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Didactic Foundations of Problem-Based Learning Technology in Teaching Entomology

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ABSTRACT

The article describes the use of didactic foundations of problem-based learning technology in teaching entomology. The importance of digital education is described, which creates new learning opportunities and the emergence of opportunities for personalizing learning, expanding communication opportunities and creating a more productive environment for learning entomology. It describes regular and systematic work on training, providing instant access to the necessary information and fostering important skills in working with sources, the ability to distinguish high-quality sources of information from unreliable, attracting young people to scientific activities, the formation of an innovative infrastructure of science in higher educational institutions.

The implementation of the technology of problem-developing learning is carried out on the basis of the teacher's application of a number of principles of didactics: problemativeness, motivation, interdisciplinary connections and accessibility. Like any other didactic system, the system of problem-based learning consists of goals, content, forms, methods and means of teaching.

The functions of problem-based learning in entomology lessons - in terms of content and goals, traditional education is primarily focused on the assimilation of knowledge, skills and abilities by students.

With the humanization of the entire social sphere in traditional education, the goal of the comprehensive and harmonious development of each student began to be declared, which, due to the inertia of the education system and the peculiarities of the methods of traditional pedagogy, was achieved only indirectly. In problem-based learning, as in traditional learning, the importance of all the same functions is recognized, but the emphasis and hierarchy of educational goals change somewhat:

- ✓ development of intelligence, cognitive independence and creative abilities of students;
- ✓ formation of a comprehensively developed personality;
- ✓ students' assimilation of the system of knowledge and methods of mental practical activity.

The use of didactic foundations of problem-based learning technology in the study of insect visual organs. Complex, or faceted, eyes (oculi), among one pair, are located on the sides of the head and consist of many (up to several hundred or even thousands) visual units, ommatidii, or facets. In this regard, some insects (dragonflies, male flies and bees) have eyes so large that they occupy most of the head. Compound eyes are present in most adult insects and in larvae with incomplete transformation from a subclass, with the exception of some groups of parasitic, cave species and inhabitants of anthills, in which they have disappeared for the second time. Of the representatives of the subclass of primiptera, only bristletails have compound eyes. With the humanization of the entire social sphere in traditional education, the goal of the comprehensive and harmonious development of each student began to be declared, which, due to the inertia of the education system and the peculiarities of the methods of traditional pedagogy, was achieved only indirectly.[1]

In problem-based learning, as in traditional learning, the importance of all the same functions is recognized, but the emphasis and hierarchy of educational goals change somewhat.:

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Simple dorsal eyes, or ocelli, in a typical case, among three are arranged in the form of a triangle on the forehead and crown between complex eyes. Sometimes the middle eye disappears, and only two lateral ones remain, less often the disappearance of paired ones is observed while maintaining the middle eye. As a rule, eyes are found in adult, well-flying insects, but they are absent in many lepidoptera and diptera and are found in the larvae of mayfly dragonflies.

In the modern theory of problem-based learning, there are ten didactic ways of creating problem situations that can be taken by a teacher as the basis for problem-based learning:

1. Encouraging students to a theoretical explanation of phenomena, facts, external inconsistencies between them.
2. The use of situations that arise when students perform educational tasks, as well as in the course of their normal life, that is, those problematic situations that arise in practice.
3. The search for practical applications by students of the phenomenon, fact, element of knowledge, skill or skill.
4. Encouraging students to analyze facts and phenomena of reality that generate contradictions between everyday ideas and scientific concepts about them.
5. Making assumptions (hypotheses), formulation of conclusions and their experimental verification.
6. Encouraging students to compare, compare and contrast facts, phenomena, theories that generate problematic situations.
7. Familiarization of students with the facts that led to the formulation of scientific problems in the history of science.
8. Organization of interdisciplinary relations in order to expand the range of possible problem situations.
9. Variation, reformulation of tasks and questions. To achieve maximum effectiveness of the educational process, the formulation of problems should be carried out taking into account the basic logical and didactic rules: separation of the unknown from the known, localization (limitation) of the unknown, the presence of uncertainty in the formulation of the problem, determining possible conditions for a successful solution, taking into account the

psychological characteristics of the assimilation of the material, the level of training of students, their motivational criteria. [1,2,3] In this regard, it is possible to formulate the following rules for creating problem situations in the form of the following problem characterization scheme:

1. An effective problem should arouse the interest of students, motivate them to a deeper understanding of the concepts that were presented. It should relate the subject to real life, so that students are interested in solving the problem.
2. A good problem requires students to make decisions or judgments based on facts, information, logic and/or interconnection. Students should be required to justify all decisions and give all the reasons from the point of view of the material they are studying or broader knowledge. The problem should encourage students to identify the necessary generalizations, important information, steps and procedures necessary to solve it.
3. A good problem is one that requires the cooperation of all members of the group to solve. Students should come to the conclusion that the divide and conquer strategy is not effective.
4. The problem should present the knowledge available to students in a new theoretical or practical interpretation and link new knowledge with concepts in other courses or subjects.
5. Assessment of students' work in problem-based learning. The main psychological conditions for the successful application of problem-based learning

- ✓ problem situations should meet the goals of forming a knowledge system.
- ✓ be accessible to students and match their cognitive abilities.
- ✓ they should cause their own cognitive activity and activity. - tasks should be such that the student could not perform them based on already existing knowledge, but sufficient for independent analysis of the problem and finding the unknown.

The task of changing the content or structure of educational material is not only for a specific teacher, but for the entire educational system: compared with the traditional concept of problem-based learning, for objective reasons, a smaller amount of specific material can be studied, and it requires a significant change in the structure of the educational material in order to give it the character of a problem. And finally, the task of encouraging cognitive activity of students.[1,4,5]

In the classification of didactic technologies according to the main direction of modernization of the traditional system, problem-based learning is referred to as "pedagogical technologies based on the activation and intensification of students' activities." In modern didactics, the priority of intellectual activity is recognized as originating from the internal motivation of students, from the conscious need for the assimilation of knowledge and skills. A great difficulty for a teacher can be the education of students' activity and the development of their creative abilities. This requires him to have a subtle sense of the psychology of the students.

In the process of solving a problem problem, the teacher should try to captivate students with the problem and the process of its research, using the motives of self-realization, competition, creating maximum positive emotions (joy, surprise, sympathy, success). The teacher should be tolerant of the mistakes of students, which they make when trying to find their own solution, as well as the inability to formulate, justify and (or) defend their position. Being a priori authoritative in the eyes of students, he can increase their learning activity if he cultivates and emphasizes their importance, forms students' self-confidence, self-confidence. To develop a creative approach, the teacher should not allow the formation of conformal thinking, that is, orientation to the majority opinion, encourage risky behavior and the manifestation of intuition by the student, stimulate the desire for independent choice of goals, tasks and means of their solution in combination with responsibility for the decisions taken. As a result, it can be noted that problem-based learning, aimed largely at mobilizing the creative forces of students, requires

the same degree of creative characteristics of the teacher himself. In such conditions, teachers' training in problem methods, apparently, should also be conducted within the framework of problem-based learning. Problem-based learning makes it possible to ensure the formation of the child's general abilities and erudition, while preserving his individuality and health; mastering an elementary culture of activity thereby laying the foundations of readiness for further development and self-education.[6,7] The activity of entomology teachers can determine the current directions of methodological research. In teaching practice, research is emerging on the problems of individualization of learning, the use of the natural environment, profiling, informatization, forms of control over the level of training of students. Some teachers themselves argue their methodological findings by performing scientific research. Practice acts as a means of approbation and proof of the results of methodological research. The truth of the research hypothesis is confirmed in practice with the help of experiments. In general, we are talking about revealing to students the meaning of work that ensures the reproduction of biological processes and promotes the affirmation of life, as well as work that opposes man to nature and ignores the specifics of the existence of life on Earth.[8,9,10,11]

Connections with information technologies are of great importance for the methodology of teaching entomology. They act as a way and means of collecting and processing biological information to express the studied object in a new quality. When such information is included in the process of teaching entomology, it becomes possible to model biological systems, analyze their current state and predict the ways of further development of these systems.

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