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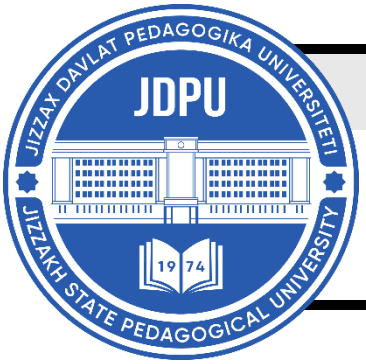

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MODERN DIDACTIC TECHNOLOGIES FOR DEVELOPING ECOLOGICAL COMPETENCE OF MEDICAL STUDENTS AND THEIR ADVANTAGES

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ABOUT ARTICLE

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Abstract: This article highlights the importance of teaching the subject of Bioecology in medical higher education institutions based on modern didactic technologies. It demonstrates how the effective use of digital tools, multimedia, the internet, and innovative pedagogical approaches contributes to shaping students into environmentally literate, conscious, and responsible professionals. Methods such as case-study and problem-based learning enhance students' analytical thinking, decision-making, and independent research skills. The article analyzes the structural components of bioecological education and evaluates their role in the teaching process. Criteria for developing students' ecological competence are presented through motivational, cognitive, and operational levels. The application of new educational technologies allows for the formation of an innovative methodology in line with the third-generation standards in medical education. As a result, a foundation is laid for training qualified doctors capable of ensuring ecological sustainability.

Introduction

Currently, in medical higher education institutions, the effective teaching of the subject Bioecology is yielding positive results not only through practical lessons but also through the use of digital technologies, multimedia tools, internet capabilities, a unified information space, and other modern information and communication technologies. At the same time, it is also of great importance to introduce innovative pedagogical approaches that encourage students to think creatively, analyze problems, and draw reasoned conclusions based on them.

Nowadays, it has become one of the pressing issues to deeply study the scientific and theoretical foundations of didactic teaching technologies and apply them in the process of medical education, particularly in mastering the subject of Bioecology. Effective use of science, technology, and advanced technological achievements based on defined goals, tasks, content, and methodological requirements in the education of students is one of the main tasks facing the modern education system.

Didactic teaching technologies serve to arouse interest in knowledge in students' minds during the learning process, ensure deep and stable learning, and develop skills to freely apply this knowledge in practice, which ensures high achievements. Therefore, when teaching the subject of Bioecology, it is important to correctly select teaching technologies based on the didactic goal of each lesson.

Materials and methods

In the process of medical education, developmental pedagogical methods can be used to train students as specialists who possess ecological knowledge and skills and take responsibility. For example, Case-study and methods for solving complex problems develop students' skills in analysis, memory retention, and application of new solutions.[1]

Table 1

Analysis of systematic teaching of the subject Bioecology to medical students.

Component	Description	Key Questions	Analysis Methods	Result Indicators
Biotic factors	Living factors (plants, animals, microorganisms)	What organisms live there? How do they interact?	Monitoring, biological analysis	Population density, biodiversity

Abiotic factors	Non-living factors (temperature, humidity, soil, light)	What abiotic conditions prevail?	Physico-chemical measurements	pH, temperature, humidity level, soil structure
Energy flow	Transfer of solar energy	Where does the energy come from and how is it distributed?	Trophic chains, energy budgets	Energy efficiency, types of food chains
Matter cycling	Cycling of chemical elements within an ecosystem	How do substances cycle (nitrogen, carbon, water)?	Biogeochemical cycle analysis	Completeness of substance cycles, balance
Ecological stability	The ecosystem's ability to respond to changes	How is ecosystem balance maintained?	Stress tests, modeling	Recovery speed, balance maintenance level
Human impact	Anthropogenic factors (construction, pollution, agriculture)	How does human activity affect the ecosystem?	Monitoring, GIS technologies	Degree of degradation, anthropogenic load
Biotic factors	Living factors (plants, animals, microorganisms)	What organisms live there? How do they interact?	Monitoring, biological analysis	Population density, biodiversity

Thus, in order to develop the ecological competence of future doctors, it is necessary to develop new approaches, identify their didactic capabilities, and review the general methodology, methods, and technologies under the conditions of transitioning to the third-generation standards in medical education.[2]

Result and discussion

In addition, in order to train students in medical higher education institutions as specialists with ecological literacy and a responsible approach to the environment through the teaching of the Bioecology subject, it is necessary to highlight the specific features of didactic teaching technologies.

Table 2

Technology Type	Definition	Advantages	Limitations	Impact on Ecological Competence
Case-study	A method of analyzing problem-solving tasks based on real-life situations	Based on real situations; promotes critical thinking; teaches decision-making skills	Requires more time; needs prior preparation	Enhances ability to view and solve ecological issues comprehensively

The use of these didactic technologies in the educational process is considered an objective need for forming students' ecological activity, allowing them to be implemented effectively from both theoretical and practical perspectives. At the same time, they play an important role in overcoming the existing contradictions related to insufficiently developed pedagogical conditions.[9]

In the process of teaching the subject of Bioecology in medical educational institutions, special attention should be paid to developing students' ecological competence. For example, during classes, students not only acquire knowledge about environmental issues but also develop attitudes toward the environment. This leads to the formation of a system of dominant motives directed toward professional activities based on ecological consciousness as a motivational component.[3]

The main skills that should be formed during the active cognitive participation of students in the teaching process of the Bioecology subject are as follows:

1. Enriching, deepening, and improving ecological knowledge through self-development and self-education;
2. Identifying main goals and issues from the content of the text and analyzing them within the scope of the topic;
3. Deeply mastering the theoretical foundations of the Bioecology subject and integrating them with professional training;

4. Selecting and systematizing information related to the topic and carrying out basic scientific-research activities based on this.

Based on the description of didactic activity skills (interest in knowledge, creative approach, student individuality, etc.), we determined the criteria and levels for the development of students' ecological competence as follows:

1. Motivational-ethical criterion – internal interest in the topic, aspiration for self-development, potential to implement ecological ideas, professional identification, participation in intercultural communication;

2. Cognitive criterion – activity in performing practical tasks, readiness for scientific research, potential for creative thinking, development of ecological thinking;

3. Operational-practical criterion – bioecological activity skills and the ability to analyze them, ability to draw conclusions, search for new knowledge and gain experience, initiative in implementing ecological activities.[5]

Students studying in medical education must have ecological competence as future doctors. These competencies are closely related to specific activity skills, leadership qualities in decision-making, professional characteristics, and adaptation to the social environment.[6]

Conclusion

Currently, the importance of the subject Bioecology in medical education institutions is increasing. Through this subject, students not only acquire ecological knowledge but also develop a conscious and responsible approach to the environment. Additionally, it enables a deeper understanding of the interrelationship between ecological safety, sustainable development, and the healthcare system.

As noted in the article, modern didactic technologies — digital tools, interactive methods, and innovative approaches — are essential in deepening students' knowledge through effective teaching of the Bioecology subject. In particular, Case-study, problem-based teaching, project-based developments, and analytical thinking-oriented methods shape students' professional and ecological competence.

Analyses show that systematic teaching of Bioecology in medical education — based on ecological components (biotic and abiotic factors, matter cycling, energy flow, human impact) — requires in-depth analysis of the educational process. This serves to help future doctors

understand ecosystems comprehensively and grasp the link between health and the environment.

The methodological approaches and analytical results presented in the article allow for viewing the Bioecology subject as a professional-competency basis for medical professions. Furthermore, students acquire decision-making skills based on ecological thinking, ecological culture, and ecological consciousness.

The following criteria are of particular importance in shaping students' ecological competence: motivational-ethical (interest, conscious participation), cognitive (analytical thinking, readiness for scientific research), and operational-practical (effective organization of bioecological activity, drawing conclusions). Based on these criteria, the dynamics of students' growth can be observed, ensuring their development as environmentally responsible specialists.

The Bioecology subject, taught using didactic technologies, strengthens the balance between ecological sustainability, health, and professional preparation. Therefore, educators and educational-methodological systems must develop new, innovative, and competency-based teaching strategies.

In conclusion, through effective teaching of the Bioecology subject in medical education, it is possible to train doctors who are environmentally cultured, professionally competent, and contributors to sustainable development. This is an important stage in ensuring ecological safety in the healthcare system.

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