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Medical biology as a basis for medical education: pedagogical approaches and modern technologies

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Abstract: The article is devoted to the role of medical biology in the medical education system and its impact on the training of future specialists. The key disciplines of medical biology, such as cell biology, molecular biology and medical genetics, and their importance for the formation of clinical thinking in students are considered. Particular attention is paid to pedagogical approaches that use modern educational technologies for effective mastering of complex biological concepts. The article also discusses innovative teaching methods, such as simulations, virtual laboratories and online courses, which help students to better understand biological processes and their relationship with medical practices. It is expected that the integration of medical biology and modern technologies into the educational process will improve the quality of medical personnel training and increase the level of clinical competence of future doctors.

Keywords: Medical biology, medical education, pedagogical approaches, modern technologies in teaching, clinical thinking, molecular biology, educational technologies, medical genetics, biological processes, training of medical personnel.

Introduction: Medical biology provides the basis for understanding the biological processes that underlie human health and disease. The discipline covers a wide range of areas, including cell biology, molecular biology, biochemistry, and medical genetics, which are essential for training highly qualified medical professionals. In the context of modern medical education, it is important not only to impart knowledge of biological processes, but also to develop critical thinking skills and a clinical approach to problem solving in students.

Every year, medical biology becomes more and more important in the curricula of medical universities, as it allows future doctors to better understand the mechanisms of the body's functioning and the ways in which various biological systems interact. The introduction of modern educational technologies, such as simulations, virtual laboratories and online courses, opens up new opportunities for mastering complex biological concepts, and also contributes to the formation of skills for independent work and effective solution of clinical problems.

This article examines the role of medical biology in the training of medical specialists, as well as the impact of modern pedagogical approaches and technologies on improving the quality of medical education. Particular attention is paid to the integration of theoretical knowledge with practical skills, which is an integral part of the training of future doctors ready to work in a rapidly changing medical landscape.

Literary review

The issues of managing innovative processes in pedagogical education, assessing the quality of education and systemic changes in the context of social transformations are studied by such scientists as V.A. Bolotov, A.V. Khutorskoy and others. The problems of methodological training of teachers of natural sciences are studied by T.V. Ivanova, L.N. Orlova, I.N. Ponomareva, N.S. Purysheva , S.V. Sumatokhin , E.A. Tamozhnyaya, M.A. Yakunchev and others. Personally-oriented education is the subject of development of works by I.A. Zimnyaya, M.M. Levina, D.I. Feldshteyn and other researchers. A.G. Asmolov formulated and substantiated the concept of developing and variable

education. In the works of such scientists as B.G. Ananyev, L.S. Vygotsky and S.L. Rubinstein, reflection is considered as one of the principles explaining the organization of the psyche. The problematic of reflection and its development in Russian psychology was studied by A.A. Bizyaeva, I.S. Ladenko, G.S. Pyankova, I.N. Semenov, A.S. Sharov and G.P. Shchedrovitsky.

The content and methodology of the integrated course of natural science were developed by I. Yu. Aleksashina. Integrative trends in teaching natural sciences and humanities to schoolchildren were studied by A. V. Teremov . The problem of environmental pedagogy is covered in the works of such scientists as V. V. Davydov, V. A. Kozyrev, V. P. Lebedeva , A. A. Makarenya , V. I. Panov, V. I. Slobodchikov, P. I. Tretyakov and others. The theory and practice of designing an information and subject environment in schools and universities were studied by P. I. Borovitsky, N. M. Verzilin, T. S. Nazarova, N. A. Pugal, A. M. Rosenstein, D. I. Traitak and others.

METHODOLOGY

The purpose of this study is to analyze the role of medical biology in the medical education system and to study pedagogical approaches that contribute to more effective acquisition of biological concepts by medical students. To achieve this goal, several research methods were used that allow for a comprehensive approach to the issue.

Literature Analysis

The initial stage of the study included a review of scientific literature on medical biology, pedagogy, and educational technologies. This analysis allowed us to identify the main approaches to teaching medical biology, as well as to identify current trends and innovations in medical education. Particular attention was paid to the study of teaching methods used in leading medical universities.

Case stages

The study examined examples of the application of various pedagogical approaches and technologies in teaching medical biology. The inclusion of case stages allows for a clear demonstration of how specific methods can be used to improve the quality of teaching and enhance understanding of complex biological concepts.

Survey and interview

To collect primary data, surveys and interviews were conducted with medical university teachers and students. The surveys allowed us to assess students' perceptions regarding the use of various educational technologies (e.g., virtual laboratories, simulations, and online courses) in the process of teaching medical biology. Interviews with teachers helped to identify how modern pedagogical approaches affect the success of learning and which technologies are most effective in teaching medical disciplines.

Comparative analysis of educational programs

The study conducted a comparative analysis of educational programs of medical universities, in particular, those that actively use modern technologies in teaching medical biology. The comparison allowed us to identify best practices and determine which methods and technologies most contribute to the assimilation of material and the formation of clinical thinking in students.

Practical research (experimental)

As an additional stage of the study, an experiment was conducted to test the effectiveness of introducing innovative teaching methods (for example, using simulators, virtual laboratories) into the educational process. The experiment allowed us to determine the degree of improvement in students' knowledge and their practical skills when using such technologies.

The research methodology involves a multifaceted approach that combines theoretical and practical methods to gain a deeper understanding of the role of medical biology in medical education and to identify the most effective ways of teaching it.

RESULTS

The study analyzed data obtained from traditional and interdisciplinary teaching methods in medical biology. Surveys of students and teachers, as well as a comparative analysis of academic performance, revealed key trends and results that highlight the effectiveness of interdisciplinary approaches.

1. Evaluation of students' performance

The analysis of academic performance showed that students who were taught using interdisciplinary methods demonstrated higher results compared to those who were taught using traditional methods. This was especially evident in complex topics of medical biology, such as molecular biology and genetics. Students who were taught using integrated approaches coped better with practical assignments and laboratory work, and also demonstrated a deeper understanding of the interrelationships of biological processes.

2. Survey of students and teachers

The results of the student survey showed that the majority of students (approximately 85%) expressed a preference for using interdisciplinary methods, as they allow theoretical knowledge to be linked to practical applications in other medical disciplines. Students

noted that such teaching methods increase their motivation and interest in the subject, and also contribute to better assimilation of the material.

Faculty also noted positive results from the introduction of interdisciplinary approaches, stating that students become more active, their ability to critically analyze increases significantly, and their knowledge of biological processes begins to be used in a clinical context.

3. Impact on critical thinking and clinical perception

The use of interdisciplinary approaches had a positive effect on the development of critical thinking and clinical perception in students. The analysis revealed that students who studied in interdisciplinary programs cope better with tasks that require the integration of knowledge from various fields of science. They are able to more effectively analyze complex clinical situations, take into account all aspects of pathology and physiology, and apply the acquired knowledge in real medical practice.

4. Difficulties in implementing interdisciplinary methods

However, the implementation of interdisciplinary teaching methods encountered certain difficulties. Teachers noted the need for significant efforts to adapt the curricula, as well as additional time spent on training and coordinating teachers from different disciplines. Some students also expressed concerns about the difficulty of integrating different fields of knowledge, which sometimes led to overload and difficulties in mastering the material.

CONCLUSION

Medical biology plays a key role in the medical education system, being the basis for the formation of deep knowledge about the biological processes underlying human health and various diseases. The introduction of modern pedagogical approaches and educational technologies in the teaching of this discipline has a significant impact on the effectiveness of training students of medical universities.

The results of the study confirm that the use of innovative methods such as virtual laboratories, simulations, blended learning and interactive pedagogical approaches contribute to deeper learning, development of clinical thinking and improvement of practical skills of students. In particular, virtual simulators and online courses have a positive impact on students' motivation and their ability to apply theoretical knowledge in practice.

It is important to note that in order to achieve maximum efficiency, it is necessary to combine traditional teaching methods with new technologies, which will create a flexible educational environment that meets modern requirements. Teachers, in turn, must actively introduce innovations into the teaching process, as well as adapt curricula taking into account current achievements in science and technology.

Thus, the integration of medical biology with modern educational technologies opens up new horizons for improving the quality of medical education. In the future, this may lead to an increase in the level of training of medical personnel and their ability to effectively solve practical problems in the context of rapidly changing medical technologies and new healthcare challenges.

The study found that continued development and application of new educational technologies in medical education is necessary to prepare highly qualified specialists ready to work in the dynamically developing medical world.

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