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Anatomy Classroom: Rethinking Teaching Practices

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Abstract

Human anatomy is a fundamental area for the training of health professionals, presenting itself as a foundation in their formation. However, the methodological path adopted in teaching practice in the course of this discipline is based on traditional methodologies. However, contemporaneity calls for new form and approach in the pedagogical course, inquiring and rethinking the anatomy classroom through different practices and active methodologies with the insertion of technological resources. Thus, the present research aims to investigate the different teaching practices applied in the anatomy classroom through an integrative review. An integrative review of the literature was performed through research in electronic databases: Science Direct and SciELO. The inclusion criteria were: studies that answered the guide question, research with human beings, published from 2015 to 2021, in English, Spanish and Portuguese. It was verified that there are a number of tools and strategies that can be used to teach the most attractive of human anatomy, stimulating the development of the skills and competencies of health students.

Keywords: methodologies; teaching; human anatomy.

1. 1. Introduction

Human Anatomy is a classical discipline that aims to understand the complexity of the human body, transcribing its high individual variability. It is a complex and essential knowledge for all courses in the health area, presenting itself at the beginning of academic training, giving support and solid foundations for professional training.

In the current contemporary scenario, the teaching of Anatomy has undergone structural changes, caused by the curricular reforms of health courses, essential for the panorama of the new guidelines. In a scenario that has become so simple to transmit information, it is essential to put education beyond this transmission, stimulating the search for scientific knowledge (Fornaziero et al., 2010; Fornaziero & Gil, 2003).

Thus, with the various technological advances already available, it is believed that there are possibilities for changes in pedagogical practices in the educational context, since technology is present in the daily lives of students and that the teaching-learning process must dialogue, in a way consistent with the reality that the student experiences.

This process must be widely discussed, so that coherent pedagogical proposals are applied in the classroom, valuing differences. Therefore, it is not prudent to be faced with practices that are repeatedly routine, stereotyped, repeatedly, which submerge the potential for critical analysis of reality and educational problems (Basso, 1998).

The related didactic-pedagogical evolution, specifically in the context of Anatomy, is influenced by several factors, among which: advances in digital technology, integrating advances in digitized images that provide the visualization of 3D structures; difficulty in obtaining cadavers for dissection; increase in the number of students; reduction of time to study structures, etc. (Silva et al., 2018).

To observe the complex relationship between technological evolution and real learning needs, it is necessary to think about the educational and learning value (Bello & Brenton, 2011). Thus, the teaching of Human Anatomy arises through new methodologies and strategies, to make the teaching process effective.

The following questions are asked: what is the relationship between active methodologies and technologies in anatomy teaching? How to rethink the anatomy classroom and its teaching practices? Thus, this research aims to investigate the different teaching practices applied in the anatomy classroom through an integrative review.

Currently, teaching strategies are considered as significant as learning contents. In this way, traditional methodologies are being rethought throughout the intellectual community that seek to identify their deficiencies by proposing methodological innovations for teaching and learning (Paiva et al., 2017). However, this study seeks to rethink the different practices used in the anatomy classroom and their possibilities of innovation for the teaching and learning process in anatomy.

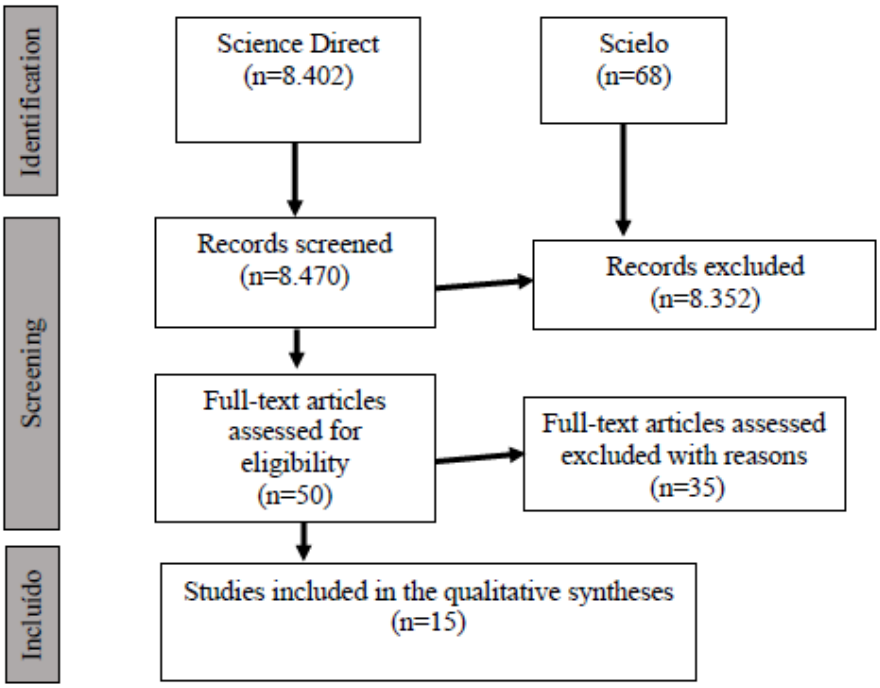
2. Methods

This study is an integrative literature review. The descriptors were selected from the Health Sciences Descriptors (DeCS). The one for other scientific topics, specialized in research, was multilingual created by BIRE to serve as a language, indexing of conference articles, technical reports and types as to be used in the research of materials and book studies Scientific literature in the available information sources.nThe following descriptors were used: teaching, active methodologies and human anatomy. Two search strategies were constructed: "teaching and human anatomy"; "active methodologies and human use anatomy".

The databases used were, Scielo and Science Direct, we chose to configure the period from 2015 to 2021, in Portuguese, English and Spanish, excluding patents and citations, so we obtained approximately 68 in Scielo, Science Direct 8,402, totaling the two databases. with 8,470.

The inclusion criteria adopted were studies that answered the guide question, quantitative and qualitative articles, published in Portuguese, English or Spanish, articles related to the theme "methodologies in the teaching of human anatomy, including, original research articles with human beings.

Thus, abstracts, editorials, literature review articles, and articles that were in duplicate, theses, dissertations, monographs were excluded.



Adapted from Moher et al. (2009). n = number of articles.

Figure 1. Flow diagram of study selection for the integrative review.

The process of selecting the articles was based on the following steps: 1) Reading and analysis of the titles and abstracts of the articles; 2) Organization and ordering of identified studies; 3) Reading the articles in full. Figure 1, called Prisma Flow, presents more detailed information on the selection, inclusion and exclusion of the studies searched in the databases.

3. Results

For analysis, the following variables were collected: author and year, objective, interventions methodologies, main results, conclusions (Table 2). It is noteworthy that the included studies were published in the period 2015 to 2021, presented in Table 1.

Table 1. Number of studies presented per year

Year	Quantity (No.)	Percent %
2017	1	6,7%
2018	3	20%
2019	3	20%
2020	4	26,6%

2021	4	26,6%
Total Studies	15	100%

Source: Survey data, 2022.

Table 2. Summary of studies included in the integrative review.

Title	Author and year	Objective	Methodological Interventions	Results	Conclusions
Anatomicis Network: An Educational Software Platform Cloud-based to Improve the Teaching of Anatomy in Medical Education	Inzunza et al., 2017	Educational software platform to improve anatomy teaching.	Educational Software Platform to access 2D and 3D anatomical images, videos and online multimodal theoretical and practical assessments.	The technologies were evaluated positively, between 66% and 89%, in educational aspects such as accessibility to images and animations, as well as their quality and relevance aspects.	A new approach and platform is needed where institutions with greater resources share their material with the less fortunate. This points to equity in access to information.
Teaching-learning of human anatomy: evaluation performance of students after the use of maps conceptual as a pedagogical strategy	Foureaux et al., 2018	Implement and evaluate the impact of the development of Concept Maps (MC) as a pedagogical strategy in teaching and learning.	Conceptual Maps (MC) as a pedagogical strategy in the teaching-learning of Human Anatomy.	The analysis of the final averages, before the project. The MC was also able to promote the reduction of failure.	The MC seems to have contributed to improve performance and approval in Human Anatomy.
Human Anatomy	Kurniawan et al.,	Development of a human	The method used is an augmented	This method showed better	Advantages, such as clarity and ease

Learning Systems Using Augmented Reality on Mobile Application	2018	anatomy learning system using augmented reality technology.	reality marker system on a mobile processing platform.	learning through the interactive visualization of augmented reality.	of understanding of the 3D anatomical model, providing different options for Visualization of various organs of the human body, meeting quality learning requirements.
Web based Augmented Reality for Human Body Anatomy Learning	Layonaa, Yuliantb, Tunardic, 2018	Development of an Augmented Reality application to learn the anatomy of the human body.	Applications are made using the waterfall method which includes planning (data collection and analysis), design (user interface and diagram), implementation and testing.	An Augmented Reality app for learning human body anatomy that contains 3D object, organ and position explanation that can be accessible on the web.	Application can be used as an alternative method to learn anatomy. Apps increase interest in learning more about anatomy.
Problem-based learning strategy in the Anatomy subject of the Degree in Medicine	Bautista; Tania Erika Román, 2019	Design, apply and Evaluate a PBL strategy to promote the development of critical meaningful learning.	Application phase: strategy design and development and validation of assessment instruments; situational diagnosis; implemented and final evaluation.	With the PBL strategy in anatomy, it was achieved that the majority of participants will achieve a better critical learning significantly.	It is necessary to continue proposing new methodologies that enable the construction of the value of knowledge.
Developme nt of active methodolog ies for the	Santos et al., 2019	Elaboration, application and experience of	Several active teaching methodologies were developed	The active methodologies made it possible to develop new skills	The active methodologies helped the students in the

teaching of human anatomy		the application of active teaching methodologies in human anatomy.	and applied, Game-Based Learning, Use of Audiovisual Resources and Visual Arts-Based Learning.	such as collaboration, interdisciplinary knowledge, capacity for innovation, group work and education.	absorption and fixation of the contents of human anatomy.
Learning strategy based on problems in the anatomy discipline of degree in Medicine.	Bautista et al., 2019	Design, implement and evaluate a Problem-based learning (PBL), strategy for the development of critical learning significant.	PBL applied: strategy design, development and validation of assessment instruments; situational diagnosis; the strategy was and final evaluation.	98.6% of students rated the strategy as effective or very effective for autonomous learning.	PBL promoted significant critical learning in most students.
Efficacy of Body Painting in the Teaching and Learning of Anatomy: a Randomized Study	Oliveira et al., 2020	To assess the acquisition of anatomical knowledge of the rib cage, larynx, trachea, of the nose and sinuses with the use of Body Painting.	Body Painting in the Teaching and Learning of Anatomy.	The sum of the post-test scores in the Body Painting group was greater than that of the cadaver group, with a statistical difference.	Body Painting, facilitated the process teaching-learning, bringing theory to practice and allowing associations and meaningful learning.
Play as a motivating factor in teaching of human	García-Barrios, et al., 2020	Evaluation of one on the use of Kahoot as an educational	Using the kahoot educational app through mobile devices.	The impact that the experience was by qualitative assessment research. The	Kahoot is an interactive, free and easy-to-use digital tool for teachers and

anatomy		tool and motivating element in the university environment.		students evaluated positively, in the teaching-learning and in the motivation.	students, allowing to improve learning using new technologies and feeling motivated.
Apprenticeship of musculoskeletal anatomy by meio de novas technologies: um ensaio clínico randomizado	López et al., 2020	To investigate the influence of the application of new methodologies on the learning and motivation of anatomy students.	Different teaching methodologies using the Atlas 3D, ultrasound and the traditional method.	98.1% considered the applied methodologies positive and that interest in anatomy was stimulated. The method with the 3D atlas Improved understanding of anatomy. Grades improve by 20%.	The traditional method, the denunciation with new technologies, contributions to increase student interest, as well as acquisition of skills and competences.
Three-dimensional Virtual Models of 3D-Scanned Real Cadaveric Samples Used as a Complementary Educational Resource for the Study of Human Anatomy: Undergrad	Tiznado-Matzner; Bucarey-Arriagada, lizama, 2020	Perception of human anatomy on the use of models of real cadaveric samples scanned, as a complementary educational resource to the conventional study.	3D-digitized human cadaver samples as a complementary method of study. These online resources were chosen because they are open web platforms.	The new generations of students are immersed in a technological environment, both general and anatomy education could benefit from the use of new technologies.	The study of anatomy must be accompanied by technological elements that complement the classic books. Evaluating 3D models of real human parts from the anatomy module as part of their courses showed that it was a widely accepted resource.

uate Student's Perception of this New Technology					
Use of a virtual human cadaver to improve knowledge of human anatomy in nursing students: research article	Yuwaraj,Narnaware, Melanie Neumei, 2021	Three-dimensional (3D) virtual human corpse—Anatomy Table (TA)—in teaching human anatomy.	Three-dimensional (3D) Virtual Human Corpse—Anatomage Table (AT).	The class average in midterm and final exams and the overall grade point average (GPA) were significantly higher in students taught with AT than in students taught without AT.	Evidence that educational technology can leverage knowledge as an effective tool to complement your learning. Teaching and learning of human anatomy can be enhanced with a "blended" and multimodal approach.
Graphic animation as an educational resource in Anatomy	Macía, Munino 2021	Opinions of students, immersed in ICT management, on autonomous learning in the area of Anatomy, assess the level of acceptance of teaching material based on animated 2D graphic images.	The techniques of rotoscoping animation, traditional frame-by-frame animation and motion graphic, generating the animated image tracing the videos.	They show the students' receptive disposition towards 2D animation. They perceived the minority knowledge of these visual resources, which are more dynamic and facilitate the teaching-learning process.	Both the didactic material produced and the information collected are indicative of the effective pedagogical value that 2D graphic animation attributes to the discipline.

Use of a 3D virtual app and academic performance in the study of the anatomy of the musculoskeletal system among Peruvian medical students	Barrera-Cantoni et al., 2021	Assess the association between the use of a 3D virtual application and academic performance.	Use of a 3D virtual app and academic performance in the study of the anatomy of the musculoskeletal.	The average score was 13.5 2 and 21% reported adequate use of a 3D application. No association was found between App 3D usage and academic performance in the fitted model.	Using a 3D application to study the anatomy of the musculoskeletal system was not significantly associated with better academic performance.
Morphological Practical Teaching Platform Improves the Outcome of Anatomy Laboratory Teaching	Liu et al., 2021	Investigate the new morphological practice teaching platform to improve anatomy outcome.	The methods used were the traditional teaching model and the innovative teaching model. Morphological Practical Teaching Platform.	The teaching results regarding the satisfaction of students in the integrated innovation teaching group were significantly higher than those in the control group. ($P < 0.05$)	Suggests that the new morphological practical teaching platform improves the outcome of anatomy laboratory teaching.

Source: Elaborated by the authors

4. Discussion

Active methodologies used

It is emphasized that of the 15 studies analyzed, 8 are directly related to new technologies and 7 to active methodologies. Thus, 2 present educational software and platform (Inzunza et al., 2017; Liu et al., 2021), 2 augmented reality for the teaching of anatomy (Kurniawan et al., 2018; Layona et al., 2018), 3 as 3D tools (de La Barrera-Cantoni et al., 2021; Narnaware & Neumeier, 2021; Rodríguez-López et al., 2020), 1 2D graphic animation (Macías & Muñino, 2021). With regard to active methodologies, 1 with the karoot platform, game show (García-Barrios et al., 2020), 1 article highlights the application of conceptual maps, 3 with PBL (problem-based learning), 1 with games, audiovisual and visual arts, 1 Body painting.

What we can perceive, that despite the different methodologies applied, both dialogue in their objectives with regard to rethinking and innovating the process of teaching anatomy. In the current educational scenario, it is important to reflect on teaching practices in a context that transcribes and represents the needs of professional training.

Regarding the proposed objectives of the studies, Inzunza et al., (2017) describe an educational software platform to improve anatomy teaching in medical education. Liu et al., (2021), investigate whether the new platform for teaching morphological practice could improve the outcome of laboratory teaching of anatomy. Kurniawan et al., (2018) Develop a human anatomy learning system using augmented reality technology. Layonaa, Yuliantob, Tunardic, (2018) developed the Augmented Reality app to learn the anatomy of the human body to be more interesting and easier for the student to understand.

López et al., (2020), studied the impact of different methodologies using Atlas 3D, ultrasound, and the traditional method. Tiznado-Matzner, Bucarey-Arriagada, Lizama, (2020), brings the perception of human anatomy students about the use of 3D scanned models of real cadaver samples, as an educational resource that complements conventional study. Yuwaraj, Narnaware, Melanie Neumeie, (2021), incorporated a three-dimensional (3D) virtual human cadaver – Anatomage Table (AT) – into teaching human anatomy. Barrera-Cantoni et al., (2021) evaluated the association between the use of a 3D virtual application and academic performance among Peruvian medical students.

In the studies by Macíasa and Munino (2021), students' knowledge of immersion in ICT management was articulated to achieve autonomous learning in the area of Anatomy, to assess the level of acceptance by students of a teaching material based on graphic images, 2D animated.

Regarding the objectives of active methodologies, García-Barrios et al., (2020) evaluated a group of students on the use of Kahoot as an educational tool and as a possible motivating element in the university environment. Foureaux et al., (2018) Implement and evaluate the impact of the development of Concept Maps (CM) as a pedagogical strategy in the teaching and learning of Human Anatomy. Bautista, Tania Erika Román, (2019) is to apply and evaluate a PBL strategy to promote the development of critically meaningful learning in anatomy students. Bautista et al., (2019) design, implement and evaluate a PBL strategy to promote the development of significant critical learning in anatomy course students.

Santos et al., (2019) developed the elaboration, application and application experience as games, audiovisual practices and visual arts. Oliveira et al., (2020), evaluated the acquisition of anatomical knowledge of the rib cage (ribs, cartilages, intercostal muscles, sternum and thoracic lines), larynx, trachea, nose and paranasal sinuses with the use of Body Painting compared to the use of cadaveric parts, in addition to knowing and analyzing the perception and meaning of the Body Painting method in the teaching and learning of anatomy for medical students. The findings show that the proposed objectives and the accomplishment of the work in question are directly interconnected with the successful searches for anatomy teaching.

For Rodrigues (2001) different practices and methodologies provide an effective opportunity for student learning, regardless of complexity. Therefore, the good use of different technological and methodological tools requires us to have a clear notion of what we want to explore and how to do it, in

order to obtain effective practices. It is important to direct who, where and for what reality will apply it (Cunha, 2001). We can see that the objectives outlined in the different research seek, through active and technological methodologies, a reconfiguration of the teaching processes in human anatomy, since this discipline presented for many decades a plastered and traditional configuration. Thus, its resignification takes place in a process that seeks the protagonist student, as well as meaningful learning.

In short, the studies demonstrate the effectiveness and success of the proposed objectives, reinforcing the creation and use of software platform, augmented reality, 3D and 2D tools, Kahoot, concept maps, PBL, games, audiovisual and visual art, evidencing stimulus for learning of human anatomy. Of the 15 studies analyzed, only one of the studies did not show significant results, such as the use of the 3D application to study the anatomy of the musculoskeletal system (de La Barrera-Cantoni et al., 2021). However, the effectiveness in the use of active methodologies and their technologies is clear, the studies in question highlight significant results in the various methods used.

It is well known that the trends of the 21st century indicate that the central characteristic of education is the shift from an individual focus to a social focus. Thus, teaching and learning gain a dialectical character, that is, of constant movement and construction by those who carry it out, where teaching is directly related to learning: the educator is no longer what only educates, but what, while educating , It's polite. Both, equally, become subjects of the process (Delors, 2001).

Thus, these new practices are diverse, ranging from the use of representational models, games, to the use of technologies and mobile devices. Therefore, active methodologies are instruments that expand and facilitate the environment for the teaching and learning process. These recognize the subject as the author of the process, stimulate criticality, autonomy, the development of social, ethical, and technical awareness, encourage the student to intervene in real problems and attract students to classes (Aparecida & Berbel, 1998).

5. Conclusion

In this research, we sought to synthesize, through an integrative literature review, information related to teaching practices in anatomy. It is suggested that health education, especially anatomy teaching, has strategies that present different and complex curricular changes that have provided a new methodological involvement, developing meaningful learning and protagonist student.

Thus, the use of different methodologies and technologies are useful tools that are necessary for the implementation of the teaching and learning process in human anatomy. These practices break with the molds of technicality and traditionalism in anatomy teaching that for centuries were centered on mechanical and traditional procedures, making it uninteresting.

In view of the above, we conclude that the studies analyzed present strong and successful evidence in the use of different innovative methods aimed at teaching anatomy, and that even when applied in a targeted and well-planned way, they have positive impacts on learning. In view of what was found, we emphasize that the topic is not exhausted, we suggest the formulation of new studies and research, as it is a subject of great richness and scientific relevance for health practices.

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