

# Active Methodology Applied to the Study of Human Anatomy: an Experience Report

Gustavo Coelho Tafuri Mota Coautore<sup>1</sup>, Camila Trindade de Abreu<sup>1</sup>, Jose Otávio Guedes Junqueira<sup>1</sup>, Gustavo Bittencourt Camilo<sup>1</sup>

<sup>1</sup>Department of Anatomy, Faculty of Medicine, Federal University of Juiz de Fora, MG, Brazil

**Disclose and conflicts of interest: none to be declared by all authors**

## ABSTRACT

**Introduction:** the current educational model has undergone several changes in recent years and the major universities and medical schools in the country are progressively implementing active models. In the teaching of Human Anatomy, they have gained unique prominence, as they are a new device for consolidating knowledge of an extremely important discipline that requires unique memorization.

**Objective:** this article aims to carry out an experience report on the implementation of the active methodology in the teaching of Anatomy.

**Experience report:** Aiming at success in anatomical teaching, the Federal University of Juiz de Fora, in its discipline Applied Anatomy to Medicine I, aims to reinforce the active relationship between professors, monitors and students. For this, a special seminar is developed in partnership with everyone, creative presentations and integrative classes are taught.

**Discussion:** there was great effectiveness in teaching the structures established by the schedule, while students acquired fundamental skills for their insertion in the job market. In addition, it is noted that the innovation in the creation of prototypes for the seminars evolves with each semester.

**Conclusion:** it is noticeable the need to expand the range of applications of the active methodology reported in other places, since it provided a satisfactory integration in all evaluated aspects.

**Keywords:** Anatomy; Active Methodology; Seminars; Prototypes; Case report.

## Introduction

Knowledge of Anatomy is based on careful analyzes of the structures of the human body. To this end, over the last few decades, this study has been involved in different processes of evolution, innovation and adaptation. Previously, the strategies were too much promoted in cadaver dissections, which are scarce in many Brazilian universities. Therefore, considering that this discipline is essential for the global understanding of Medicine, influencing Semiology, Internal Medicine, Radiology and Surgery, it is necessary to combine other teaching methodologies to improve academic knowledge<sup>1,2,3</sup>.

The methodologies permeated by the traditionalist model are widespread in several medical schools in the country, presenting, among their characteristics, an association of theoretical demonstrations in the expository model and practical classes in laboratory cadavers<sup>4</sup>. At the same time, there is an increase in the number of students and a reduction in the number of pieces under ideal study conditions, evidencing a difficulty for students learning<sup>2</sup>. Therefore, there is a growing difficulty in consolidating anatomical knowledge, given that memorization, as a result of this model, is established fleetingly.

In search of new perspectives, initial paradigms related to the anatomical study have been gradually

modified. Changing this scenario aims to actively involve academics in the teaching-learning process, ensuring a global aspect to the acquisition of content that he positions himself as the holder of a critical vision adequate to modernity<sup>4</sup>. In this way, the innovative structure brings together an enhanced understanding of Anatomy, ensuring greater efficiency in the acquisition of knowledge<sup>5</sup>.

The proposal for an active teaching methodology aims to ensure a more complete curriculum, enabling an intense relationship between the theory acquired and the practice<sup>5</sup>. Therefore, it is up to the teacher to establish an inclusive reality, based on dynamism, collaboration and dialogue with the student<sup>6</sup>. In view of this, the teacher stands out as a great simplifier in the process of obtaining information, while the student understands the link and assumes the main role in their own education<sup>5</sup>.

The Active Teaching-Learning Methodology (MAEA), although it had its beginning of employability in the 21<sup>st</sup> century, still appears insufficiently in many curriculum frameworks<sup>3</sup>. The objective of this strategy is the search for innovation regarding educational perceptions, with the in order to improve the student-teacher relationship. Therefore, the apprentice must have his own domain and pay attention to the social situation, aiming at his educational freedom<sup>3</sup>. For

this, the projects carried out by the academics must be aligned with the medical reality of the country, fostering the interest and stimulus for the realization of enlarging works for their graduation<sup>7,8</sup>.

One of the main virtues of active teaching is enabling students to engage in teamwork<sup>9</sup>. Certainly, groups are developed in a way that employs the principle of “learning to learn”, and they could acquire knowledge through collaborative integration, among the participants<sup>10</sup>. This quality reverberates in an easier absorption of anatomical knowledge, contributing to its real consolidation. In addition, this methodology provides the creation of a competent professional, capable of contributing to other colleagues in the health area, based on their active medical training<sup>9,10</sup>.

In view of this, the present work aims to carry out an Experience Report on the application of the Active Methodology in practical classes of Anatomy Applied to Medicine I at the Federal University of Juiz de Fora (UFJF).

## Experience Report

The discipline of Anatomy Applied to Medicine I at the Federal University of Juiz de Fora has an organizational division based on two teaching fronts: theory and practice. These two modalities are complementary, given that the applicability laboratories receive contributions from theoretical models, thus enhancing the learning of the syllabus. In view of this, we have as an example the expository classes on the Brachial, Lumbar and Sacral Plexuses, which constitute fundamental foundations for an effective understanding of structures of the Upper and Lower Limbs.

The construction of knowledge in practical classes is mainly based on real cadaveric pieces, with the anatomical complement of Osteology of the Axial and Appendicular Skeleton. In order to guide the acquisition of the contents taught, a Guide to Practical Classes is made available. In this way, it is up to the students to associate this material with the demonstration of the structures.

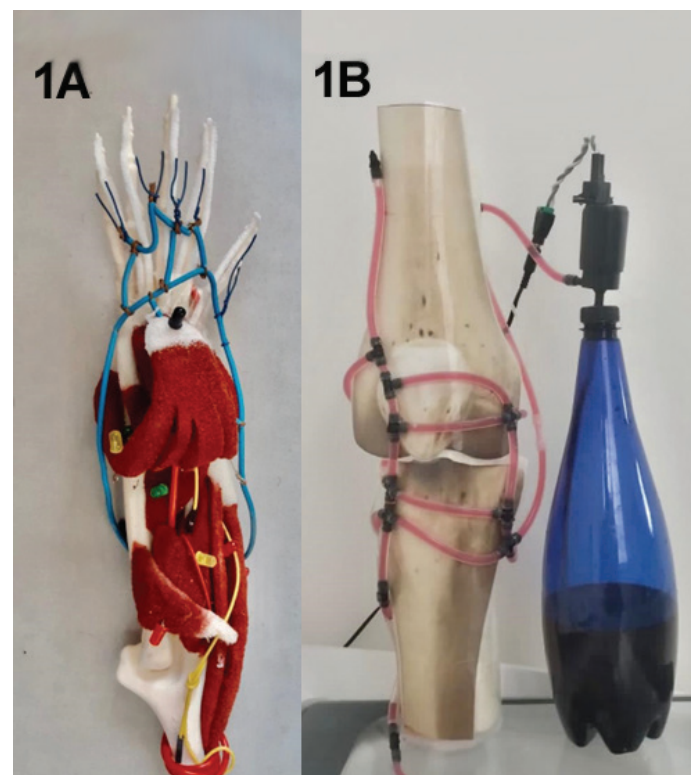
To help students, monitors are periodically choiced through a selection process. These, in turn, organize themselves into groups with a fixed mentor, who accompanies them until the conclusion of the activities. Among the attributions assigned to the monitors, there is the need to assist students in carrying out the projects, which constitute the pillar of the active construction of knowledge.

The main project promoted by the discipline is the holding of seminars. Initially, the teachers carry out a raffle of the theme and the student responsible for the oral presentation of the content. In this way, it is up to the other members to prepare the expository material that will be studied with the whole class, in addition to a playful prototype and interactive dynamics, in

order to substantiate the theory. Complementarily, the members distribute themselves in the other groups and perform an oral explanation of the script proposed for that class, acquiring the experience of “a day as a monitor”.

As for the portion of the prototype, which is based on playfulness, structures are developed that encourage innovation and learning among students. To do so, they choose a relevant theme within the proposed content, in order to demonstrate it in the form of pieces based on creativity. As an example, there is figure 1, which demonstrates artifacts made by academics, whose study of a certain region of the human body was made possible through practical analogies that resemble cadavers.

The work depicted in Figure 1A demonstrates not only the broad versatility, but also the artistry associated with the innovation provided by the active model. In this example, the twelve muscles of the dorsal region of the forearm were represented schematically from the approximation about their origins and insertions, thus facilitating their identification in practice. Concomitantly, the prototype makes use of basic electrical engineering to turn on the light corresponding to the stimulated part, associating it with its innervation and irrigation.



**Figure 1.** Prototypes developed by students. Figure 1A: Schematic and electrical representation of the dorsal antebrachial region. Figure 1B: Schematic representation of the genicular anastomosis.

The prototype developed and presented in Figure 1B demonstrates the broad applicability of the active methodology, enabling easier understanding of a

complex theoretical concept. The anastomosis is established due to obstruction of the main irrigation route, in which the collateral arteries take over the vascularization. Thus, the seminar highlighted this process that takes place in the genicular region, helping to understand the phenomenon that forms a network, with several arteries represented in the model, being crucial in the acquisition of content by the whole class.

As for the integrative part of the project, the participants develop activities with the aim of stimulating joint learning, relying on questionnaire dynamics and interactive games, as shown in figure 2. In addition, they take notes distributed throughout the room, aiming to fixing the content, exemplified in figure 3.

The questionnaire and the visual scheme shown, respectively, in figures 2 and 3 aim to express the concepts learned in theoretical classes in an effective way in practice. Memorization, critical analysis and knowledge were allowed by the active method employed, in addition to strengthening group work and the completeness of colleagues, who must answer questions quickly and accurately, since the response were timed. Concomitantly, the seminar is a way to make learning Anatomy more enjoyable, in which the academic develops more interest, stimulating cognition.

In order to prolong the study of the theme presented, the group of students disseminates their developed materials on online platforms. Thus, colleagues can later continue to be in contact with the demonstrations, pieces, questionnaires and notes made available. Concomitantly, the profile “@anatoljf” present in the Instagram® social network application exposes the works promoted.

Aiming to correlate Clinic, Surgery and Radiology with the anatomical knowledge acquired in practical and theoretical classes, the seminars also have case



Figure 2. Interactive quiz designed for one of the seminars.

reports. In this sense, students search for real articles and publications about a particular pathology, using radiography, ultrasound and magnetic resonance imaging to support the discussion. In an example of the presentation of a clinical case, the students highlighted the association between the anatomy of the lower limbs and the Baker’s Cyst, a synovial nodule in the posterior region of the knee, emphasizing the knowledge beyond the cadaveric pieces.

### Discussion

The Experience Report shown above, brings together elements about the active methodology based on group seminar presentations. It was observed that this form of learning is effective, as it provides the student with broad contact with several essential aspects of medical training. Bearing in mind that the works are playful and creative, the academic can develop skills that he has more aptitude for, such as drawing, assembling structures and preparing questions that aim to complement the study beyond the methods of theory and practice classics. With this, this new form of learning seeks to focus on strategies to base knowledge collectively<sup>11,12</sup>.

It should be noted the significant importance of incorporating innovations in anatomy courses that can increase student satisfaction, involvement and acquisition of knowledge. These improvements can

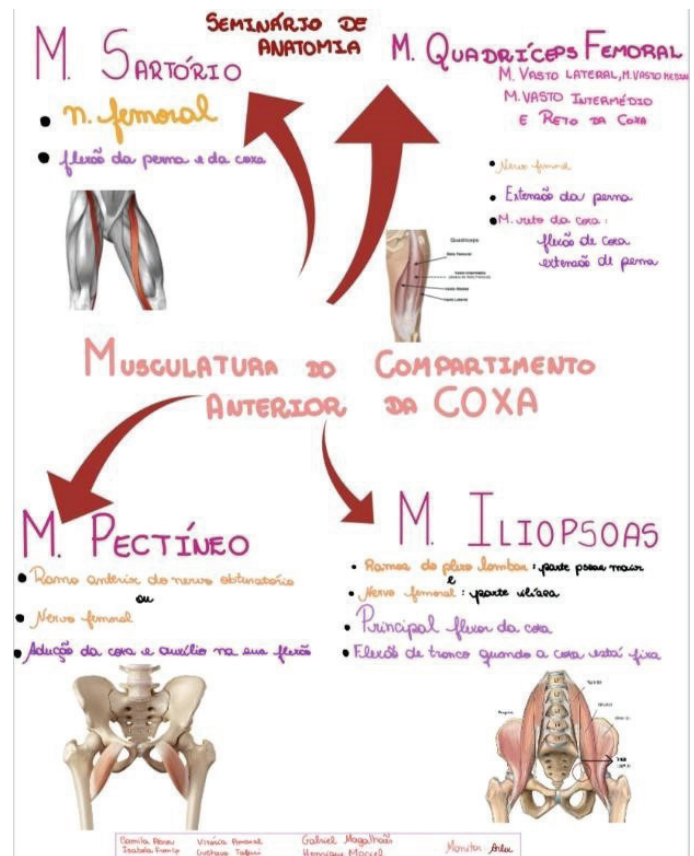


Figure 3. Visual scheme developed by the students, supporting the anatomical study of the anterior region of the thigh.

be largely attributed to the active methodology in association with new technologies and the appreciation of creativity in teaching that provide more authentic learning contexts, realistic practice environments and improved visualizations, which can facilitate the acquisition of basic knowledge and improve decision-making and clinical reasoning<sup>13,14,15,16,17,18</sup>.

Another important point to highlight is that social media are already a tool used for collaboration, information and knowledge sharing among colleagues, as well as between students and facilitators, being useful to improve personal skills and professional communication<sup>16</sup>.

Finally, other works have already reported the importance of students and monitors taking on a leading role in teaching and collaborating with teaching work, generating great satisfaction, greater approximation between students and already preparing students for a better experience in the job market<sup>14,15,16</sup>.

Bearing in mind that the structures studied in real cadaveric pieces can present anatomical variations, the

implementation of the seminars as one of the pillars of the discipline complements the study and facilitates the identification of these by the students. In addition, the fact that the activities are developed and designed in a group promotes, in the future, insertion in the job market, enhances a better coexistence between colleagues and helps in clinical practice.

## Conclusion

The educational scenario in the medical field highlights the need to expand the applicability of the active methodology, with the aim of stimulating not only learning, but also various technical and intellectual skills, bringing together a better future insertion of the student in the job market. Therefore, the integrality between professor and student, combined with the help of monitors, allows the seminars to persist, encouraging the theoretical-practical study of students who study Applied Anatomy to Medicine I at the Federal University of Juiz de Fora.

## References

1. Carvalho CAF. Utilização de Metodologia Ativa de Ensino nas Aulas Práticas de Anatomia. *Rev. Grad. USP* 2017;2(3):117-21.
2. Singh K, Bharatha A, Sa B, Adams OP, Majumder MAA. Teaching anatomy using an active and engaging learning strategy. *BMC Med Educ*. 2019;19(149):1-9. doi: 10.1186/s12909-019-1590-2.
3. Campos BM, Pelizon CM, Santos JMC de S, Carrocini JC. Revisão integrativa de ferramentas inovadoras para ensino-aprendizagem em anatomia em curso de Medicina. *Rev bras educ med* 2022;46(4):1-9.
4. Rocha DP, Silva KGA da, Montenegro IHP de M, Schwingel PA. Alternative methods for human anatomy teaching: systematic review. *RSD* 2021;10(16):1-13.
5. Strini PJSA, Strini PJSA, Bernardino Júnior R. Metodologia ativa em aulas práticas de anatomia humana: A conjunta elaboração de roteiros. *Ensino Em Re-Vista* 2020;27(2):680-97.
6. Carabetta Jr V. Metodologia ativa na educação médica. *Rev. Med*. 2016;95(3):113-21.
7. Silva VAM da, Ferreira Filho AR, Rocha DP, Montenegro IHP de M. Estratégias virtuais de ensino-aprendizagem em anatomia humana. *Revista de Saúde Digital e Tecnologias Educacionais*. 2022;7(1):27-40.
8. Valadão Bittar R, dos Reis Neto JA, Tenório de Albuquerque Filho E. ESTUDO AVALIATIVO & COMPARATIVO DA APLICABILIDADE DE METODOLOGIAS ATIVAS (PBL) NO APRENDIZADO DE ANATOMIA HUMANA NOS CURSOS SUPERIORES DAS ÁREAS DE SAÚDE. *CBioS* 2019;5(2):41-50.
9. Alegriani P, Segato GF, Prevedello AS. METODOLOGIA ATIVA NA GRADUAÇÃO MÉDICA: A VISÃO DOS DISCENTES DA SAÚDE SEGUNDO A LITERATURA. *Rev. Faed*;28(2):99-112.
10. de Melo EAS, Matos Júnior A, Barbosa GR, Sampaio I de M, dos Santos L da CM, Cavalcanti RJF, da Silva AL, Nery JS, Lopes MR, de Santana MAD, da Fonsêca DV. CONCEPÇÃO DE DISCENTES ACERCA DAS METODOLOGIAS DE ENSINO ADOTADAS PELAS ESCOLAS MÉDICAS. *REVASF* 2018;8(15):129-141.
11. Vieira MNCM, Panúncio-Pinto MP. A Metodologia da Problematização (MP) como estratégia de integração ensino-serviço em cursos de graduação na área da saúde. *Medicina* 2015;48(3):241-8.
12. Rocha, Antônio & Silva, Ivina & Ribeiro, Ana & Brito, Lívia & Holanda, Júlia & Veras, Christianne & Bastos, Karinn. (2022). Metodologia ativa de ensino-aprendizagem do plexo braquial na disciplina de Anatomia Humana da Universidade Federal do Piauí. *Research, Society and Development*. 2022;11(14):1-9.
- 13- Camilo GB, Maciel SM, Camilo GCT, de Oliveira Andrade KF, de Oliveira B, da Silva Silveira R, Ferreira INB, da Silva Fernandes C, Ferreira MV. Introducing medical students to radiological anatomy: The importance of experiential learning during the Covid-19 pandemic lockdowns. *Anat Sci Educ*. 2022;15(5):980-984. doi: 10.1002/ase.2210.
- 14- Camilo GB, Junqueira JO, de Castro Teixeira HG, Resende AB, deOliveira AG, de Freitas Batista Mendes P, Toledo GC, Ferraro MC, de Oliveira Junqueira TB, de Oliveira Junqueira BB. 2021. Vascular radiological anatomy and the development of interactive teaching platforms. *Sci Med Porto Alegre* 2021; 31:1-5.
- 15- Corrêa LD, Silva BO, Camilo GB, Toledo Camilo GC, Maciel SM, Bastos MG. 2022. Early incorporation of ultrasound into the medical curriculum through its association with human anatomy. *J Morphol Sci* 2022;39:77- 80.
- 16- Sousa AL, Tubenchlack AL, Muffato BG, Cyranka CM, Vaz LF, BerzoiniPH, Dias YH, Camilo GB. Mobile learning in teaching radiology in times of social isolation. *Rev Assoc Med Bras* 2021;67:1525-8.
- 17- Toledo GC, Schreider A, Camilo GB, Basile Colugnati FA, da SilvaFernandes NM, Bastos MG. Abdominal ultrasound augments the medical students' ability to identify free intraabdominal fluid. *Rev Assoc Med Bras* 2021;67:195-199.
- 18- Camilo GB, Toledo GC, Olímpio Júnior H *et al*. Teaching point-of-care transfontanellar ultrasound for pediatricians and medical students. *J Pediatr*. 2021;97(2):1-7.
19. Mattos MP. Metodologias ativas auxiliando no aprendizado das ciências morfofuncionais numa perspectiva clínica: um relato de experiência. *cmbio* 2017;16(2):146-50.

## Mini Curriculum and Author's Contribution

1. Gustavo Coelho Tafuri Mota: Conceptualization Methodology, Project administration, Supervision, Validation, Visualization, Writing-review & editing.
2. Camila Trindade de Abreu: Methodology, Supervision, Validation, Visualization, Writing.
3. Gustavo Bittencourt Camilo: Conceptualization Methodology, Project administration, Review & editing.
4. Jose Otávio Guedes Junqueira: Conceptualization Methodology, Project administration, Review & editing.

Received: November 26, 2023  
Accepted: December 11, 2023

Corresponding author  
Gustavo Bittencourt Camilo  
E-mail: [gustavo.bittencourt@ufjf.br](mailto:gustavo.bittencourt@ufjf.br)