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Research Article

IMPROVEMENT OF MEDICAL STUDENTS ON THE METHODOLOGY OF THE THEORY OF ERROR AND PHYSICAL CHARACTERISTICS OF THE HEARING SYSTEM ON THE BASIS OF INNOVATIVE EDUCATIONAL TECHNOLOGIES

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ABSTRACT

Scientific and technical progress that is achieving effective results in the world shows that biophysics occupies an important place in the development of modern innovative technologies in medical education. The method of using innovative educational technologies in the teaching of biophysics in medical institutions of higher education means the creation of practical and laboratory training based on interactive methods.

KEYWORDS

Moodle, Ilias, Dokeos, TXST (international standard classifier education), integration, trend, Simulations.

INTRODUCTION

The twenty-first century is characterized by the rapid development of unique sciences that have emerged as a result of the combination of various sciences, such as physics, chemistry, and biology. One such discipline is biological physics or biophysics. Life as a biological form of matter movement includes physical and chemical forms of matter movement. Biophysics studies the physical and physico-chemical processes in the body at the molecular level, reveals the mechanisms of physiological processes and allows to explain the causes of the observed biological phenomena. Studying the physico-chemical basis of physiological processes is very difficult. Physical and chemical processes in the body are not similar to any processes in non-living nature and take place under specific conditions. Therefore, they have a number of

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laws that require special research. Biophysics as an independent science is separated from many other sciences. These are physiology, biological chemistry, physics, etc. Therefore, in most cases, the boundaries between these sciences and biophysics are conditional. B.N. According to Tarusov's definition, biophysics is physical chemistry and chemical physics of biological systems. Since the subject of biophysics is physical and physico-chemical processes in the body, biophysical research mainly uses physical and physico-chemical methods, which are adapted for biophysical research. All methods of research should achieve quantitative results. Only then can one find quantitative correlations of changes in the physical parameters of a living system.

Therefore, biophysics uses mathematical methods of research, physical and mathematical modeling, as well as various technical devices. Thus, biophysics raises biology and medicine to the level of exact sciences. On the basis of innovative educational technologies, scientists are distinguishing another direction of biophysics. This direction studies the effect of physical factors - ionizing radiation, light, ultrasound, etc. on the body. This section is important for medicine in the present era. The development of pathological processes depends on the influence of physical and chemical factors. Most of them have a negative effect on the body. Currently, biophysics has a significant impact on the development of theoretical and practical medicine. Recently, medical biophysics has developed. One of its main tasks is to determine the physical and chemical parameters that can be used to objectively assess the functional state of the organism.

U.Sh Begimkulov, R.Kh.Djurayev, M.Djorayev, B.M.Mirzaahmedov, Y.G'.Mahmudov, G.E.Karlibayeva, G.S.Ergasheva, K.A.Tursunmetov, J.E.O' Sarov, N.Sh.Turdiyev, M.Mamadazimov, S.Q.Kahhorov, M.Kurbanov, D.Sh.Shodiyev and others were researched. The problems of implementing interdisciplinary integration in physics education were researched in the scientific works of U.E. Abdiyev, H.O.Zhorayev, E.O.Turdiqulov, K.Sh. On issues such as the use of hypertext systems in the educational process, the creation of electronic manuals and textbooks, the features of using practical software, and the use of simulation models N.I. Tailakov, R.R. Boqiyev, U.Y. Yuldashev, F.M. Zokirova, V.V. Anisimov, M. Mamarajabov and M.H. Lutfillayev, O.B. Bogomolov conducted research. On issues of improving the methodology of teaching physics in the countries of the Commonwealth of Independent States V.A. Orlov, N.M. Shakhmayev, N.A. Rodina, U.V. Usova, A.A. Pinsky, V.G. Razumovsky, Y.I. Dick, Y.K. Babansky, A.V. Perishkin, S.L. Rubinstein conducted research. Research on methodological issues of teaching physics in developed foreign countries Researched by M. Dougiamas, J. Piaget, A. Gartung, J. Kidd, A. Bates, J. Daniel, and others.

THE MAIN FINDINGS AND RESULTS

Although various directions of teaching have been studied in the above research works, the methodology of using innovative educational technologies in teaching biophysics in medical institutions of higher education, based on the creation of interactive methods for conducting practical and laboratory training and usage issues have not been explored. It is possible to draw a conclusion about the disturbance of life processes according to the change of these parameters. It is known that living cells have their own characteristics, which are: presence of membrane potential (electrokinetic potential), maintenance of ion gradients at the same rate, polarization of electric current, ability of chemiluminescence, cytoplasm movement, etc. Some of these parameters have been used in medicine for a long time to evaluate the activity of the body. Recording of biopotentials remains one of

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the main methods (electrocardiography, electroencephalography, etc.). Currently, electrical conductivity and chemiluminescence are also recognized. It has been proven that these methods can be used in the diagnosis of diseases and in the assessment of the negative impact of various factors on tissues.

One of the next important tasks of medical biophysics is to study the effect of factors used in physiotherapy on the body. These are diathermy, inductothermy, thought therapy, X-ray therapy, etc. Such studies allow more effective use of these factors in the treatment of a number of diseases.

Error theory. No matter how accurately we measure any physical quantity, its true value cannot be found. The experimentally measured value is only an approximation of the true value. The difference (difference) between the actual value and the measured value is called the measurement error. Error theory examines what factors and why experimental measurements vary, and how they affect measurement accuracy. A number of factors affect the size of experiments: the quality of the equipment used, temperature, humidity, measurement method, personal characteristics of the experimenter, etc. The factors listed above have a negative effect on the result of the experiment and make it difficult to determine the true value. Even with improved experimental conditions and the use of precisely sensitive devices, it is difficult to avoid some errors. The reason for this can be different. When determining experimental results, it is accepted to divide errors into chronic (systematic) and random errors. The chronic error always changes in one direction from the true value for the result, that is, it decreases it. Random error, on the other hand, causes the result to be both higher and lower than its true value with equal probability. Let's look at the reasons for the mistakes made when conducting the experiment.

1. Errors related to the method of conducting the experiment

Errors made depending on the method of conducting the experiment are classified as chronic errors. For example, when working with a simple calorimeter, if it is not well insulated from the external environment, then when the result is obtained, the value of the amount of heat is determined less than the actual value, that is, a chronic error is made. Chronic errors are eliminated by transitioning to more perfect methods.

2. Random device-specific bugs.

These kinds of mistakes are belonged to high quality constructions. They have a certain level of sensitivity and detection. Thus, measuring devices can determine the result only within the limits of a certain level of sensitivity.

3. Chronic errors related to the hardware used.

The quality or grading of manufactured devices also causes chronic errors. For example, incorrect adjustment of an analytical balance, incorrect calibration of a thermometer or voltmeter scale - leads to a chronic error in temperature or voltage measurement. Such errors can be eliminated by properly configuring the device.

4. Personal error of the experimenter.

These errors depend on the attention, experience, and sensitivity of the experimenter and are included in random errors. For example, when working with photometer devices, two half-lights are equalized according to the eyepiece, in this case, a certain degree of error is allowed when looking at the equalization of

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light by eye. (It depends on the vision of the experimenter)

5. Errors due to experimental conditions.

Random errors also include errors due to experimental conditions. They occur in temperature, pressure changes, voltage changes in the current circuit, and in other cases. In addition to chronic and random errors, there are errors that differ greatly from other results among experimental results. This error occurs due to the carelessness of the experimenter or a malfunction of the device. This error will discard the result and fill it with another result.

The theory of errors teaches how to reduce the error of the measurements obtained in the experiment. Therefore, it is essential to know how precisely the experiment was carried out. We present some of the most commonly used techniques in this guide.

6. Arithmetic average value.

Random errors created as a result of experiments with the same probability deviate the measured value from its true value in one direction or another, and in a sufficient number of experiments, these errors compensate each other. These cases indicate the probability with the arithmetic mean value of the quantity and it is calculated by the following formula.

$$\bar{x} = \frac{x_1 + x_2 + \ldots.. + x_n}{n} = \frac{\sum_{i=1}^{n} x_n}{n}$$

Here x - average arithmetic value, $x_1, x_2, \ldots, x_n$ - the result of individual dimensions, n- number of dimensions, $\sum_{i=1}^{n} x_i$ - the sum of all dimensions.

7. An absolute mistake.

In the conducted experiments, the concept of absolute error is introduced to show the degree of approximation of the result to the true value. It shows how much it differs from the actual value. It is appropriate to include the average absolute error in repeated measurements of some quantities. The absolute error of each dimension is calculated as follows.

$$|x - x_1| = |\Delta x_1|; \quad |x - x_2| = |\Delta x_2|; \ldots\ldots\ldots\ldots; \quad |x - x_n| = |\Delta x_n|;$$

Then the mean absolute error

$$|\Delta x| = \frac{|\Delta x_1| + |\Delta x_2| + \ldots\ldots\ldots + |\Delta x_n|}{n} = \frac{\sum_{i=1}^{n} \Delta x_i}{n}$$

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It is determined by the formula. Here is the absolute value of the deviation from the arithmetic mean, that is, all positive numbers.

8. Relative error.

The quantity that indicates the accuracy of the measurements is the relative error. It shows how much of the measurement result is the absolute error and is calculated as follows.

$$D = \frac{\left|\overline{\Delta\chi}\right|}{\overline{\chi}} \quad \text{here} \quad \left|\overline{\Delta\chi}\right| = D \cdot \chi$$

Usually the relative error is expressed as a percentage:

$$D = \frac{\left|\Delta\bar{x}\right|}{\bar{x}} \cdot 100\% \cdot$$

The actual values of the results of the experiments are within the defined error range. For example: let l be some measured length. The average value of the length *l=23,4mm* average value of the absolute error $\overline{\Delta l}$ =0,5 mm then the actual value of the length

$$l_{1haq.} = (23{,}4 - 0{,}5)mm \quad \text{and} \quad l_{2haq.} = (23{,}4 + 0{,}5)mm,$$

Or 22,9< $l_{haqiqiy.}$<23.9 *mm* will be. It is accepted to write the result of calculations in the following general form.

$$l_{haqiqiy} = (l \pm \Delta l)mm \qquad l_{haqiqiy} = (23{,}4 \pm 0{,}5)mm.$$

CONCLUSION

In conclusion, according to the decision of the International Association of General and Applied Biophysics, biophysics is divided into the following departments: molecular biophysics, cellular biophysics, biophysics of sense organs and complex systems. Molecular biophysics studies the structure and physical properties of biological molecules (mainly proteins and nucleic acids), as well as the kinetics and thermodynamics of biological processes. Cell biophysics, firstly, studies the ultrastructure of the cell, its physical and physicochemical properties, and secondly, it reflects the functional activity of the cell, that is, it studies conductivity, bioelectric potentials and other parameters. The main goal of the biophysics of sensory organs is to study molecular physicochemical mechanisms, complex reactions of nerve cells, and information encoding mechanisms in sensory organs. Biophysics of complex systems is important for controlling multicellular systems with a complex structure and studying the thermodynamic and kinetic properties of their activity.

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