflexive thematic analysis. Qual Res Sport Exerc Health. 2019;11(4):589–597.
17. DeHoff ME, Clark KL, Meganathan K. Learning outcomes and student-perceived value of clay modeling and cat dissection in undergraduate human anatomy and physiology. Adv Physiol Educ. 2011;35(1):68–75.
18. Curlewis K, Leung B, Perera M, Bazira PJ, Sanders KA. Clay-based modeling in the anatomist's toolkit: a systematic review. Anat Sci Educ. 2021;14(3):252–262.
19. Akle V, Peña-Silva RA, Valencia DM, Rincón-Perez CW. Validation of clay modeling as a learning tool for the periventricular structures of the human brain. Anat Sci Educ. 2018;11(2):137–145.
20. Chong W, Tran N, Bui A. Effectiveness of a clay pelvic model: a hands-on approach to understanding pelvic floor anatomy. Obstet Gynecol. 2022;140(1):94–98.
21. Drake RL, McBride JM, Lachman N, Pawlina W. Medical education in the anatomical sciences: the winds of change continue to blow. Anat Sci Educ. 2009;2(6):253–259.
22. Ahmed K, Rowland S, Patel VM, Ashrafian H, Davies DC, Darzi A, et al. Specialist anatomy: is the structure of teaching adequate? Surgeon. 2011;9(6):312–317.
23. Liu L, Arnold R, Robinson M. Dissection and exposure of the whole course of deep nerves in human head specimens after decalcification. Int J Otolaryngol. 2012;2012:418650.
24. Pawlina W. Professionalism and anatomy: how do these two terms define our role? Clin Anat. 2006;19(4):391–392.
25. Laakkonen J, Muukkonen H. Fostering students' collaborative learning competencies and professional conduct in the context of two gross anatomy courses in veterinary medicine. Anat Sci Educ. 2019;12(2):154–163.
26. Dueñas AN, Kirkness K, Finn GM. Uncovering hidden curricula: use of dark humor in anatomy labs and its implications for basic sciences education. Med Sci Educ. 2020;30(2):345–354.
27. Dinsmore CE, Daugherty S, Zeitz HJ. Student responses to the gross anatomy laboratory in a medical curriculum. Clin Anat. 2001;14(4):231–236.
28. Talarico EFA. A change in paradigm: giving back identity to donors in the anatomy laboratory. Clin Anat. 2013;26(2):161–172.
29. Williams AD, Greenwald EE, Soricelli RL, DePace DM. Medical students' reactions to anatomic dissection and the phenomenon of cadaver naming. Anat Sci Educ. 2014;7(3):169–180.
30. Ferguson KJ, Iverson W, Pizzimenti M. Constructing stories of past lives: cadaver as first patient: "Clinical summary of dissection" writing assignment for medical students. Perm J. 2008;12(2):89–92.
31. Tuohimaa P, Tamminen T, Fabrin V. Is it appropriate to speak of death during a dissection course? Teach Learn Med. 1993;5(3):169–173.
32. Rizzolo LJ. Human dissection: an approach to interweaving the traditional and humanistic goals of medical education. Anat Rec. 2002;269(3):242–248.

Acknowledgments

The authors wish to acknowledge and thank all participants of the study for their time and cooperation.

Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

Author Contributions

Conceptualization: TC, AT, JVDM, QW. Data Curation: TC, JC, QW. Formal Analysis: TC, JC, AT, QW. Investigation: TC, JVDM, QW. Methodology: TC, JC, QW. Project Administration: TC, JC, JVDM, QW. Supervision: JC, AT, QW. Visualization: TC, AT, QW. Writing – Original Draft: TC, JC, AT, QW. Writing – Review & Editing: JC, AT, QW.

Cite as

Toni Chiappini, Janine C. Correia, Adam M. Taylor, Jan van der Merwe, Quenton Wessels. Sculpting the Science: Teaching Anatomy of the Facial Muscles to Medical Students. Int J Med Stud. 2025 Apr-Jun;(2):126-132.

ISSN 2076-6327

This journal is published by Pitt Open Library Publishing