A REVIEW OF MODERN ANATOMY TEACHING PRACTICES

Maryann Waithaka[1], Vincent Kipkorir[1], Jeremiah Munguti[1], Beda Olabu[2]
[1.] Department of Human Anatomy and Physiology, Faculty of Health Science, University of Nairobi
[2.] Faculty of Health Science, Agha Kan University, East Africa
Correspondence to: Maryann Waithaka, **Email:** maryannwaithaka24@gmail.com
ORCID ID: https://orcid.org/0000-0002-4694-3173

INTRODUCTION

Human anatomy is considered to be the cornerstone of medicine. It is an essential part of the learning experience of undergraduate students and serves to equip the aspiring medical practitioner with adequate understanding of the human body and its intricacies; its various developmental stages and microscopic organization (Brenner et al., 2003). This provides the appreciation of the structures which form the functional unit that is composite of a healthy human being. Multiple models of teaching have been employed to dispense anatomical knowledge with each method utilizing different resources to achieve a specific objective. These methods in addition differ in the time it takes to administer knowledge. Different learning institutions thus select their preferred teaching method based on multiple considerations (Estai and Bunt, 2016).

Brenner et al grouped these teaching methods into 6 categories namely: dissection by students, inspection of prosected specimen, didacted teaching, use of models, computer-based learning and the teaching of living and radiological anatomy (Brenner et al., 2003). Multiple studies have reviewed the effectiveness and relevance of these models given the current educational climate including the just recent COVID-19 pandemic learning environment, ethical considerations, cost of teaching, time saved, student interest and preference, and overall memorability (Estai and Bunt, 2016), (Losco et al., 2017). It has also been reported that the quality of anatomical education has decreased over time as learning institutions dedicate less time and effort into anatomy teaching which supposedly has led to an increase in incidences of malpractice due to surgical incompetence related to anatomical errors (Cahill et al., 2000). It is therefore of interest to review these teaching methods to provide further insight into the current state of anatomy education, the impact of modern models and their reported effectiveness.

The first method under review, cadaveric dissection, is the oldest and most commonly practiced method of teaching. This method has been utilized for the past 400 years and has been the primary method of dispensing anatomical knowledge. Cadaveric dissection facilitates active learning, prepares students for the concepts of death, visualizes the classification of various bodily systems, and equips students with useful manual dexterity skills (Estai and Bunt, 2016). However, it is time consuming, expensive and poses a health risk to due to prolonged exposure to formalin. In addition, its validity has been put to question as studies claim it has no added benefit in preparation of students for the clinical experience and that modern teaching practices such as radiology based and computer associated learning provide a better understanding of patient illnesses in relation to anatomical structure (Azer and Eizenberg, 2007). It is for this reason that many developed countries have abandoned this teaching method in favour of other models. However, a review on anatomical teaching in Africa saw that most medical schools retained cadaveric dissection as the primary method of teaching due to easy

access and institutional preference (Kramer et al., 2008).

Prosection as a teaching method utilizes already dissected gross specimen. This method has the advantage over traditional dissection as it cuts down the hours required to visualize anatomical structures and thus is much more time efficient. In addition, it is not dependent on students' dissection skills to find deep set structures that would have otherwise been missed or severed by undergraduate students. This has thus made it highly favourable among anatomy students (Karaer and Barut, 2017). It is an increasingly common method of teaching and in some schools has wholly replaced dissection. However, a more common picture seen is an integrated form of learning where schools adopt both dissection and prosection and in addition, use other methods like computer assisted learning and anatomical models to supplement teaching.

Computer based learning is a model that utilizes computer software to visualize anatomical structures through simulated dissection presented in 3D, virtual or augmented reality. It also simultaneously offers additional information which includes radiological comparisons, histological organization and pathologic illustrations. This interactive method of teaching enables the exploration of the human body from a completely different perspective, displaying cross sections, neurovascular organizations, isolated systems to render an illustration that could not be displayed using traditional anatomical teachings. Computer assisted models include the Visible Human Project by the National Library of Medicine (Estai and Bunt, 2016), the Anatomage table, a virtual reality dissection table, BioDigital Human and various medical learning programs offered by the virtual reality headset developed by Meta, among others. This form of learning is becoming increasingly popular with many institutions due to its flexibility, easier access, student preference and reported effectiveness (Estai and Bunt, 2016). In addition, this teaching method does not require preservation, storage and does not raise any ethical issues. The effectiveness of this model over other methods has been repeatedly assessed with questions of how well it enables short term and long term retention (Losco et al., 2017). Computer assisted learning is also dependent on regular internet access, constant power supply, training to students by professionals and thus in resource limited settings like many medical institutions in Africa, this model is the least accessible and most expensive. It is due to these constraints that an integrated mode of learning has been promoted, focusing on problem based learning and clinical concepts over a specific method of learning.

The other methods of learning, including: didacted learning, the use of models and the teaching of radiological anatomy are methods that although not sufficient by themselves, serve to augment the understanding imparted by the other more practical methods discussed previously (Estai and Bunt, 2016). It is for this reason that they are often neglected and their importance undermined. Didacted learning solidifies anatomical illustrations and highlights the areas of emphasis in the vast field of gross anatomy. It enables discussions between learners and teachers that keep a student active and motivated. Anatomical models are the practical illustrations of various systems and have the advantage of longevity without the need for preservation, easy visualization of human structures without the complexity of organic material that hinders visualization and are readily available. Radiological images provide an abstract visualization of anatomical structure using 2D images and 3D reconstructions. With the massive relevance of imaging technology in the medical practice, this method gives students an introduction to radiographic anatomy in correlation with the gross specimen and equips them with

relevant skills for the interpretation of radiological images.

There is much speculation on the future of anatomy given the current educational climate. Reduced hours dedicated to anatomy, abandonment of manual dissection and the adoption of distance online learning due to the COVID pandemic are some of the current trends in anatomy teaching. However, given the increased emphasis by anatomists and specialists on the importance of maintaining high standards of anatomy education, institutions are adopting changes to their curricula that are more student-centered, problem-based, integrated, community-based, and systematic. This includes the enhancing of continuous anatomy learning throughout the medical course, with the encouragement of a peer system of teaching between advanced and younger learners. In addition, the vertical integration of anatomy into other clinical topics will be employed more and more, with increased emphasis on radiological anatomy and the training of instructors on this updated model of learning. A big part of the future of teaching involves the increased incorporation of technology-based learning models to reflect the increasing integration of technology into therapeutic practice. However, this should not come at the expense of previously utilized traditional methods such as cadaveric dissection which equips students with useful dissection skills. The understanding of anatomy is crucial to the development of a competent clinician and aspiring surgeon and should not be overlooked in order to promote better patient care. With the multiple methods available, institutions should dedicate enough time and utilize their available resources to provide an integrated method of learning that includes multiple models and has a focus on clinical aspects and problem-based learning so as to create a well-rounded student and clinician in order to enhance safe medical practice.

REFERENCES

1. Azer, S.A., Eizenberg, N., 2007. Do we need dissection in an integrated problem-based learning medical course? Perceptions of first- and second-year students. Surg Radiol Anat 29, 173–180.
2. Brenner, E., Maurer, H., Moriggl, B., Pomaroli, A., 2003. General educational objectives matched by the educational method of a dissection lab. pp. 173229–173230.
3. Cahill, D.R., Leonard, R.J., Marks, S.C., 2000. Standards in health care and medical education. Clin. Anat. 13, 150–150.
4. Estai, M., Bunt, S., 2016. Best teaching practices in anatomy education: A critical review. Annals of Anatomy - Anatomischer Anzeiger 208, 151–157.
5. Karaer, E., Barut, Ç., 2017. Study preferences in anatomy education: a descriptive study including preliminary results*. Anatomy 11, 99–103.
6. Kramer, B., Pather, N., Ihunwo, A.O., 2008. Anatomy: Spotlight on Africa. Anat Sci Ed 1, 111–118.
7. Losco, C.D., Grant, W.D., Armson, A., Meyer, A.J., Walker, B.F., 2017. Effective methods of teaching and learning in anatomy as a basic science: A BEME systematic review: BEME guide no. 44. Medical Teacher 39, 234–243.