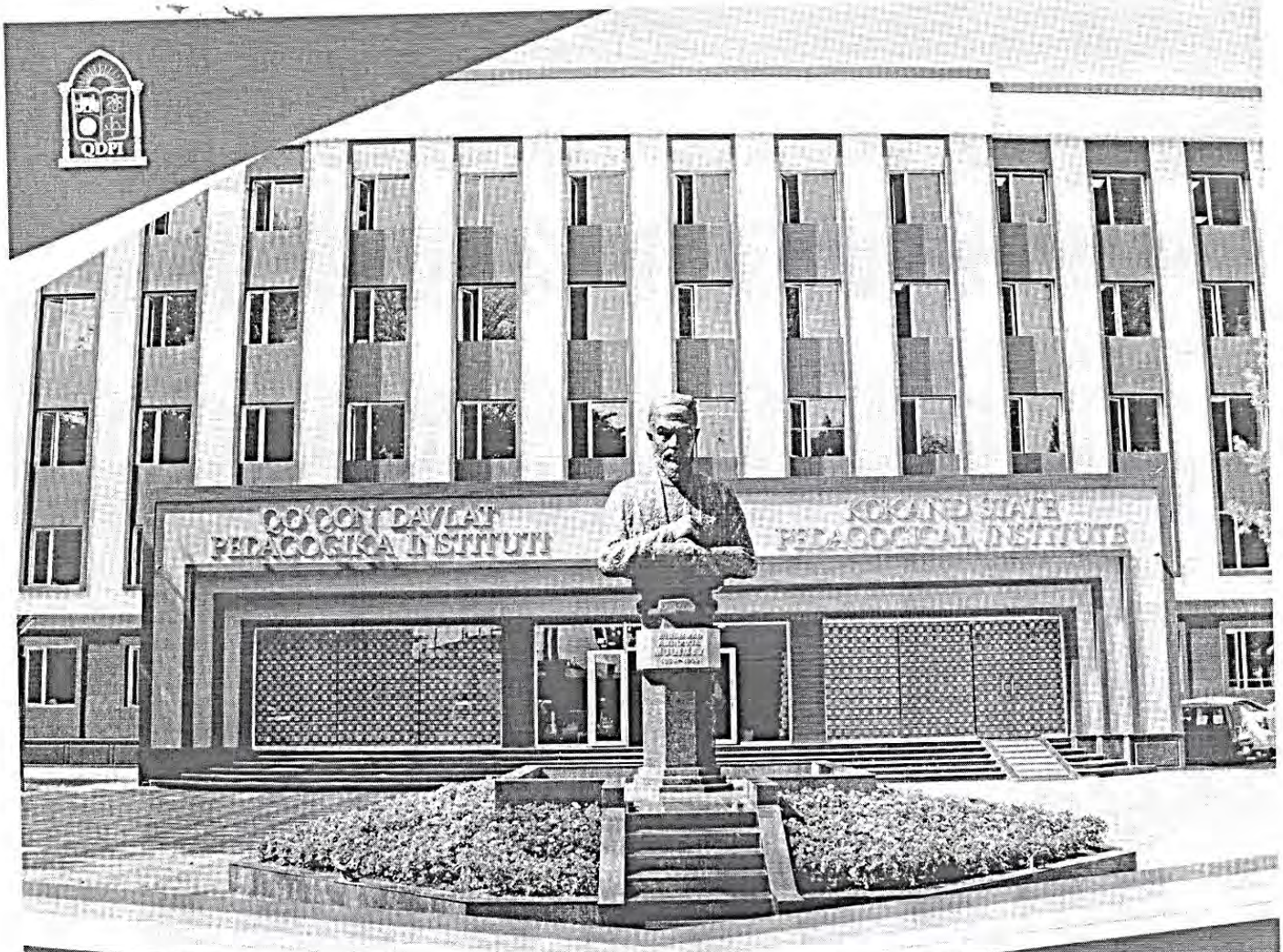

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TABIIY FANLAR

NATURAL SCIENCES

METHODOLOGICAL OPPORTUNITIES FOR ORGANIZING INDEPENDENT LEARNING ACTIVITIES IN BIOCHEMISTRY

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Annotation: The Science of Biochemistry studies such issues as the chemical composition of the human body, the exchange of substances, their role in biological processes in the field of Natural Sciences. Independent teaching activities help students to further master science and develop scientific activities. The methodology of independent study in biochemistry is based on the formation of theoretical knowledge and practical skills for students, the creation of self-examination and assessment opportunities.

Keywords: independent educational activities, theoretical knowledge, practical skills, analysis and mastering, laboratory work, scientific research, self-assessment, online resources.

The Concept of Development of the Higher Education System of the Republic of Uzbekistan until 2030, in Section 3, Paragraph 1, outlines the goal of increasing the proportion of independent learning hours, encouraging students to engage in independent learning, critical and creative thinking, systematic analysis, and the formation of entrepreneurial skills. It emphasizes the introduction of methodologies and technologies aimed at strengthening competencies in the educational process, and promoting the implementation of advanced pedagogical technologies, curricula, and educational-methodical materials based on international education standards to direct the learning process toward the development of practical skills. This approach focuses on the continuous development of students' independent learning skills and their ability to acquire the necessary competencies, including creativity, research skills, and logical thinking, all of which are essential for the development of future specialists.

The organization of independent work for students is one of the most pressing issues of modern education. It is closely related to the need for continuous acquisition of new knowledge, which forms the basis for the cognitive independence necessary for the professional development of the student. Some studies indicate that insufficient attention has been given to

addressing the issue of organizing independent work. Its complexity and multifactorial nature highlight that resolving this problem through traditional teaching methods alone is very challenging. Thus, the need for independent learning of new knowledge is connected with the existence of contradictions within modern education systems, as the rapid acquisition of knowledge often conflicts with the limitations of traditional teaching methods for assimilating new information.

The subject of biochemistry helps to understand the fundamental laws of life by studying biological processes and chemical reactions in organisms. This science allows students to comprehend molecular-level processes in the human body, their interactions, and the factors influencing them. Biochemistry is not only significant in the natural sciences but also plays a crucial role in fields such as medicine, pharmacy, ecology, and others.

Independent learning plays a critical role in education, as it strengthens students' knowledge, deepens their understanding of material, and allows them to apply it in practice. In studying biochemistry, independent learning not only provides students with theoretical knowledge but also fosters their scientific and practical development.

There are various methodological approaches and tools for effectively organizing independent learning activities. These methods enhance students' analytical thinking, deepen their understanding of the topics studied, and prepare them for scientific research. Educational materials, tests, laboratory work, interactive technologies, and methods for working with scientific literature are widely used in organizing this process.

The potential of modern telecommunications tools is vast and encompasses not only well-known concepts such as computers, multimedia tools, computer networks, and the internet but also includes newer terms like information systems, information system management, transmission systems, data warehouses, and knowledge bases. The "Information Age" of the 21st century necessitates the introduction of electronic education (e-learning) in the educational sector, which requires the informatization of teaching and learning processes, management systems, and the environment of educational institutions. Creating an e-learning environment in educational institutions starts with establishing a psychological information environment. It requires the use of modern tools and methods based on technological and scientific results and the development of software products. The establishment of independent and computer-based education systems through individual and advisory sessions for educators is essential. The organization and use of educational information resources are given special attention in the country. The introduction of e-learning in education is directly linked to the intellectual potential of society, the informatization of the education sector, and the development of educational information resources.

The integration of education with science and industry, the creation of mechanisms for implementing this integration, the development of technologies and tools for distance education (DE), and the use of new pedagogical and information technologies to enhance student learning are among the key tasks. Organizing the educational process based on DE requires adjustments

to the principles of presenting educational materials. The application of information and communication technologies (ICT) in education, particularly in distance education, occurs in two forms: the use of technical equipment and the availability of specialized software.

In addition, when organizing independent learning in biochemistry, it is important to foster students' creative and critical thinking abilities and support them in finding their place in the scientific field. This process motivates students to engage in scientific research and provides a solid foundation for effective learning activities.

1. Objectives and Tasks of Educational Activities The primary goal in organizing independent learning in biochemistry is to thoroughly familiarize students with the subject, develop their independent thinking and scientific abilities, and ensure that they can apply the learned material in practice. This process deepens students' knowledge and prepares them for scientific research activities.

2. Methodological Foundations for Organizing Independent Learning Independent learning is aimed at developing students' independent thinking. Several methodological approaches are used in this process:

- **Lectures and Seminars**: Lectures and seminars play an essential role in teaching the basic concepts of biochemistry. During seminars, students analyze the topics they have learned and engage in discussions.
- **Working with Educational Materials and Literature**: It is recommended that students use scientific literature and educational manuals to build a solid knowledge base. They study scientific articles, monographs, and textbooks to expand their knowledge.
- **Tests and Self-Assessment**: Given the complexity of biochemistry, it is important to provide students with the opportunity to test their knowledge through self-assessment. This method helps students reinforce their understanding.
- **Laboratory Work**: Biochemistry laboratory work introduces students to practical skills. Through independent laboratory exercises, students learn to analyze biological processes.

3. Practical Methods for Organizing Independent Work

- **Preparing Lectures and Seminars**: Students independently analyze educational materials and prepare for seminars. During this process, students should understand the topics well and provide relevant examples.
- **Discussion and Group Work**: Students form groups to exchange ideas and assist each other in solving biochemistry-related problems. This method strengthens students' knowledge and teaches them to accept different perspectives.
- **Evaluation and Self-Assessment**: Students should be given the opportunity to evaluate their work and analyze the grades given by others. This method encourages students to improve their knowledge and skills.

4. Application of New Technologies New technologies, such as online resources, video lectures, interactive educational platforms, and other digital tools, support independent learning

in biochemistry. The internet and digital resources provide students with access to a wide range of educational materials, forums, and opportunities to share knowledge.

5. Enhancing the Effectiveness of Independent Learning

• **Analytical and Creative Thinking**: Students should not only memorize the material but also analyze and develop creative thinking. This prepares them for scientific research.

• **Effective Time Management**: To organize independent learning effectively, students must learn to plan their time wisely. This helps in deepening their knowledge and improving self-assessment.

Conclusion The methodology for organizing independent learning in biochemistry aims to provide students with in-depth knowledge while integrating scientific and practical activities. To effectively organize independent learning, it is necessary to use methodological approaches, modern technologies, and laboratory exercises in the educational process.

Biochemistry plays a significant role in helping students understand molecular processes in life and develop scientific knowledge based on these processes. Organizing independent learning fosters the integration of theoretical knowledge with practical skills, while enhancing students' abilities in scientific research and analytical thinking. The methodological opportunities for organizing independent learning in biochemistry include various tools that assist students in mastering, creating, and analyzing the material. These include working with educational materials, conducting laboratory exercises, using online resources, group work, and testing knowledge. Additionally, the use of modern educational technologies, such as interactive platforms and multimedia materials, makes independent learning more engaging and effective.

In conclusion, the methodological opportunities for organizing independent learning in biochemistry are essential for deepening students' knowledge, preparing them for scientific work and practical activities. The diversity of approaches and the effective use of methodological tools significantly improve the quality of the educational process.

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