VISUALIZATION OF THE HUMAN BODY BY USING 3D TECHNOLOGIES IN THE STUDY OF «HUMAN ANATOMY» IN MEDICAL UNIVERSITIES

Abstract. The article examines the possibilities of using the latest forms and methods of teaching students in the basic discipline «Human Anatomy» at the stage of preclinical professional training of future doctors of various specialties in
institutions of higher medical education. The important role of combining classical approaches in studying the basic discipline with innovative technologies such as digital library, digital textbooks, test systems, simulators, expert systems, interactive anatomical table and 3D ORGANON is emphasized.

And the advantages of using 3D anatomy visualization and virtual dissection, such as an ability to put a virtual marker and text fragments, which can be used during a lesson on a digital presentation of a body or an organ with the function of saving and fixing, are also considered. The interactive anatomical table helps to avoid prior contact of an unprepared student with a real corpse, and due to regular software updates via the Internet, future doctors always receive up-to-date information.

Modern students are creative and seek an interactive experience, so these features have to be considered when organizing the educational process. One of the ways to modernize higher medical education, taking into account the requests and needs of modern students, is the use of media technologies.

Therefore, future doctors use the technologically advanced 3D anatomy visualization and dissection by the interactive anatomical table and 3D ORGANON software at the Zaporizhzhia State Medical and Pharmaceutical University during the study of the «Human Anatomy» discipline. This provides an opportunity during the educational process to demonstrate structures of organs and systems of the human body, which makes the lesson more informative and interesting. All this creates the impression of working with real objects, which contributes to a better understanding of the educational material, interests and motivates students to study human anatomy.

The use of media technologies contributes to the formation of students' critical thinking, more effective assimilation of educational material and forms their media competence. That, in turn, makes it possible to form an information-rich educational environment, to influence the level of media culture of an individual, to prepare him for safe and effective interaction with the modern media space.

**Keywords:** the interactive anatomical table, 3D ORGANON, the latest innovative teaching methods, media environment, media competence.

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ВИКОРИСТАННЯ ВІЗУАЛІЗАЦІЇ ТІЛА ЛЮДИНИ ЗА ДОПОМОГОЮ 3D ТЕХНОЛОГІЙ ПРИ ВИВЧЕННІ «АНАТОМІЇ ЛЮДИНИ» В МЕДИЧНИХ УНІВЕРСИТЕТАХ.

Анотація. В статті розглянуто можливості використання в закладах вищої медичної освіти новітніх форм та методів навчання студентів з базової дисципліни «Анатомія людини» на етапі доклінічної професійної підготовки майбутніх лікарів різних спеціальностей. Підкреслено важлива роль поєднання класичних підходів у вивченні базової дисципліни з інноваційними технологіями такі як, цифрова бібліотека, цифрові підручники, тестові системи, тренажери, експертні системи, анатомічний стіл та 3D ORGANON.

А також розглянуто переваги використання 3D анатомічного столу такі як віртуальний маркер та текстові фрагменти, які можна використовувати під час заняття над зображенням тіла або органу з функцією збереження і закріплення. 3D анатомічний стіл допомагає уникнути попереднього контакту непідготовленого студента з реальним трупом та завдяки регулярному оновленню програмного забезпечення через Інтернет, майбутні лікарі завжди отримують актуальну інформацію.

Сучасні студенти креативні та прагнуть інтерактивну, тому ці особливості необхідно враховувати під час організації освітнього процесу. Одним із шляхів модернізації вищої медичної освіти з урахуванням запитів і потреб сучасних студентів є застосування медіатехнологій.
Introduction. In institutions of higher medical education, special attention is paid to the study of fundamental disciplines at the stage of pre-clinical professional training, since the medical-biological cycle creates the basis for further mastery of clinical disciplines. At this stage, such an educational discipline as «Human Anatomy» plays an important role as an integral part of morphology [7]. The peculiarity of teaching «Human anatomy» in current conditions is the optimization of the educational process by introducing the latest forms and methods of education. Therefore, the introduction of the latest innovative teaching methods into the educational process remains relevant.

One of the factors that necessitates the introduction of radical changes in the educational process of institutions of higher medical education is the difference between modern students and their previous generations. These are internet children with enormous supply of information, who learned to use a computer and various gadgets before they could read. They spend a significant part of their lives in a virtual world. Modern students are not adapted to the offline learning methods of the past and do not consider it necessary to memorize information, because it can be instantly obtained from the Internet. They are creative, seek interaction and are focused on solving complex tasks independently. These features of students should be taken into account when organizing the educational process. One of the ways to modernize higher education, taking into consideration the requests and needs of modern students, is the use of information technologies.

The training of future doctors, capable of effective professional activity in the conditions of the media information society, involves the ability to learn during life...
and master new media technologies, which will generally contribute to the formation of their media competence. Therefore, the educational process of training future doctors in the process of pre-clinical professional training at a medical university is aimed at the introduction of media technologies, on the basis of which innovative teaching methods are introduced as conditions for the development of media competence.

The aim is to consider the possibilities of using the interactive anatomical table, as the most technologically advanced system of visualization of the human body, when studying the academic discipline "Human Anatomy" in institutions of higher medical education.

Research methods. The Department of Human Anatomy, Operative Surgery and Topographic Anatomy of the Zaporizhzhia State Medical and Pharmaceutical University works effectively to create comfortable and effective conditions for learning and assimilation of educational material by future doctors, which includes the use of the interactive anatomical table and 3D ORGANON.

Main Part. The peculiarities of teaching the educational discipline «Human anatomy» in modern conditions are determined by the requirements for a higher level of knowledge of human anatomy by future doctors as the foundation of professional training. The priority tasks of the Department of Human Anatomy, Operative Surgery, and Topographic Anatomy are to improve the educational process and improve the quality of student training for the assimilation of knowledge in clinical departments. It remains important to implement the latest forms and methods of education. When teaching an academic discipline to students of various specialties, it is necessary to take into account the specific features of the future profession. Thus, for students in the specialty 222 «Medicine», the future profession is taken into account, the task of which is the preservation and prevention of human health. For students in the specialty 228 «Pediatrics» age-specific features of the organs and systems of the child's body are shown. And for students in the specialty 221 «Dentistry» features of maxillofacial area are presented.

The educational process at the department of human anatomy, operative surgery and topographic anatomy consists of lectures, practical classes and independent work of students. However an important component of the educational process is the formation of the «clinical thinking» of the future doctor, which takes place in the first years of study at a higher medical educational institution. In most cases, students' education is based on the principle of mastering the material of the future specialty for the credit session. The educational process is built on the principle of assimilation of information and its reproduction leads to the formation of template thinking by students. To avoid this, it is necessary to orient future doctors to independent search in various situations, this task is solved by the transition to education that is competently oriented and is the result of the integration of knowledge, skills and understanding.
Today, more than ever, the latest innovative technologies such as digital libraries (access to digital information resources), digital textbooks (ensure the formation of new knowledge and skills and access to accumulated knowledge), test systems (assessment and verification of knowledge), simulators (formation of practical skills); expert systems (decision making), media environment (allows remote access to media resources), interactive anatomical table, 3D ORGANON have become widely used.

The use of information technologies in the educational process requires continuous self-education to both lecturers and students. According to L. Bondar, information technologies change the structure of traditional subject-object pedagogy, in which the student becomes a person who strives for self-realization [1].

Information technologies provide new opportunities during the study of human anatomy by future doctors. To understand the structure of the human body, it is necessary to see it, so the use of visual aids is a mandatory element of human anatomy classes. In the process of teaching the discipline «Human Anatomy» to future doctors at the Zaporizhzhia State Medical and Pharmaceutical University, cadaver material is also used. Traditionally, printed visual aids (as posters, anatomical atlases) and anatomical models are used. These tools are static and have limited capabilities when demonstrated. They do not ensure the effective use of visualization and do not meet modern requirements for ensuring the quality of education. The need to demonstrate human organs and organ systems without the use of cadaver material, high requirements for the quality of education require the introduction of educational tools that provide the opportunity to study the structure of the human body in a virtual environment.

A real breakthrough in the study of human anatomy was made by 3D technologies. Electronic 3D human anatomy atlases allow you to see a three-dimensional image of the human body and particular organs, are available for use, and can be easily installed on a laptop or smartphone, which almost all students have.

At the Zaporizhzhia State Medical and Pharmaceutical University, future doctors use the interactive anatomical table and 3D ORGANON software when studying human anatomy. The anatomical table provides an opportunity for the lecturer to demonstrate the structure of organs and organ systems of the human body during the presentation of educational data, makes the lesson more informative. This creates the impression of working with real objects, which contributes to a better understanding of the educational material, interests and motivates students to study human anatomy.

Students also use the possibilities of the interactive anatomical table during practical tasks. It provides an opportunity to examine the image in detail, to enlarge it and rotate it at different angles, to study the smallest structures of an organ in the desired perspective. Working with the table, students are able to independently
complete tasks at a pace convenient for them, which ensures individualization of learning.

Based on the analysis of scientific studies, which highlight the possibilities of 3D anatomical educational resources [2; 5; 6], and summarizing the practical experience of their use in classes on the educational discipline «Human Anatomy», we identified a number of didactic advantages of 3D atlases on human anatomy, which determine the expediency of their use in the training of future doctors. The capabilities of the interactive anatomical table contribute to the effective use of visual aids. 3D anatomy tool have a virtual marker and text fragments that can be used during the lesson on the image of a body or an organ with the function of saving and fixing. It also helps to avoid preliminary contact of an unprepared student with a real corpse. Due to regular updates of the interactive anatomy table software via the Internet, future doctors always receive up-to-date information.

Printed visual aids (posters, anatomical atlases) are static and can only convey a two-dimensional image. 3D anatomical models are also immobile and have limited capabilities during demonstration. These teaching aids cannot provide examination of organs from all sides, study of the layered structure of the human body or individual organs. The interactive anatomical table provides an ability to rotate the image and examine each organ in detail, study the area of the human body from the superficial to the deepest layers, see the relative arrangement of organs, and most importantly, the blood supply and innervation of all anatomical structures. On account of using media technologies, the process of studying a complex subject adds interest, excitement and acquires a research character, which provides conditions for self-realization, self-organization, self-regulation, self-actualization and self-identification in future professional activities.

The use of media technologies contributes to the formation of critical thinking in students, more effective assimilation of educational material. And it is the skill of professionally oriented critical thinking, according to G. Onkovich [4], that helps to make independent judgments and make competent decisions in response to information transmitted by mass communication channels, which contributes to the formation of a doctor's media competence.

By the concept of media competence of an individual, we consider a set of his knowledge, skills, abilities that contribute to the search, selection, interpretation, use, evaluation, critical analysis, creation and transmission of media information [3]. Media competence helps an individual to think critically, which helps to form a certain understanding and make competent decisions in response to media information transmitted by mass media channels.

In the framework of our study, we understand the media competence of future doctors as their competence in using media technologies in their professional activities. The use of media in the educational process of the university is an
important value of improving the quality of higher education, since the professional activity of future specialists is increasingly connected with the use of modern information technologies, the creation of one's own media product to promote one's resources and services, and the solution of media security problems through mass media. Therefore, future doctors must confidently navigate the media environment, possess the skills to create their own media product.

Conclusions and prospects for the further research. The Department of Human Anatomy, Operative Surgery and Topographic Anatomy makes maximum efforts to the innovative development of Zaporizhzhya State Medical and Pharmaceutical University, in order to achieve the strategic goal of transitioning the educational space to a qualitatively new level, which corresponds to promising world trends of higher medical education, and allows the university to create conditions for breakthrough and integration into the system of training doctors of an international standard and spreading positive results to the system of higher medical education. In today's conditions, it is necessary to improve the online education system, which, in addition to many undeniable advantages, of course, has a number of disadvantages. Our lecturers take an active part in providing all the necessary information by using electronic media and devices. This will make it possible, under unforeseen circumstances, to maintain the quality of teaching and presentation of "Human Anatomy" studying materials at the appropriate level. However, no modern technology can replace the most important thing - alive communication between a lecturer and a student.

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