

“Problem Situations” - Methods and Rules of Creation, Use in Entomology Lessons

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ABSTRACT

The article describes the importance of using problem situations in entomology lessons, methods and rules for creating problem situations and the use of innovative technologies in the study of insects. 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.

A problem situation is a cognitive task that is characterized by a contradiction between the available knowledge, skills, relationships and the requirement. The basis of the theory is the idea of using the creative activity of students through the formulation of problem-formulated tasks and activation. Problem-based learning is based on the consistent and purposeful creation of problem situations. The form of problem situations is similar to that used in traditional teaching: these are educational tasks and questions. However, if in traditional learning these tools are used to consolidate the educational material and acquire skills, then in problem-based learning they serve as a prerequisite for cognition. Therefore, the same task may or may not be problematic, depending on the level of development of students. The task becomes problematic if it is cognitive, rather than reinforcing, training in nature. All this determines the nature of problem-based learning as developing. Problematic situations are usually classified according to various criteria:

- ✓ focus on the search for new knowledge or ways of action,
- ✓ to identify the possibility of applying known knowledge and methods in new conditions;
- ✓ according to the level of problems.

How to use problem-based learning in entomology lessons, since problem-based learning is based on the consistent and purposeful creation of problem situations, let's look at some of them.

Insects constitute a special class in the type of arthropods. Insects are closest to the classes of millipedes (Myriapoda) and crustaceans (Crustacea) and together with them form a group that is allocated to a separate subtype of mandibular (Mandibulata).[1]

Complete the task: What signs unite millipedes and crustaceans insects - insects, millipedes and crustaceans are united by such signs as the presence of one or two pairs of antennae and the transformation of three pairs of limbs following the antennae into oral organs, of which the upper jaws or mandibles are especially strongly developed. The body of insects is covered from the outside with a dense chitinized cuticle forming an external skeleton, or exoskeleton.[1,2]

The main functions of the exoskeleton			
protective	biomechanical	barrier	reference
?	?	?	?

The main functions of the exoskeleton are protective, biomechanical, barrier (prevents the evaporation of water from the insect's body), support (internal outgrowths of the cuticle serve as a place of attachment of skeletal muscles).

In the cuticle there are various pigments that provide a variety of insect coloration.

The most common is the division of problematic situations by the nature of the content side of the contradictions into four types:

1. Insufficiency of students' previous knowledge to explain a new fact, previous skills to solve a new problem;
2. The need to use previously acquired knowledge and skills in fundamentally new practical conditions;
3. There is a contradiction between the theoretically possible way of solving the problem and the practical impracticability of the chosen method;
4. There is a contradiction between the practically achieved result of the educational task and the students' lack of knowledge for its theoretical justification. For the successful implementation of problem-based learning technology, it is necessary: to build an optimal system of problem situations and means of their creation (oral and written words, multimedia tools); selection and use of the most relevant, essential tasks (problems); taking into account the features of problem situations in various types of educational work; finally, in problem-based learning, a personal approach and the skill of the teacher, capable of causing active cognitive activity of the child. The levels of problem-based learning also reflect different levels of thinking. The level of ordinary independent activity is the perception by students of the teacher's explanations, the assimilation of a sample of mental action in a problematic situation, the performance of independent work, exercises of a reproducing nature. The level of semi-independent activity is characterized by the application of acquired knowledge in a new situation and the participation of students in a joint search with the teacher for a way to solve the posed educational problem. The level of independent activity provides for the performance of independent work of the reproductive-search type, when the student independently works according to the text of the textbook, applies the acquired knowledge in a new situation, constructs a solution to a problem of medium complexity.[3,4]

The main tasks of problem-based learning

It is possible to distinguish the following main tasks that problem-based learning poses to the teacher:

1. Informative support;
2. Direction of research;

3. Changing the content and (or) structure of the educational material;
4. Encouraging cognitive activity of students.

Informative provision in this case is understood as not providing knowledge in a ready-made form. Firstly, we are talking about the formulation of problematic situations, during which students are given the very minimum of information that is necessary for a contradiction to arise. Secondly, we are talking about the information required for the successful solution of a problem problem, which at this stage goes beyond the zone of the student's immediate development. The search for all other information is carried out by students independently or with the help of a teacher, but still within the framework of search, not assimilation.[5]

The next task - the direction of the study - characterizes the position of the teacher in problem-based learning. The teacher ceases to be a source of knowledge, but becomes an assistant or a leader in the search for this knowledge - depending on the specific method of teaching and the level of problematic situation for students. The peculiarity of problem-based learning is that the teacher simultaneously acts as a coordinator or partner and as a learning leader. The teacher organizes the entire learning process and, if necessary, is included in it to maintain the process in the required direction. In addition, a separate aspect of this task of the teacher can be attributed to the organization and methodological support of the task in a team, a group of students, when such intervention is objectively necessary. In various groups of insects, the oral apparatus has been modified in order to absorb food of various kinds in the best way and in various ways. (determine which insects have a modified oral apparatus)

The most specialized and diverse types of oral apparatus are listed below; they are chosen to demonstrate the richness of forms taken by homologous parts and the various ways they are used. There are also many other types, and they often represent transitional stages between the types that we are considering here.

The type of oral apparatus is a systematic feature at the squad level. In smaller taxa, there are usually no differences on this basis: as a rule, there are only some individual features of the structure. The type of damage to the plant depends on the method of nutrition and the structure of the oral organs, according to which it is possible to diagnose pests and choose a group of insecticides to combat them. Thus, insecticides of internal or intestinal action can be used to destroy insects with gnawing oral organs, whereas insecticides of external or contact action or fumigants are used against insects with sucking oral organs.[6,7]

Technology of problem-based learning

- organization, under the guidance of a teacher, of independent search activity of students to solve educational problems, as a result of which new knowledge, skills and abilities are formed, cognitive abilities, curiosity, erudition, creative thinking and other significant personal qualities are developed:
- the teacher does not communicate knowledge in a ready-made form, but puts forward a task for the trainees (creates a problem situation) and encourages its resolution;
- a problematic situation arises if the contradiction between:
- existing knowledge and ignorance is actualized (the inability to resolve the problematic situation by known methods and techniques);
- old knowledge and new facts (lower and higher level knowledge, every day and scientific knowledge, discrepancy between existing knowledge and new requirements);
- existing knowledge and changed practical conditions of its application;
- theoretically possible way of solving the problem and the practical impracticability of the chosen method;

- the practically achieved result of the performance of the training task and the lack of knowledge of the trainees for its theoretical justification;
- a problematic situation has didactic value only if the proposed problem task (educational task, questions, practical tasks) corresponds to the intellectual capabilities of the student, encourages him to solve the situation, remove the contradiction that has arisen. 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] Links 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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