Georgian Scientists

ქართველი მეცნიერები

Vol. 5 Issue 2, 2023

https://doi.org/10.52340/gs.2023.05.02.28

A review of new technologies in Anatomy teaching methods

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In the 21st century, medicine is progressing very rapidly. This advancement has been further accelerated during the period of the pandemic. We should be aware that during this era, technology is becoming more accessible and versatile, greatly influencing the development of teaching methodologies.

The human body is an intricate and meticulously organized entity composed of specialized cells. Its cohesive functioning is paramount for the sustenance of life. The human anatomy exhibits a hierarchical organization, spanning from the fundamental level of atoms to the more elaborate structures such as organs and organ systems. (2)

Anatomy and physiology are fundamental subjects within medical and healthcare science programs. Moreover, these disciplines are often regarded as inherently intricate, posing notable challenges for students regarding comprehension and assimilation. In the present era, studying and understanding human anatomy in medical and other healthcare science schools is undergoing a critical and transformative period. Over the past few years, in line with the advent of the digital age, the integration of technologies has brought about significant changes regarding how the morphology of the human body is taught to students. This transformation can shape future approaches in its comprehension and exploration. (3) Estai's and Bunt's 2016 critical analysis of literature explores dissection, projection, plastination, anatomical informatics, visualization, and the continued relevance of anatomy in education. These discussions delve into inquiries, integrated pedagogical approaches, and innovative methods within the field. (4)

The revisiting of cadaveric dissection remains a main method in studying human anatomy. Hands-on training and learning, rooted in practical education, have stood the test of time as the primary instrument of anatomical instruction throughout the ages. Using real anatomical specimens (cadavers) is considered essential and foundational for studying anatomy. It serves as the gold standard and provides a fundamental framework for anatomical education's regional, systemic, surgical,

neuroanatomical, forensic, and anthropological aspects. The field of anatomical research encompasses creating and exploring various visualizations, including anatomical models, learning methods, and diverse forms of illustration. However, when applying these new models, there are distinct considerations regarding their suitability for comprehensive dissection, particularly in preparing materials for interdisciplinary university education. (4)

In the twenty-first century, technological advancements have led to the reconstruction of anatomical teaching methods, as there has been a prioritization of learning based on 2D or 3D models. (5) As previously mentioned, significant changes have occurred in anatomical education and students' learning experience in recent years. Anatomical lecturers have moved away from traditional pedagogical approaches and responded to the evolving needs of the curriculum, the influence of technology, and the demands of healthcare professions. When discussing the new methods in anatomical education, we refer to technologies such as virtual reality (VR) and augmented reality (AR). These technologies provide an immersive and enhanced reality experience. (6)

The study of anatomy is greatly enhanced by using three-dimensional (3D) visual models, which provide a more comprehensive understanding. It should be noted that interactive multimedia models and virtual visualization programs have become readily accessible to students, assisting them in creating informative representations and facilitating significant memory retention. These tools enable students to engage in the generation of knowledge actively and also contribute to the extended storage of information. (1) Additionally, it provides students with more motivation and interest.

The study of anatomy and physiology, available through virtual dissection, enhances the quality of structural detailing. In addition, we have incorporated interactive software called 'ANATOMAGE' into the learning method, which allows for exploring anatomical structures and diagnostic information on a high-resolution screen.

Students can actively manipulate the dissected structure and explore different anatomical components in detail compared to anatomical illustrations while working with the anatomical table. They can change the dissection plane and examine various anatomical structures from different perspectives, learning specific aspects. The acquired information will assist students in applying their knowledge for demonstration purposes and collaborative, interactive work with the lecturer to accomplish group tasks.

The table includes four cadaver 3D graphics with fundamental human parameters. The advantage of the model is that it allows for the manipulation of the montage plane, meaning it is possible to change the model's viewpoint. In the anatomical table, 1250 cases of clinical anatomy and 500 histological slides are uploaded for normal and pathological clinical correlation. Additionally, high-quality CT and MRI scans are available for radiological anatomy. It is also beneficial for embryology studies to enhance visual learning of angiography for students. Animal models are also uploaded, which helps to compare them with human structures for comparative anatomy.

Indeed, all of this facilitates a more realistic simulation of working on actual human anatomy and greatly aids students in understanding regional, systemic, pathological, radiological, and clinical anatomy in more depth. Therefore, the anatomical model serves as a versatile multidisciplinary tool. Moreover, the chosen model stands out among the available options because it incorporates precise digital photorealistic data and an extensive digital library.

In line with standard practices, integrating emerging technologies is crucial in enhancing the study and understanding of various structures in the human body, promoting effective learning and comprehension. (7) It is important to note that changes should not be implemented solely for the sake of change, but rather, emphasis should be placed on evaluating the impact of these changes on learning. In terms of research, quantitative and qualitative analyses demonstrate the necessity of effective evaluation methods that accurately assess the students' knowledge levels, particularly concerning clinical anatomical concepts. These evaluations should also account for the variations in spatial abilities. The assessment format should be carefully designed to align with instructional methods and facilitate the application of knowledge in clinical practice (8).

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