Active methodologies in human physiology teaching: experience report in the medicine course

Metodologias ativas no ensino de fisiologia humana: relato de experiência no curso de medicina

DOI: 10.55905/revconv.16n.8-077

Recebimento dos originais: 03/07/2023
Aceitação para publicação: 03/08/2023

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ABSTRACT
The medical curriculum traditionally has divisions such as the basic cycle and the clinical cycle, in which the first includes subjects and areas of knowledge that serve to guide and subsidize the clinical reasoning built in the second. Among the subjects of the basic cycle, Human Physiology is included, responsible for studying the physiological processes that determine the state of balance in the organism. However, not infrequently, it is noted that some obstacles hinder the study of physiology: high workload, complexity of subjects, and interest of students. In this sense, this study aims to present an experience report on the importance of monitoring in the discipline of physiology as an opportunity for active methodologies. During the monitoring, the organic systems studied were worked on in the form of clinical cases, which required reasoning, study, and participation from the students. At the end of the semester, an online questionnaire was constructed to obtain students' opinions about the impact of monitoring on their learning. As a result, based on the assessment made by the students, monitoring exerted a positive influence on the process of studying physiology, since students were able to practice what was learned in class, bringing the subject closer to medical practice.

Keywords: monitoring, human physiology, active methodologies, high education.
RESUMO
A grade curricular de medicina possui, tradicionalmente, divisões como ciclo básico e ciclo clínico, em que o primeiro inclui matérias e áreas do conhecimento que servem para nortear subsidiar o raciocínio clínico construído no segundo. Dentre as matérias do ciclo básico, inclui-se a Fisiologia Humana, responsável por estudar os processos fisiológicos que determinam o estado de equilíbrio no organismo. Entretanto, não raro, nota-se que existem alguns obstáculos que dificultam o estudo da fisiologia: carga horária alta, complexidade dos assuntos, interesse dos alunos. Nesse sentido, o objetivo desse estudo é fazer um relato de experiência sobre a importância da monitoria na disciplina de fisiologia como oportunidade para metodologias ativas. Durante a monitoria, os sistemas orgânicos estudados foram trabalhados na forma de casos clínicos, que exigiam raciocínio, estudo e participação dos alunos. Ao final do semestre, um questionário online foi construído para obter a opinião dos alunos sobre o impacto da monitoria no seu aprendizado. Como resultado, com base na avaliação feita pelos alunos, a monitoria exerceu influência positiva no processo de estudo da fisiologia, uma vez que os estudantes puderam praticar o que foi aprendido nas aulas, tornando o assunto mais próximo da prática médica.

Palavras-chave: monitoria, fisiologia humana, metodologia ativa, ensino superior.

1 INTRODUCTION
Graduation in Medicine is known to be divided, in the traditional way, into some stages, such as the primary and clinical cycles, the first of which plays a vital role in understanding the second. However, numerous variables (curriculum, student interest, didactics used) can influence the quality and effectiveness of learning in these disciplines, defined as a base, Human Physiology (RIBEIRO et al., 2020).

The Human Physiology discipline represents the opportunity to contemplate the mechanisms of action of different organs, to be dazzled by the existing connections between different organic systems in favor of homeostasis (a state of equilibrium of the organism), to contextualize the function of other subjects of the primary cycle – anatomy, histology, biochemistry – and, above all, to develop an arsenal of thoughts to guide the understanding of medical specialties. In this context, Silva and Resende (2008), correlate a solid understanding of basic medical disciplines with a deeper understanding of a patient's health conditions, that is, with forming a better-prepared professional.

However, as previously mentioned, many obstacles can exist and affect, in varying degrees, the understanding of Human Physiology. In this sense, Alves et al. (2013) express some aspects that should be analyzed, such as the absence of contextualization between disciplines and
a curriculum focused only on diagnosis, treatment, and prophylaxis of diseases. In addition, extensive disciplines, with much information to discuss and process, concentrated in a short period, can affect the quality of the construction of the base in physiology. In this context, monitoring in Physiology becomes a vital teaching practice in content learning by students and the monitor.

The monitoring activities stand out for their contribution to students and student monitors’ teaching and training process, increasing the diversity of methodologies to approach certain concepts and making studying Human Physiology attractive (ALVES et al., 2013). In addition, monitoring is defended as an opportunity for active study, providing space for reviewing information, discussing key points in understanding certain subjects, and clarifying doubts (ALVES et al., 2013b). Furthermore, monitoring is essential to awaken interest in teaching practice, as it allows the development of personal skills of the student monitor (BOTELHO et al., 2013).

The more traditional teaching strategy is based on the unilateral transmission of knowledge, whose conservative vector directs from the teacher to the student, using little or no technological device and reducing the student's participation and interest in the content taught. Active teaching methodologies, by definition, distance themselves from the exposed problem since they use challenges, activities, games, and problem situations to make the class more collaborative and dynamic. Therefore, such strategies are presented as a handy tool in teaching Human Physiology since they allow cognitive integration and a deeper work of reflection, enabling dialogue between students and reducing a passive learning experience where no critical thinking is possible, is formulated (FREEMAN et al., 2014).

Furthermore, active methodologies are intrinsically linked to the profile of health professionals (SETTE-DE-SOUZA & SILVA, 2016; MARQUES, 2023) as they are essential for developing autonomy, creating a basis for solving subsequent problems, creating interest in acquiring new knowledge, and overcoming challenges (PAIVA et al., 2017).

Given the above, the present study aims to report the experience of monitoring the module of Physiological Processes of the Human Being, describing the activities carried out, defending it as an active methodology strategy, and exposing its notorious contribution to the professor, students, and student monitor in the experience of contact with Human Physiology. In addition, the relevance of disseminating active methodology strategies within the teaching disciplines in
the health area is also highlighted since improved didactics and the quality of academic training must always be encouraged.

2 METHODOLOGICAL PROCEDURES

The Physiological Processes of the Human Being module, a curricular component of the medical course at UNIFASB/UNINASSAU, aims to teach the physiological mechanisms that contribute to the human body's homeostasis, with a total workload of 140 hours, distributed in seven weekly periods. Monitoring was carried out in the second semester of the year 2022, during the second academic semester, in person in the classroom, for a class of about 52 medical students. The activities were mainly based on using clinical cases created by the monitor as a resource for reinforcing physiological concepts and for the clinical applicability of the learned theory, always aiming at an active and contextualized review of knowledge. The organic systems addressed were the renal, respiratory, gastrointestinal, and endocrine systems.

The first system worked on was the renal system. The chosen approach presented a fictitious clinical case using the following methodology: the students were presented with the patient's clinical picture. Then, they were asked to formulate their hypotheses, test their knowledge, and apply the theory learned to the clinical picture presented. The discussion was then mounted on the use of the problems presented by the fictitious patient to illustrate the importance of the physiological concepts of the urinary system.

Physiological concepts were employed to monitor the respiratory, endocrine, and gastrointestinal systems, including relevant glands such as the liver, pancreas, and salivary glands. The selected disease was adjusted to represent the specific organic system under observation accurately. Regarding monitoring the digestive tract, which includes the esophagus, stomach, and small and large intestine, secondary semiological aspects were correlated with pathophysiological processes affecting the segments mentioned above. This approach aimed to emphasize the significance of physiology by demonstrating the consequences of homeostatic imbalances leading to pathological conditions.

Apart from attending to clinical cases, the monitoring time was also allocated to students who were required to answer questions pre-designed by the professor responsible for the Physiological Processes module and monitoring. This enabled them to employ the guiding questions to elicit prior knowledge and evaluate each student's proficiency in certain content
through personal analysis. Furthermore, the student monitor facilitated discussions on relevant topics that needed to be covered in the module, such as study techniques, academic progression, and scientific exposure.

An online questionnaire was created with Google Forms to study the impact of monitoring on students' learning process. The questionnaire consisted of six multiple-choice and discursive questions aimed at evaluating the helpfulness of monitoring during physiology studies and obtaining constructive criticism for future monitoring to improve efficiency and didactics. It was made available for 15 days, and 15 responses were received, representing approximately one-third (33%) of the total students. To ensure greater confidence in the opinions expressed, the answers were identified by name, and registration numbers were requested to verify the possible existence of more than one answer per student.

3 RESULTS AND DISCUSSION

A set of four clinical cases were developed, each focusing on a specific theme related to human physiological processes. The first case explores the topic of acute kidney injury and the disruption of renal physiology homeostasis. The second case delves into the pathophysiology of chronic obstructive pulmonary disease. The third case is centered on liver cirrhosis. All cases are designed to provide in-depth analysis and understanding of these complex medical conditions.

The clinical cases were thought of and elaborated to deepen and relate the theoretical content with the clinical one. It was notorious for their difficulty building this relationship, but at the same time, the effort to build this theoretical-practical relationship with the monitor teacher. Faced with this context, the monitor teacher inserted the students with an active role in the joint construction of their learning. According to Christie van Diggele et al. 2021, such activity provides a basis for students to develop and practice their skills in interprofessional teamwork while refining them for significant and actual clinical steps, experiencing authentic cases that relate to the reality of medicine. Studies with a pedagogical approach focused on the student's reality, such as active methodologies in higher education, have been widely used in different contexts and courses in the health area (SETTE-DE-SOUZA & SILVA, 2016; MARQUES, 2023; MONTREZOR, 2016; RODRIGUES et al., 2021).

This study examined the significance of teaching physiology in students' understanding. Our questionnaire began with the question: "What are the difficulties you encounter when
learning physiology?" The responses confirmed the challenges mentioned previously, with the amount and complexity of the subject matter being the primary obstacles. Over four months, students had to comprehend quite complex topics and understand how different organ systems function in the human body. This presented a challenge for students since they also had to allocate time to review the material covered in class. It has been shown that the brain tends to forget information that is not reviewed regularly, thus highlighting the significance of revisions. Furthermore, recent findings in neurophysiology demonstrate that emotions impact memory. As a result, monitoring progress becomes critical since it facilitates the review of fundamental concepts and helps students overcome the challenges they face when studying physiology.

Regarding the same question described above, another topic addressed by students as a difficulty in learning physiology was the lack of applicability of concepts. In this context, by bringing clinical cases to illustrate key physiology concepts, monitoring activities were also based on the deconstruction of this more conservative teaching, in which theory is far from professional practice (IRBY & WILKERSON, 2013; MUDALY & MTSHALI, 2018).

Figure 1: Results obtained related to learning difficulties in Physiology.

WHEN IT COMES ABOUT THE LEARNING OF PHYSIOLOGY, WHAT DO YOU THINK IT’S AN OBSTACLE?

- The amount of subjects/the workload dedicated
- How difficult the subjects are
- Lack of clinical applicability

![Pie Chart](https://via.placeholder.com/150)

Source: Authors (2023).
In the third moment, the intention was to analyze the perception of the discipline's students about the importance of monitoring their training process, as well as about the performance of the monitor. To answer these concerns, four questions were developed, presented from the second to the fifth question, described below.

The second question in the questionnaire was multiple choice and asked: “The monitoring activities aimed to contribute to learning physiological concepts, relating them to clinical aspects. In your opinion, what was the monitoring performance about this objective?” Among the five response options (terrible, wrong, fair, reasonable, and excellent), 14 students (93%) answered “excellent.” In contrast, one student (7%) answered “good.”

The third question provided a space to argue answers. The monitor highlighted the didactics, language, and mastery of the subject. Four students (25%) did not justify their answers.

The fourth question was also a multiple-choice question. The question was asked: “Do you think that the strategies adopted in monitoring changed your way of seeing the importance of physiology?” The answer options were: (1) yes, I started to find physiology more critical; (2) yes, I found physiology less important; (3) there was no change in my perception. The 15 students, when choosing the first alternative, corroborated the feeling that the moments dedicated to monitoring activities were critical to the construction of a more careful look at physiology, making it an area of medical knowledge most valued by part of the students. This finding in the questionnaire reinforces the defense of monitoring as a valuable tool in constructing the health professional.

The fifth question was: “Do you think that the approach adopted by the monitoring contributed to a better learning of physiological concepts?” Again, the 15 students stated that there was a contribution to the learning process. Finally, since monitoring activities are aimed at students, the last question consisted of possible suggestions students had to offer. Among the points raised, the students mentioned “more monitoring time,” “passing more questions about the subjects,” and “taking more classes with physicians.” 11 students (73%) made no suggestions.
Because of the results obtained through the questioning, some points can be highlighted: (1) the monitoring achieved its objective of mitigating the efforts that the medical student's understanding of human physiology may require. This has very positive consequences for the future health professional that these individuals will become since a solid understanding of basic concepts is essential for the safe practice of the profession (SILVA & RESENDE, 2008).

(2) Monitoring, when well planned and executed, manages to provide an exciting exchange of information between the student monitor and the students, and this communication is better established when there is good communication on the part of the monitor, in addition to the ability to arouse curiosity and encourage student participation. In this, the reasoning and speaking skills of the participants are also developed, and the importance of these skills cannot be underestimated since competent professionals who act with dexterity are expensive for the current professional field (SAWATSKY et al., 2014); In addition, students value conversations with other students from different professional degrees, as this allows them to solve problems together and learn different perspectives on clinical cases, in addition to providing educators with...
the opportunity to design collaborative teaching and facilitate the clinical execution of theoretical knowledge (BURGES et al., 2020).

(3) since the practice of medicine is increasingly technological, the education of future physicians must also follow this advance. In other words, under the influence of specific demands, the teaching model that is restricted to the classroom and that places the teacher as the center of attention becomes outdated, requiring new investments in technologies such as the use of realistic simulators with virtual reality and augmented (MORO et al., 2020), such as the use of the metaverse (MORO et al., 2022).

Another issue to be highlighted is that monitoring is a potential activity for discovering teaching. In this context, the monitor can develop personal communication and teaching skills and review subjects previously seen by him. Authors corroborate this fact, citing that monitoring can awaken the teaching activity as the monitor begins to observe and understand a teacher's complex assignments, which go far beyond preparing and teaching classes on the curricular component in question (SANTOS & BATISTA, 2015; COSTA et al., 2021).

Physicians and all health professionals also need to develop as teachers, as they will be dealing with health education when exercising their profession (BURGES et al., 2020), and more adherence is needed, especially in the medical field.

Feitosa et al. (2023), mentions that the monitoring process emerges as a moment of opportunity for the monitor, both personally and intellectually. Through the contributions exchanged with the monitored students, the monitor develops interpersonal relationships regarding the reciprocity of knowledge between the professors of the disciplines and the student monitor, enriching the skills inherent to teaching, deepening the knowledge, and transmitting it to the monitored ones (FEITOSA et al., 2023).

Azevedo et al. (2023), reports the monitoring experience in a nursing course, letting the monitoring process contribute to both the monitor and the student, especially for the academic development of the monitor. Another study (FERNANDES et al., 2020), mentions that this area of knowledge exchange collaborates in training professionals attentive to improving their attitudes since college, enabling a more humanistic and competent medical education to serve the population in which they are inserted.
Finally, a study carried out in the same university center and in the same context discusses the challenges that tutoring students find to look for monitoring jobs in medical teaching, also highlighting the importance of such work (da FONSECA & MARQUES, 2023).

4 FINAL CONSIDERATIONS

The medical curriculum must keep pace with the latest advancements in the dynamic realm of education. While it may seem challenging to keep up with the extensive syllabus and the need to cover copious amounts of information each term, trainees can leverage this opportunity to sharpen their abilities in building clinical cases by attending monitoring sessions.

Through the execution of this activity, the monitor gained valuable experience in supervisory responsibilities, study orientation, teacher development, clinical reasoning, and reflection on the significance of communication in the educational process. It is crucial to emphasize the necessity for conducting research and publishing relevant studies that chronicle academic progress in medicine in Brazil, specifically to encourage student participation in this teaching practice and to report the successful outcomes of academic community-driven initiatives.

ACKNOWLEDGEMENTS

The authors thank the students who voluntarily participated in the research.
REFERENCES


ANEXOS

Graphical Abstract

ACTIVE METHODOLOGIES IN HUMAN PHYSIOLOGY TEACHING: EXPERIENCE REPORT IN THE MEDICINE COURSE

Monitoring in Physiology

Clinical Cases

Investigative Questionnaire

Source: Authors (2023).