



PSIWORLD 2013

Modern methods used in the study of human anatomy

Calin Mihai Tanasi^a, Viorel Iulian Tanase^b, Tudor Harsovescu^{a*}

^aTitu Maiorescu University, Faculty of Medicine, 67A Gh. Petrasu street, sector 3, Bucharest 031593, Romania

^bTitu Maiorescu University, Faculty of Psychology, 187 Calea Vacaresti, sector 4, Bucharest 040051, Romania

Abstract

The definition of anatomy is *ana* + *temeinon* = by cutting. So dissection represents the main means of highlighting the anatomical formations, involving active student participation.

The role of knowledge construction by students themselves in learning is really significant, reflected in formation of critical, reflexive and qualified professionals. Using methods of cognitive behavioral training, we obtained a positive response from students; objectively, student participation in classes was improved.

Because bare anatomical knowledge could be acquired by students through many media, the teacher should act as an ally and companion of the students in order to build strong, logical medical knowledge.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

Selection and peer-review under responsibility of Romanian Society of Applied Experimental Psychology.

Keywords: human anatomy; dissection; teaching; learning; constructive psychological methodologies;

1. Introduction

You will probably ask yourselves why we write this presentation, and which will be the impact on readers foreseen by the authors. In the 21st century, due to the explosive growth of the media and Internet, people, in their thirst for knowledge are increasingly interested to decipher the structures of the human body.

Often, before surgery, the physician who has to perform the operation explains to the patient the repercussions that the surgery may have on the body. For this purpose, some physicians use didactic drawings or anatomy atlases,

* Corresponding author. Tel.: +4-021-324-3013; fax: +4-021-324-3013.

E-mail address: dr.tudor@gmail.com

and other physicians make sketches of the order of the pre and post-operative structures. Also, patients are interested in these facts, they make researches, they navigate on the internet looking for anatomic images.

2. Psychological basis of interest in studying anatomy

In the past, demonstrative dissections were carried out in public spaces. When they were held by famous personalities of the time university courses, which are by definition public, were heard by both students from the medical school, and by students from other faculties with other profiles, or even by different people regardless of their level of education.

Another evidence of the interest of the general public in knowing the anatomy of the human body is the success recorded by the presentation of plastination models. Their presentation at the last international congress of anatomy which I attended, and the exhibition organized at National History Museum Grigore Antipa were highly successful, as it can be seen from the great number of visitors.

Learning is the personal development following an experiential process, leading to a relatively stable modification of the knowledge behaviour.

The large number of the terms from the anatomical nomenclature used, the huge volume of notions make the discipline "Anatomy" to be practically a foreign language for a freshman in the medical school or for a person who does not work in the field. We believe it is necessary to use combined, balanced, systematic didactic processes on two levels: a level addressed to the healthcare professionals and another level addressed to the general public.

Everyone studying Gray's Anatomy, the most important anatomy treaty that can be found in the bibliography of any other work or pedagogic contest, is going to be topped by the avalanche of notions (Stranding, S. et al., 2008). Basically, the anatomy studied during 6 years of medical school, 6 days a week, as Saturday was not free, was compressed into two years of study with two inputs of 2-3 hours per week. The anatomical concepts are the same everywhere, and more than that, they have been described in more complex writings in certain regions.

Modern means of laboratory investigations are also used and thus imaging anatomy came into being. X-rays, ultrasound, computed tomography, with or without contrast dye, nuclear magnetic resonance produce images which are viewed both by the specialist and by medical students and by the patients investigated. These images are often handed over to the patient who begins to study the loco-regional anatomy out of the desire of knowledge.

Professor Rainer Francis developed the saying "Anatomy is the science of the living form" which can be read on the frontispiece of the anatomy hall at the University of Medicine and Pharmacy "Carol Davila" in Bucharest. Clinical anatomy has highly developed recently as various societies in different regions of the world have been established.

3. Actual trendlines and issues in the study of human anatomy

Each new method published in the anatomy study tried to impose itself over the other methods. Currently we have witnessed the uproar stirred by plastination.

Of course there were times when the use of cadavers for the study of anatomy was dropped temporarily. They made casts, virtual dissections were performed, but the use of computers and of the newest IT acquisitions has tried and will definitely try to overshadow the older methods of study.

The concern of teachers for the improvement of the teaching process has materialized lately in publications with an iconography in line with European standards (Drake et al., 2009).

However, we are often asked: which is the best book, which is the best treaty, which is the best anatomy atlas? Once every five years a new edition appears it is most likely that man will always develop the means of understanding and knowledge of anatomical structures.

Psychological studies may provide quantified information on the way of understanding anatomical concepts and on the ability to transfer information from teacher to student. The analyzers used are the acoustic system and the visual system. The human brain makes connections between the visual and the acoustic perception, and it also has its own way of processing this information.

This processing should be investigated because experiments have shown now that the ancestral baggage of human species is quite improved, considering that today's studies on the functioning of neural cortical and

subcortical circuits are performed in an attempt to create analogies between programming systems of computers and the human way of thinking.

The university professor is like an actor in front of students, any didactic presentation represents an exercise to capture the attention of the audience and an attempt to make the presentation fit the students level of understanding.

Thus, the notion of interactive course came into being. Before, teachers were required to have artistic talent to draw anatomic formations on the blackboards of classrooms, but in time things have evolved and various technical means came to their aid. In the dissection rooms each group of students had a dissection table with a corpse, a blackboard and a stand where anatomical drawings were presented. During that time, teachers used slides, a retro-projector while now they use a video-projector which transmits images from the computer by using most often Microsoft Office Powerpoint.

However, the student cannot correctly understand the anatomy concepts because the number of bodies in relation to the number of students is insufficient.

By using cadavers and by performing anatomy on the living another analyzer is involved in the information processing, namely the skin analyzer. Palpation of the various structures gets the future doctor familiarized with and helps him understand the relationships in situ. The new preparation techniques of bodies, for example the Thiel method allows maintaining colour consistency and mobility. This can result in surgical techniques useful for both resident physicians and specialists.

The three-dimensional view of man determined the transition towards the 3D projection of images, first in IMAX theaters, and then on the displays used at home. Currently, three-dimensional images are used in the presentation of human anatomy, reconstructions are performed and formations can be rotated so that the user can view the pictures from all angles. Certainly, the use of cameras in a 3D format would allow the recording of quality images during dissections so that the disadvantages caused by the lack in the number of corpses necessary for a growing number of students may be decreased. These images can be added to the traditional means of anatomy study. A challenge for us is the enormous amount of data generated, and there is a current need for dedicated databases, where data are stored in a standardized fashion.

So, the problem is: the number of the anatomy concepts remains relatively constant, but the modes of presentation have proliferated in recent decades, and the technology of the future will likely bring new changes in the teaching process.

For example, often the student reads the anatomy concepts from a treaty and visualizes the images on an atlas. Many times we have asked ourselves the question: why there isn't a treaty to have on the left the systematized theory notions and on the right the iconography related to theory.

Also, there was a time when only the didactic atlases with colour images drawn were used, followed by the atlases with images from the dead body with anatomical structures presented through video acquisitions during classic or laparoscopic surgery. This subject raises a discussion regarding the publishing of atlases that would present on the left page the didactic coloured image and on the right the real image from the dead body or during surgery.

Then, the problem of the results evaluation is raised. Any educational process ends with students' assessment. There were and there are still various controversies on this subject. The earliest methods of examination involved practical and theoretical tests. The classic practical exam involves the recognition of certain anatomical structures on dissection preparations or sections of the different topographic regions.

To these we can add the recognition of anatomical formation on paraclinical investigation images: X-rays, CT with or without contrast dye, nuclear magnetic resonance. Other evidence implies the highlight of certain anatomical structures through their dissection by the student, namely the so-called anatomical findings, while others have mentioned the use of human living models. We believe that currently, three-dimensional images obtained by dissection or by video acquisitions during surgery should be introduced. Theoretical examinations involve the written or oral presentation of anatomical concepts systematized by the student. They tried to use multiple choice tests.

Nowadays, databases to analyze the storage of knowledge by students might be created. Anatomy study should not be completed in the 2nd year of medical school, instead the student, by means of a harmonized curricula, shall

continue the process of understanding the anatomy in the 3rd, 4th and 5th year by means of optional and facultative subjects such as clinical anatomy, imagining anatomy, joint biomechanics (Moore et al, 2012).

We believe that a correct assessment of the knowledge acquisition by students and the collating of the knowledge level with the type of teaching will lead to the establishment of the correct proportions regarding the allocation of time for each method of study of the anatomy.

Thus, comparative studies between various faculties of medicine in different countries and continents may be established and the impact of each method of presentation of the anatomy can be taken into account. The processing of these databases accompanied by psychological studies and by meetings of the Anatomists from various parts of the world would create the premises for the achievement of a modern method of study of human anatomy.

Anatomy is one of the few disciplines of medicine where no changes occur, as the structure of the human body remains the same. Yet, every teacher struggles permanently to improve their course. All the time, they have tried to strike a balance between the number of concepts presented and the iconography quality, the type of analyzer used in reception and the understanding by the student. We ask ourselves, since teachers were compared to actors and the actors play in plays and then the films came into being, wouldn't it be better in the future to use 3D images with the anatomy teacher. Thus, better and better courses could be obtained, and the teacher will sit at his/her chair in the classroom and interact with the amphitheater. There will still be questions from students about the understanding of certain structures.

Thus, the teacher will be able on the one hand to explain these unknown subjects to the students, access pictures or demonstrations to clarify the concepts and upgrade their course based on the redundancy and importance of questions. Certainly, technology enables the achievement of these holograms but the presence of the teacher in the room is still needed in order to achieve interactive courses. From the standpoint of economy it would seem that individual laboratory work should be assigned to a pupil when it is necessary for him to experiment to obtain information essential to the solution of his problem and which cannot be obtained first hand by other means or when it is desired that he acquire certain manipulative skills.

We could be accused of using a "playback" as in music, but the originality of the method and the positive repercussions on teaching, accompanied by the moderation of presentations due to the actual presence in the amphitheater of the teacher will remove any suspicion. Anyway, time will prove the effectiveness of the anatomy presentation methods.

Another issue of interest related to anatomy study is the existence of anatomical variants. In the old anatomy treaties, and in some new treaties as well, variable percent's describing the incidence of these variants are mentioned. These were schematized, images during dissections were kept and anatomical drawings were made. Today, technology allows the establishment of databases.

Thus, the global storage of these anatomical variants which would be useful to any physician who is specialized in surgery could be achieved. Descriptions can be performed and they can be systematized according to topographic region.

Just as in the case of a more complicated surgery the doctor reviews the imaging anatomy of the patient, the atlas anatomy, and the surgical techniques, in the same way, in case of the discovery of an anatomical variant during surgery she/he will be able to access this database in order to obtain valuable information for the proper development of the medical act.

Just as the harmonization of the curricula is a necessary act, we believe that the anatomy study should be harmonized through a better collaboration between university and through the involvement of other professionals from the fields of psychology and IT.

4. Conclusions

Our teaching practice made clear how important is the active student participation in the teaching – learning process.

The role of knowledge construction by students themselves in learning is really significant, reflected in the formation of critical and reflexive individuals and qualified professionals. Using these methods of cognitive behavioral training, we obtained a positive response from students, who declared being more interested; objectively, student participation in classes was improved.

Because bare anatomical knowledge could be acquired by students through many media (e.g., books, atlases, internet), the teacher should act as an ally and companion of the students in order to build strong, logical medical knowledge.

In short, the use of constructive psychological methodologies in the teaching of human anatomy facilitated the learning by the students, making it more significant than the traditional methodology.

References

- Clavert, P., Bouchaïb, J., Duparc, F., & Kahn, J. L. (2012). A plea for the use of drawing in human anatomy teaching. *Surg Radiol Anat.*, 34, 787-789. Epub 2012 Jun 16
- Drake, R., Wayne Vogl, A., Mitchell, A. (2009). *Gray's Anatomy for Students* (2nd ed.). Edinburgh: Churchill Livingstone
- Gibbs, G., & Jenkins, A. (1992). *Teaching large classes in higher education, how to maintain quality with reduced resources*. London: Kogan Page
- Johnson, E. O., Charchanti, A. V., & Troupis, T. G. (2012). Modernization of an anatomy class: From conceptualization to implementation. A case for integrated multimodal-multidisciplinary teaching. *Anat. Sci. Educ.*, 5, 354-66. doi: 10.1002/ase.1296. Epub 2012 Jun 21
- Moore, K., Dalley, A., Agur, A. (2010). *Clinically oriented anatomy* (6th ed.) Philadelphia: Lippincott Williams & Wilkins
- Mota, M. F., Mata, F. R., & Aversi-Ferreira, T. A. (2010). Constructivist pedagogic method used in the teaching of human anatomy. *Int. J. Morphol.*, 28, 369-374
- Nayak, S. B., & Kodimajalu, S. (2010). Progressive drawing: a novel "lid-opener" and "monotony-breaker". *Anat. Sci. Educ.*, 3, 326–329
- Palombi, O., Pihuit, A., & Cani, M. P. (2011). 3D modeling of branching vessels from anatomical sketches: towards a new interactive teaching of anatomy: interactive virtual blackboard. *Surg. Radiol. Anat.*, 33, 631–636
- Stranding, S. et al. (2008). *Gray's Anatomy. The anatomical basis of clinical practice*. (40th ed.). Edinburgh: Churchill Livingstone
- Thiebaut, M. (2002). *Pour une éducation à l'image au collège*. Paris: Hachette

The Human Anatomy Dissector from SUNY Downstate Medical Center is the next best thing to being in the lab. You can study by working your way through their collection of dissection photos organised by laboratory sessions. Don't miss their online Anatomy Quiz that lets you customise your own quiz on arteries, bones, muscles, nerves and veins by regions. Stanford's Bassett Collection of Stereoscopic Images of Human Anatomy is an online resource. Stanford University School of Medicine's Bassett Collection of Stereoscopic Images of Human Anatomy is another great resource for clear dissection photos when modern means of laboratory investigations are also used and thus imaging anatomy came into being. X-rays, ultrasound, computed tomography, with or without contrast dye, nuclear magnetic resonance produce images which are viewed both by the specialist and by medical students and by the patients investigated. These images are often handed over to the patient who begins to study the loco-regional anatomy out of the desire of knowledge.

3. Actual trends and issues in the study of human anatomy. Each new method published in the anatomy study tried to impose itself over the other methods. Currently we have witnessed the uproar stirred by plastination. Of course there were times when the use of cadavers for the study of anatomy was dropped temporarily. The exact method used is variable. Some people study with flashcards, or by re-writing and summarizing content, others prefer to have a visual reference (cadaver, bones, atlas pictures) in front of them while they go through this step. The goal is to accurately label or list the structures that are present. Additional information may be included.

In physical therapy school, I practically lived in the cadaver lab. I did 100 percent of my studying for all my human anatomy written tests and lab practical tests there. My text book and Netter's Anatomy book were on a cart I pulled up to the table, and my gloves were on, with scalpel in hand. 20 years later I still know the anatomy when I need to know what goes where on the human body! Human anatomy is the study of the structure of the human body on a large and small scale. Learn study tips to help you learn all of the body systems.

Studying anatomy involves lots of memorization. For instance, the human body contains 206 bones and over 600 muscles. Learning these structures requires time, effort, and good memorization skills. Perhaps you can find a study partner or group that will make it easier.

Using standard anatomical terminology ensures that anatomists have a common method of communicating to avoid confusion when identifying structures. Knowing anatomical directional terms and body planes, for instance, enables you to describe the locations of structures in relation to other structures or locations in the body. Recent papers in Human Anatomy and Physiology Teaching Methodologies. People.

Methods and materials: A total of 168 aesthetic physicians underwent facial applied anatomy training for 2 days at The Academia, Singapore. The 2-day course encompassed detailed facial anatomy of neurovasculature, fat compartments, ligaments, and muscles followed by simulated practice of safer injection techniques.

Descriptive anatomical and structural study of LF at the cervical, thoracic and lumbar levels of the vertebral column in human cadavers is carried out here. The aim of the work is to clarify the anatomical features and fine structural differences in the human LF at different vertebral levels (cervical, thoracic and lumbar).