



SPECIFICITY OF TEACHING THE BIOPHYSICS OF FUTURE DENTISTS

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ABSTRACT

The article discusses the issues of teaching the discipline "Biophysics", which is studied in medical schools. The analysis of the content of this discipline. We study the physical problems of a professionally directed nature, which are used in the process of studying this subject.

Key words: *biophysics, physical task, professionally oriented tasks, dentistry.*

Teaching biophysics of future dentists, as shown by the results of our research and experience in a medical school, has certain specifics, mainly related to the features of the future professional activity of a dentist [4, 9].

We will describe the experience of teaching the discipline "Biophysics" in medical universities in Russia (for example, Chita State Medical Academy [5], then ChSMA) and Uzbekistan (for example, the Tashkent State Dental Institute [6], hereinafter TSHI), focusing on the specifics of physical problems and their features inclusion in the educational process of medical school in the training of future dentists.

In his work, A.A. Verbitsky notes that the task is "a generalized symbolic model of many past problem situations, containing data and conditions that are necessary and sufficient for its resolution by cash means the knowledge and experience of a given person" [3, p. nineteen]. "A task is a system object, the main components of which are the content of the task (subject of the task, conditions and requirements) and means of solution (methods, methods)" [8, p. 73]. The most important psychological moment of solving the problem is the adoption by the subject of the conditions of the problem. According to V.V. Serikov, the student is included in the solution of only that task in which he finds one or another personally significant meaning. At the same time, the scientist claims that the use of tasks contributes to the development of personal-volitional potential, organization of a student in a difficult situation of transferring theoretical knowledge into practice [ibid.].

Thus, following the researchers, we will consider that the physical task is an integral element in the training of future specialists, including future dentists in the study of the discipline "Biophysics" at a medical university.

Therefore, in our opinion, one of the specific features of teaching biophysics of future dentists is the inclusion of professional tasks in the educational process.

By physical tasks of a professionally oriented orientation (FZPON) we mean physical tasks whose contents are of a professionally oriented nature, and the solution may prove to be useful in the future professional activities of a dentist [1].

We have developed a model for the content of FZPON [1] as a special tool for teaching biophysics to future dentists (Fig. 1.) [2]

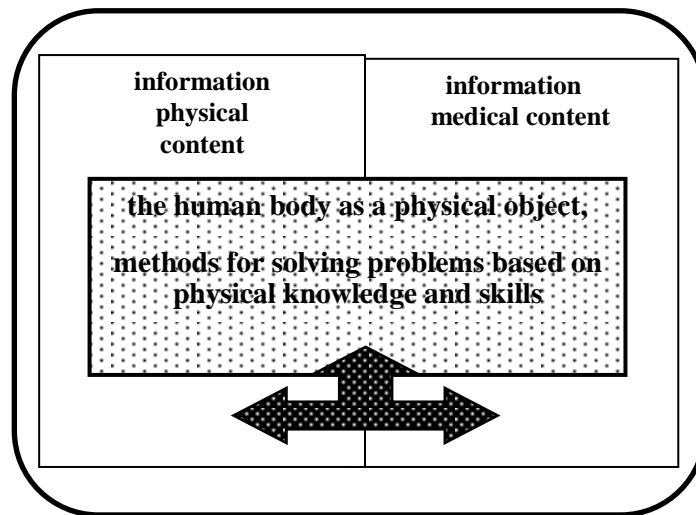


Fig. 1. The model of the content of the physical task of a professionally oriented orientation

The basis of the FZPON condition is information of physical and medical content. Information of medical content has the following specifics: cognitive information about the history and essence of the medical method; about the prospects of the modern development of medicine, etc. ; information specifying, specifying the content of the problem, the nature of the results, conclusions obtained in the process of solving the problem, application in medical practice, etc. ; explanatory information on the principle of operation of a medical device; about the specifics of the processes occurring in the human body; features of medical effects on the human body, etc. [1]

As the experience of teaching future dentists showed, when studying the discipline "Biophysics" in a medical school, the following types of students' work with medical information from the conditions of the Federal Law on Educational Law can be carried out:

- inclusion in the task condition of facts obtained on the basis of the specified information of medical content of an explanatory nature; subsequent solution to this problem;
- independent cognitive research activities of future dentists to expand knowledge about the history, essence of modern medical methods, the specifics of the functioning of medical devices, which are physical devices in their design; about the prospects for the modern development of medicine, etc. [1]

In table 1. examples of copyright FZPON within the section "Biomechanics" are presented, which can be effectively used in the study of the discipline "Biophysics" by future dentists in a medical school.

Table 1. FZPON examples

Th eme	Элементы модели ФЗПОИ		
	The human body as a physical object	Infromatio	
		Physical content	Medical content
Biomecha	Human tooth	Mechanical pressure on the surface	Chewing food, the effects of food on tooth enamel
FZPON No. 1:			

<p>Calculate the force sufficient to destroy the tooth enamel as a result of strong mechanical impact on the tooth during chewing of very solid food, if the tensile strength of tooth enamel is 37 MPa and its thickness is conventionally 2 mm.</p>		
Human ear	Mechanical effect of sound on the surface	Audible hearing loss, sound pressure on the eardrum
<p>FZPON No. 2:</p> <p>In accordance with the international classification of hearing loss, the average value of the hearing threshold for a person with a third degree of hearing loss lies in the range 56-70dB. Estimate the value of sound intensity for the boundary values of the specified limit. Determine the average force that will act on the eardrum of a person (S = 66mm²) with this pathology, if we assume that the frequency of the impact sound is 1 kHz.</p>		

1. Thus, as shown by the results of our study (based on the ChGMA), the decision of FZPON in the process of studying biophysics by future dentists at a medical university has a positive effect on their motivation for learning, contributes to the formation of the ability to solve future professional problems based on physical knowledge and skills, etc. .
2. In general, in the process of studying the discipline “Biophysics” by future dentists at the ChSMA [5], FZPON acts as one of the special training tools aimed mainly at developing future doctors' skills to solve professional problems based on physical knowledge and skills [1].
3. In TGSI, the goal of the subject “Biophysics” [7] is to develop students' knowledge, skills in physics, which are the basis of human life processes, biophysics of the oral cavity, as well as familiarizing students with the basics of the modern mathematical apparatus as a means of solving various theoretical and the practical tasks of a dentist general practitioner, which provides the ability to continuous additional education in the emerging socio-economic conditions. In general, the process of studying the discipline is aimed at the formation of appropriate competencies among students.
4. In this case, the interaction of future dentists with teachers of the discipline "Biophysics" in a medical university is carried out mainly in the lecture type, seminar-practical type, in laboratory work, during group consultations, individual work, etc.
5. Let us dwell in more detail on practical exercises to solve physical problems of medical and biological content, aimed mainly at summarizing the students' knowledge of the discipline under study, at forming their corresponding skills. In addition, this educational form of the lesson develops thinking, educates memory and forms the correct attitude of students to ecology in general, and to a healthy lifestyle, in particular.
6. The structure of the training activities of future doctors to solve physical problems in practical exercises consists of the following elements: orientation on ideas; theories and laws of discipline; planning a specific course of action for students; performing actions according to the algorithm; monitoring of work performed and their assessment.
7. In the process of summing up the results of work and their assessment, the teacher indicates the typical mistakes made, considers these errors, directs students' thoughts to correct actions according to the proposed method, etc.

Let us give an example of the author’s physical problem (see Table 2.), which can be considered with future doctors in the practical exercises under consideration. The specifics of compiling and solving such physical problems is related to their biomedical content. As the experience of practical training in biophysics of future dentists in TGSI showed, the practice-oriented content of these tasks is of particular interest to future doctors, preparing them for the practical application of physical knowledge and skills.

Table 2.An example of a physical problem of medical content with a solution in the framework of the discipline "Biophysics" (in TGSI)

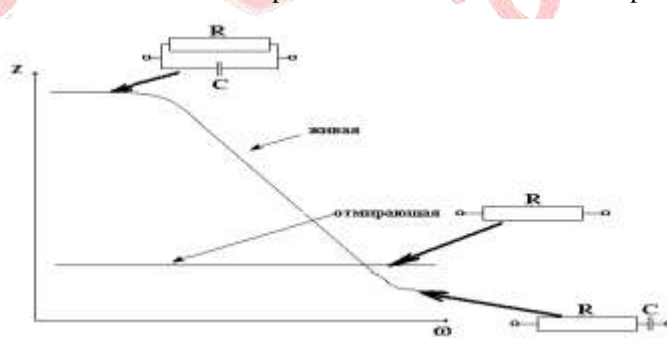
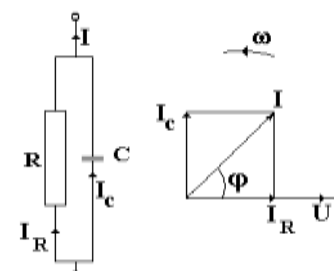
<p>У <i>словие задачи</i></p>	<p>Calculate the electrical impedance of the pulp at a low frequency of 40 Hz, using simple equivalent circuits for calculations. The active resistance of the tissue is 40 kOhm, and the capacity is 2 μF.</p>
<p>D <i>decision progress</i></p>	<ol style="list-style-type: none"> 1) 1) the choice of the simplest equivalent circuit of biological tissue, describing its electrical properties at low frequencies; 2) 2) the determination of the components of biological tissue, acting as capacitive resistance; 3) 3) the determination of the components of biological tissue, acting as active resistance; 4) 4) the implementation of mathematical transformations in the calculation formula; 5) 5) obtaining the final result by substituting numerical data into the obtained formula.
<p>D <i>decision</i></p>	<p>The choice of an equivalent electrical circuit is determined by the frequency dependence of the impedance of biological tissues. The best equivalent circuit for low frequencies is the circuit of a parallel-connected resistor and capacitor.</p>  <p>Fig. 1. Equivalent circuit.</p> <p>With elements connected in parallel, the voltage across each of the elements of the circuit is the same</p> 

Fig. 2. Parallel connection of elements.

The electrical impedance of living tissue at a low frequency is determined by:

$$Z = \frac{R}{\sqrt{1 + \omega^2 \cdot C^2 \cdot R^2}} = \frac{R}{\sqrt{1 + (2 \cdot \pi \nu)^2 \cdot C^2 \cdot R^2}}$$

$$Z = \frac{R}{\sqrt{1 + (2 \cdot \pi \nu)^2 \cdot C^2 \cdot R^2}} \cong \frac{40 \cdot 10^3 \text{ Ом}}{\sqrt{1 + (2 \cdot 3,14 \cdot 40)^2 \cdot c^{-2} \cdot 2^2 \cdot 10^{-12} \text{ Ф}^2 \cdot (40)^2 \cdot 10^6 \cdot \text{Ом}^2}} \cong 2 \text{ кОм.}$$

R	2 кОм
<i>esponse</i>	

As shown by the practical experience of teaching biophysics of future dentists in the TGSI, physical problems of medical content within the framework of the discipline "Biophysics" are a model of situational tasks of the future medical practice of dental students. It is advisable to use such tasks in the educational process of medical school for the development of future doctors' skills in solving problematic issues that may arise in their subsequent professional activities.

In general, based on the foregoing, and also based on personal experience and the results of practical training in the biophysics of future dentists in medical universities, it can be concluded that the use of physical tasks with a professional focus in the teaching of dental students to the discipline "Biophysics" is not only in Russian medical schools (for example, ChSMA), but also in Uzbek medical schools (for example, TGSI). At the same time, the inclusion of these tasks in the educational process at a medical university is closely connected with the specifics of teaching biophysics of future dentists regarding the features of the professional activity of a dentist.

REFERENCES

1. Biryukova, A.N. (Kobzar, A.N.) Preparation for the solution of professional tasks of medical students in physics studies taking into account interdisciplinary integration: diss. ... cand. ped Sciences: 13.00.02 [Text] / Biryukova Antonina Nikolaevna. - M., 2013. -- 277 p.
2. Biryukova, A.N. (Kobzar, A.N.) Physics at a medical university; under the editorship of S.I. Desnenko [Text] / A.N. Biryukova (A.N. Kobzar). - Chita: IITs ChGMA, 2012. -- 83 p.
3. Verbitsky, A.A. New educational paradigm and contextual learning: monograph [Text] / A.A. Verbitsky. - M.: Publishing Center for the quality of training of specialists, 1999. - 75 p.
4. GOS VO - 5510400 - Dentistry. - Tashkent, 2014. -- 78 p.
5. The work program of the discipline "Biophysics". Specialty: 05/31/03 - "Dentistry". Chita: ChGMA, 2017. -- 23 p.
6. A working curriculum on the subject of "Biophysics". Field of education: 5510400 - dentistry, 5511000 - pediatric dentistry. - Tashkent: TGSI, 2017. -- 23 p.
7. Remizov, A.N. Collection of problems in medical and biological physics [Text] / A.N. Remizov et al. - M.: Higher School. 1987. □ 158 p.
8. Serikov, V.V. Education as a type of pedagogical activity; under the editorship of V.A. Slastenina, I.A. Kolesnikova [Text] / V.V. Serikov. - M.: Academy, 2008. -- 256 p.
9. GEF HE - 05/31/03. Dentistry - M., 2016. -- 22 p.