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PEDAGOGICAL CONDITIONS FOR USING BIOLOGICAL PROBLEMS IN STUDENTS' INDEPENDENT WORK

Jumayev Sirojiddin Zafarovich
Lecturer in the Department of Biology at the Faculty of Natural Sciences of the Nizami National University of Uzbekistan

Annotation. The article highlights that the effective use of exercises and tasks in developing students' independent thinking and research skills in biology teaching encourages students not only to master ready-made knowledge but also to analyze the received information and draw conclusions, and such a methodological approach develops students' independent thinking, allowing them to understand and explain complex biological processes.

Keywords: independent learning, form of education, problem-solving, educational system, credit-module system, problem, exercise, working with information, self-development, cognitive, creative thinking.

Introduction. The primary goal of the modern higher education system is to train specialists who not only possess ready-made knowledge but also think independently, are capable of making correct decisions in problematic situations, and are competitive. In today's rapidly growing information flow, the proper organization of students' independent activities outside the classroom is of particular importance. Especially in the teaching of fundamental and dynamically developing disciplines such as biology, students' independent work should not consist of mere notes or mechanical memorization. To achieve this, it is necessary to introduce biological problems (problem situations, cases, and cognitive tasks) into the educational process that encourage the student to search, analyze, and draw conclusions.

The systematic use of biological problems in students' independent work fosters critical thinking, a creative approach, and research skills. However, in educational practice, simply introducing biological problems into students' independent work does not always yield the expected results. To achieve this, it is necessary to define specific pedagogical conditions for this process, adapt the level of task complexity to the individual capabilities of students, and develop didactic support. The insufficient systematization of this issue determines the relevance of this article.

Materials and methods. This study is aimed at scientifically, theoretically, and practically substantiating the methods of psychological and pedagogical implementation of the didactic possibilities of using exercises and problems in organizing students' independent work on biology in the context of higher education to develop independent thinking skills, combining qualitative and quantitative research methods based on a comprehensive approach. The study was conducted during the 2025-2026 academic year and relied on the integration of pedagogical, psychological, and information technology components.

The object of the research is the process of educational activity of students studying the subject "Fundamentals of Genetics and Genomics." The subject of the study was the study of the didactic possibilities of using exercises and problems in organizing students' independent work to develop independent thinking skills.

The methodological basis of the study is based on the principles of pedagogy aimed at determining the didactic possibilities of using exercises and problems in organizing independent work in the educational activities of students studying the subject "Fundamentals of Genetics and Genomics" to develop independent thinking skills. These approaches made it possible to design a differentiated learning environment adapted to the individual needs of students. In the process of data collection, methods of pedagogical observation, psychological diagnostics, biometric

monitoring, and reflective analysis were used. Specifically, within the framework of the observation method, the process of organizing students' extracurricular activities was assessed in real-time. At the same time, it was determined how much time students spend on the task assigned by the professor, as well as the methods used individually for the independent formation of knowledge, skills, and abilities. These data were compared with the results of pedagogical observation and comprehensively analyzed.

Results. When organizing students' independent individual learning, it is necessary to take into account their individual characteristics, their interest in the subject, the need for the subject, the student's talent, and the student's level of mastery of subject-specific knowledge. Taking into account the individual characteristics of students and performing tasks designed for use in the course of teaching the subject, the student becomes the subject of their own educational activity.

In the theory of the step-by-step formation of mental activity, the process of acquiring knowledge is considered as the student's educational and cognitive activity, which is carried out in the form of one or more thinking actions and mental actions (operations) performed in a specific sequence during each session (when performing an educational task). [2;70 b]

Exercise involves multiple repetitions on the path to mastering intellectual or practical (physical) actions, without which skills and abilities cannot be formed. Exercises are divided into oral, written, graphic (reflecting the nature of technical processes), social, physical, and other types. [3;46-b.].

In the process of teaching the subject "Fundamentals of Genetics and Genomics," students review their initial theoretical knowledge using exercises and apply it based on tasks in familiar situations, resulting in the formation of scientific skills. Problems are used to transform a skill formed in students into a competence. As the problems become more complex, unfamiliar situations begin to arise for the student. Skills are formed as a result of using acquired skills in complex situations.

A problem is a natural language representation of situations occurring in our daily lives. The problems mainly consist of three sections: 1. The problem statement refers to information about known and unknown quantitative indicators characterizing the situation under study, as well as the quantitative relationships between them; 2. The requirement of the problem is to express what must be determined in the quantitative relations given in the problem's condition; 3. The problem operator is a set of actions performed in relation to quantitative relations under the conditions of fulfilling the requirements of the problem. It consists of solving the problem by forming an equation, solving the problem by forming an equation, identifying the required quantity as much as possible with a single letter, expressing the quantity involved in the problem's condition with a specific letter, finding the quantitative relations specified in the problem's condition, the sequence of logically correct operations, and its solution[1;225-b.].

The student carries out independent thinking activities by creating a scientific educational task and verifying the solution to the created educational task. When creating a scientific and educational task, it is necessary to analyze previously obtained theoretical information and apply creative thinking. During the calculation process, information is recalled, mathematical operations are performed, an algorithm for the process stages is developed, and the ability to draw conclusions and make decisions about the process is formed. This, in turn, demonstrates the high efficiency of using practical exercises and tasks in forming students' perceptions of processes related to the subject "Fundamentals of Genetics and Genomics." The reason why problems and exercises are used to study the content and topics of the scientific process in organizing independent thinking activities in the subject of Fundamentals of Genetics and Genomics:

First, the main goal of studying the subject is to create opportunities for applying acquired knowledge in practice under unfamiliar conditions by solving given problems and performing exercises.

Secondly, students' educational and creative activity is intensified based on problem-solving and exercises.

Thirdly, it allows for the analysis and study of the process through problem-solving. It should be noted that in the development of the problem, it serves as an object that directs the student's attention not only to calculation and determination of the result, but also to independent thinking based on analysis. When studying a subject through problem-solving, it is based on the analysis of specific figures, facts, and laws.

Analysis and discussion. Performing exercises serves to reinforce knowledge acquired in academic subjects and to form skills. Exercises conducted on the topic help students gain a deep understanding of the information received, master the principles and definitions of the topic, and develop skills for applying this knowledge in practice. The use of educational exercises in various situations also helps to increase the effectiveness of teaching the topic.

Reviewing the studied material during the lesson is of great importance for effectively memorizing information on the topic, analyzing information, comparing the obtained information, and developing skills for applying this knowledge in various educational situations. The use of exercises helps students master information by reviewing and applying acquired knowledge in practice.

Educational sessions are an effective means of transforming knowledge acquired from academic subjects into skills and implementing it in practice. Educational exercises help students understand the information received, deeply master the rules and definitions of the topic, and develop skills for their practical application. Transforming acquired knowledge into a skill requires performing the exercises repeatedly and quickly in the shortest possible time. Performing the exercise multiple times plays a crucial role in the effective assimilation of knowledge and the formation of skills. This allows students to apply the acquired knowledge in practice and turn it into skills.

Repeating the exercises encourages the analysis of acquired knowledge, its connection with concepts, and the impression of concepts. At the same time, students are given the opportunity to master the acquired knowledge and acquire the skills necessary to apply it in various conditions.

Teaching students how to perform various cognitive actions using educational tasks helps them gain a deeper understanding of the acquired knowledge and apply it in practice. This allows students to assimilate acquired information and verify its consistency, express their opinions, and find solutions to problematic situations through their own knowledge and skills. The effectiveness of educational exercises is manifested in the practical application of the knowledge acquired by students.

Conclusion. When studying the foundations of genetics and genomics, the diversity of information within the subject encourages students to seek an effective method of motivational learning. When studying the foundations of genetics and genomics, exercises and tasks play a key role in creating motivation that encourages students to perform actions for educational purposes. If knowledge and skills are acquired through exercises, then skills and abilities are formed using problems. In the process of studying problems, the student can think associatively, analytically, independently, logically, and systematically, and can independently evaluate their knowledge based on an unresolved problem. To find a solution to the problem, the student searches for, finds, and repeatedly learns the information to be studied based on the exercise.

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