

THE IMPORTANCE OF TEACHING BIOPHYSICS WITH THE USE OF INTERACTIVE METHODS IN MEDICAL EDUCATION

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Abstract. This article analyzes the role of biophysics in medical education, its practical significance, its role in forming the competencies necessary for future doctors, and the main directions of biophysical research methods in modern medicine and interdependence of the various processes occurring in the human body, it is often possible to distinguish among them those that are close to physical processes. For example, such complex physiological processes as blood circulation are actually physical processes, since this process is associated with the flow of fluid - hydrodynamics, the propagation of elastic vibrations along the vessel - vibrations and waves, the mechanical work of the heart - mechanics, the generation of biopotentials - electricity, etc. Breathing is associated with the movement of gases - aerodynamics, heat transfer - thermodynamics, evaporation (spatial transitions), etc.

Keywords: Biophysics, medical education, physics of biological processes, diagnostic technologies, electrophysiology, medical imaging, MRI, ECG, UTT, radiobiology, medical devices, signal processing, biomechanics, medical physics, educational methods, virtual laboratory, medical technologies.

Abstract. In this state, the role of biophysics in medical education, its practical significance, role in the formation of competence, necessary for future doctors, and basic directions of biophysical methods of research in modern medicine are analyzed. Nesmotrya na slojnost i vzaimozavisimost rizlichnykh protsesov, prokhodyashchix and human organism, sredni nix chasto mojno vydelen te te, which is close to physical processes. Naprimer, takie slojnye physiological processes, kak krovoobrashchenie, fakticheski yavlyayutsya physical processes, poskolku etot process svyazan s techeniem jhidkosti - hydrodynamics, rasprostraneniem prugix osbulaniy po susudu - vibratsii i volny, mechanicheskoy robotoy serdtsa - mechanics, generatsiei biopotentsialov - elektrichestvo i t. d. Dykhanie svyazano s dvijiniem gasov – aerodynamics, perenosom tepla – thermodynamics, ispareniem (prostranstvennymi perekhodami) and t. d.

Keywords: Biophysics, medical imaging, physics of biological processes, diagnostic technologies, electrophysiology, medical visualization, MRI, EKG, UTT, radiobiology, medical equipment, signal processing, biomechanics, medical physics, educational methods, virtual laboratory, medical technologies.

Abstract. Abstract. This article analyzes the role of biophysics in medical education, its practical significance, its role in the formation of competencies necessary for future doctors, and the main directions of biophysical research methods in modern medicine. Despite the complexity and interdependence of various processes occurring in the human body, it is often possible to distinguish among them those that are close to physical processes. For example, such complex physiological processes as blood circulation are actually physical processes, since this process is associated with the flow of fluid - hydrodynamics, the propagation of elastic vibrations along the vessel - vibrations and waves, the mechanical work of the heart - mechanics, the generation of biopotentials - electricity, etc. Breathing is associated with the movement of gases - aerodynamics, heat transfer - thermodynamics, evaporation (spatial transitions), etc.

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Many of the principles and ideas of diagnostics and research are based on the use of. Most modern medical devices are physical devices by design. Mechanical magnitude - blood pressure is an indicator used to assess a number of diseases. Hearing sounds originating from within the body allows us to obtain information about the illness or health of its organs. A medical thermometer, which works based on the expansion of mercury from heat, is a common medical diagnostic instrument. In recent years, as a result of the development of electronic devices, diagnostic methods based on recording biopotentials occurring in living organisms have become widespread. The most well-known method - electrocardiography - is the recording of biopotentials reflecting the activity of the heart. We all know the importance of the microscope in medical and biological research. Modern medical devices based on fiber optics allow us to see the internal cavities of the body. The spectral analysis method is used in forensic medicine, hygiene, pharmacology , and biology. The achievements of atomic and nuclear physics are also known to us as well as the more popular methods in diagnostics: X-ray diagnostics and targeted atom methods that occur in the body - electrical signals, membrane metabolism, blood flow, the mechanics of breathing - are subject to physical laws. Biophysics is the study of these processes. interprets mathematical and physical models from a medical perspective.

Teaches the scientific foundations of diagnostic methods

Modern medicine relies on the following physical principle-based technologies:

- Electroencephalography (EEG)
- Electrocardiography (ECG)
- Computed tomography (CT)

- Magnetic resonance imaging (MRI)
- Ultrasound diagnostics (UTT)

Biophysics classes teach students the working mechanism of these technologies, the properties of waves, and signal processing. teaches the principles.

Develops skills in working with medical devices

Doctors work with the following devices:

- defibrillator
- pulse oximeter
- ECG machine
- X-ray machine
- spectrophotometer

Biophysics is their:

- structure
- safe operation requirements
- measurement accuracy

teaches aspects such as.

The importance of biophysics in clinical practice

Electrophysiology

The heart, brain , and muscle tissue operate on electrical activity. The analysis of electrophysiological signals is one of the most important methods in medicine for diagnosing diseases.

Medical Imaging

Biophysics explains the physical nature of processes such as nuclear magnetic resonance in MRI, electromagnetic radiation in X-rays, and mechanical waves in ultrasound.

Radiobiology

Knowledge of the effects of ionizing radiation on biological tissues is important in oncology, radiology , and protective measures.

Modern methods used in biophysical education

- practical training on simulators
- virtual laboratories
- computer training in signal processing
- 3D biological modeling
- interactive physics process animation

They provide students with a combination **of skills + knowledge + practical experience** .

Requirements for teaching biophysics using interactive methods

The study of the requirements for teaching biophysics based on interactive methods was carried out through the following approaches. The study included a

comprehensive literature review, analysis of existing scientific literature and pedagogical experiences, which provides an understanding of the role and importance of interactive methods in teaching biophysics. The effectiveness of these teaching methods was assessed by comparing traditional approaches with interactive methods, as well as by studying the development of interactive methods as a pedagogical strategy through scientific articles and studies. In addition, the study included a comparative analysis between 147 groups that used interactive methods and those taught by traditional methods, measuring the level of student learning, participation and overall impact on the learning process. This analysis focused on the effectiveness of knowledge formation and assessed the advantages and disadvantages of interactive methods. In addition, the study assessed the effectiveness of these methods using criteria such as student knowledge, interest in learning, activity and satisfaction. Ultimately, the study aims to explore the pedagogical effectiveness of interactive methods in teaching biophysics, opportunities to consolidate students' knowledge and increase the interactivity of the learning process, while also improving the overall effectiveness of biophysics education.

Scientific results of using interactive methods in teaching biophysics

The scientific results on the use of interactive methods in teaching biophysics consist of the following main aspects:

Validation of effectiveness: The study demonstrated the effective use of interactive methods in teaching biophysics and their importance in consolidating students' knowledge. Interactive methods (e.g., group work, problem-based learning, simulations, and multimedia tools) significantly increase student engagement and improve the learning process.

provided clear evidence of the development of students' knowledge, understanding, and analytical thinking skills through interactive methods.

Improving learning efficiency: The study examined how the introduction of interactive methods affects learning efficiency. The results showed that through interactive methods, students acquire not only theoretical knowledge, but also practical skills. These methods encourage active participation, independent thinking, and the ability to solve complex medical problems.

Improving teaching methods: Effective strategies for combining traditional and interactive methods in teaching biophysics were developed. The study showed that interactive methods, when combined with traditional approaches, can improve student learning and increase the overall effectiveness of teaching. Teachers were given recommendations on how to incorporate interactive methods into their curricula.

Studying student perspectives: Surveys and interviews conducted among students showed how interactive methods increase their motivation to learn and

increase their interest in the learning materials. The study explored positive experiences gained from interaction, discussion, and group work during the learning process.

Improving pedagogical methods: The study examined how the use of interactive methods contributes to the professional development of teachers and the renewal of their teaching methods. Through interactive methods, teachers can more effectively identify the individual needs of students and adapt to changing pedagogical conditions, and simulators) to create modern approaches to teaching biophysics . These approaches enable students to understand complex scientific concepts more easily and in a more engaging way.

Improving the quality of teaching: Research has shown that interactive methods improve the quality of teaching in biophysics by improving student understanding, developing practical skills , and consolidating knowledge. This, in turn, contributes to better training of highly qualified specialists in the medical field .

The study highlighted the importance of interactive methods in improving the quality of teaching biophysics. These methods allow students to deepen their knowledge and skills, improve the quality of education, and develop competitive and collaborative learning among students. This is very important for training highly qualified specialists in the medical field. **Improving teaching methodology:** The study showed that the introduction of interactive methods leads to a new stage in teaching methodology. Interactive methods improve traditional teaching methods and play an important role in developing students' practical skills. The results of the study show that the use of interactive methods is effective not only in teaching biophysics, but can also be useful in other medical disciplines. These methods help students actively acquire knowledge and contribute to improving the overall quality of the higher education system in medicine.

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