

ORGANIZATION OF RESEARCH ACTIVITY OF SCHOOLCHILDREN AT THE LESSONS OF BIOLOGY

L.M. Karakhonova

Head of Department at Research Institute of Pedagogical
Sciences of Uzbekistan named after T.N. Kori Niazliy,
p.f.f.d(PhD), associate professor

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Abstract. *State educational standards suggest the possibility of implementing currently relevant competency-based, systemic-activity approaches that define a number of tasks for teaching biology. One of the tasks is to master the ability to creatively solve educational and practical problems, independently perform various research work, and participate in project activities.*

Not only the ability to learn and create skills, but also the ability to apply it to life is important for a student today. Therefore, this article focuses on the issues of developing research competence in biology classes based on the direct orientation of students to research activities.

Keywords: *learning activities, student skills, educational and research work, the ability to see a problem, raise questions, put forward hypotheses, explain, prove, defend one's ideas, explain, classify, master the methods of scientific knowledge, conduct experiments, draw conclusions and conclusions.*

Introduction. One of the ways of creative perception of modern sciences is systematic teaching and research work. Competently conduct research can not only a person engaged in science professionally, but also someone who is still in school.

The current stage of development of society takes place in conditions of hypercompetition. At the same time, the following are taken as the most significant factors of competitiveness: the availability of qualified, creatively thinking personnel; ability to organize their creative activity; willingness to accept an innovative idea and create conditions for its implementation.

However, in a modern school, most of the knowledge is presented in a ready-made form and does not require additional search efforts, and the main difficulty for students is the independent search for information, the acquisition of knowledge. Therefore, one of the most important conditions for increasing the effectiveness of the educational process is the organization of educational research activities and the development of its main component - research skills, which not only help schoolchildren to better cope with the requirements of the program, but also develop their logical thinking, create an internal motive for learning activities in general.

When studying biology, the main types of educational activities include the student's ability to characterize, explain, classify, master the methods of scientific knowledge, conduct experiments, draw conclusions and conclusions.

Practice shows that one of the ways of creative perception of modern sciences is systematic research work. In this regard, the problem of organizing educational and research activities of students in the classroom and outside of school hours becomes relevant.

State educational standards suggest the possibility of implementing currently relevant competency-based, systemic-activity approaches that define a number of tasks for teaching

biology. One of the tasks is to master the ability to creatively solve educational and practical problems, independently perform various research work, and participate in project activities.

This is connected with the introduction of methods and technologies into the practice of educational institutions based on the research activities of students. School graduates must master the components of research, including the ability to see the problem, raise questions, put forward hypotheses, explain, prove, defend their ideas.

When teaching students research activities, the following tasks are set:

- formation and development of creative abilities of students;
- development of skills and abilities in posing problems and finding ways to solve them;
- development of individual responsibility for their actions, decisions and actions;
- development of the student's communication skills.

The variety of objects and processes studied in biology lessons provides great opportunities for research activities, during which students learn to express their thoughts, work individually, in a group and in a team, construct direct and feedback. During the research work, each student has the opportunity to realize himself, apply his knowledge and experience, and feel success.

In the course of work on educational research, it is possible and advisable to develop the following research skills: understanding the essence of the problem and formulating a problematic issue, formulating and substantiating a hypothesis, defining research objectives, selecting and analyzing literature data, conducting an experiment or observation, recording and processing results, formulating conclusions. As well as the development of such communication skills as organizing intra-group cooperation, joint development of methods of action, public presentation of work.

Research methods. The use of the research method implies the following stages of organizing educational activities: determining the general topic of research, the subject and object of research; identifying and formulating a common problem; formulation of hypotheses; determination of methods for collecting and processing data in support of the hypotheses put forward; data collection; discussion of the obtained data; hypothesis testing; formulation of concepts, generalizations, conclusions; application of conclusions.

1. Determination of the general topic of research, subject and object of research. When choosing a topic, social, cultural, environmental, economic and other significance is of great importance. The outlined idea can be realized only after consideration in a certain system of knowledge, a social phenomenon, an economic problem, etc. That is, an idea can pull along a whole series of interrelated projects that make up a single topic that it is advisable to consider, analyze, consistently study, deeper and deeper delving into the problem, considering its various aspects.

2. Identification and formulation of a common problem. Students are presented with a number of problems, questions, the discussion of which leads to the next step - the formulation of a general problem on the basis of particular ones. Discussion of the relevance and novelty of the research helps to solve the formulated problems.

3. Formulation of hypotheses. Students, with the help of a teacher, formulate a research hypothesis, which later serves as a guideline in the search for the necessary information. For example, a hypothesis may correspond to one or more of the problem questions discussed earlier. Usually hypotheses are formulated in the form of certain relations between two or more events, phenomena.

Purpose of the study. When the problem is defined, the subject, object of research are outlined, the hypothesis is formulated, you can start writing an introduction to future research. For him, the figures of speech given in the table can be recommended. Involving students in research, it is necessary, first of all, to rely on their interests. Everything that is studied should become personally significant for the student, increase his interest and level of knowledge. Research activities should arouse a desire to work, and not repel with their complexity.

Teacher and student together must discover something. Then the attitude of students to the experiments will be thoughtful and meaningful. They themselves will begin to express a lot of hypotheses and offer different options for explaining what they saw. Here the teacher, as a more knowledgeable experimenter, will be able to analyze the results obtained together with them, explain their essence, causality and find answers.

Research activities under the guidance of a teacher allow students to:

- master essential scientific concepts, ideas;
- independently identify problem situations, find ways to resolve them;
- Accurately describe facts, phenomena using generally recognized technology;
- acquire the skill of selecting facts according to their essential characteristics;
- group facts, signs in accordance with general scientific rules;
- to analyze the facts and phenomena, to isolate from them the general and uniform, accidental and natural;
- build evidence and give a refutation.

When writing a research paper, students develop the skills to:

- analyze, systematize (analysis is a way of knowing an object by studying its parts and properties);
- compare (comparison is a way of knowing by establishing similarities and differences);
- generalize and classify (generalization is a way of knowing by defining common essential features);
- define concepts (a concept is a word or phrase denoting a separate object or a set of objects and their essential features);
- prove and refute (proof is a reasoning that establishes the truth of a statement by citing previously proven statements. Refutation is a reasoning aimed at establishing the falsity of a statement put forward).

By participating in research work, students learn ready-made forms of social life, acquire their own social experience, take an active life position, which helps to achieve positive self-realization. The skills and abilities acquired in the process of creative activity will allow students to feel attached to culture and science, able to actively express themselves in the labor market, freely dispose of educational capital.

The advantage of the research method of organizing educational activities is instilling in students the skill of cooperation. Participants in research activity are not limited to personal interests, they learn to see the problems and interests of their partners and understand that the results of their research will be used to analyze the data obtained and formulate conclusions. It would be wrong to say that, using the research method of teaching, students imitate the work of scientists - they really carry out scientific research if the problems, topic and goals of the work are correctly defined. Such research may be significant in terms of contribution to science or drawing public attention to a particular problem. Therefore, in order to form a holistic, harmonious and

proactive personality of the pupil in the learning process, the research method should be used as often as possible.

The methodological literature offers an algorithm for performing research work in a certain sequence:

- 1) the formulation of the topic
- 2) formulation of the purpose and objectives of the study
- 3) conducting a theoretical study;
- 4) experimental verification;
- 5) analysis and presentation of the results of scientific research;
- 6) implementation and effectiveness of scientific research results;
- 7) public presentation of works at scientific and practical conferences.

Research assignments fascinate children. Research activities can be carried out in three stages: research work for students in grades 5-6; projects for middle management grades 7-8; research work grades 9-11. Receiving their own experimental material, students conduct an analysis and draw conclusions about the nature of the material being studied.

The research problem is connected with overcoming the contradiction between the need to activate cognitive activity, develop the research inclinations of the student, his cognitive interest in the study of biology and the predominance of anatomical and morphological material in the content of the school biology course.

The variety of objects and processes studied in biology lessons provides great opportunities for research activities, during which students learn to express their thoughts, work individually, in a group and in a team, construct direct and feedback. The organization of research activities allows the teacher to provide independent working out of the missed educational material - for example, to conduct an independent research on a given topic in the form of observation and record the results, as well as to motivate a successful student with a puzzling task - for example, to conduct research on the basis of a media lab using a computer and protect the results research. Elements of research activity in biology lessons can be introduced already in the 6th and even in the 5th grade. In order to intensify research activities among younger students and form motivation, it is advisable to familiarize them with the research work of high school students. This system of gradual involvement of students in research activities contributes to the development of their interest in knowledge in the field of biology, as well as the identification of talented and gifted students.

During the research work, each student has the opportunity to realize himself, apply his knowledge and experience, demonstrate his competence, and feel success.

In the course of work on educational research, it is possible and advisable to develop the following research skills: understanding the essence of the problem and formulating a problematic issue, formulating and substantiating a hypothesis, defining research objectives, selecting and analyzing literature data, conducting an experiment or observation, recording and processing results, formulating conclusions, preparation of a report on the implementation of the study. As well as the development of such communication skills as organizing intra-group cooperation, joint development of methods of action, public presentation of work.

Involving students in research, it is necessary, first of all, to be based on their interests. Everything that is studied should become personally significant for the student, increase his interest and level of knowledge. However, the proposed topics and research methods

recommended for the student should not exceed his psychological and physiological capabilities. Research activity should cause a desire to work, and not repel with its complexity and incomprehensibility.

The teacher offers a problematic task, students without the help of the teacher are looking for a solution.

This method involves the most independent activity of students in obtaining and assimilating knowledge and skills. At the same time, the method is based on a clear goal - to ensure the assimilation of the experience of creative activity.

Types of research activities in the lesson

The structure of research activities is defined as follows:

Search activity → analysis → evaluation → forecasting the development of the situation → actions → search activity.

Based on this, the following types of research can be used when organizing the research activities of middle-level students.

Solving creative biological problems.

Elements of the theory of inventive problem solving (TRIZ) are used to successfully solve biological problems.

TRIZ has a large number of tricks and methods that help create a solution and "extract" the solution from the subconscious.

1. Reception "On the contrary"

He recommends that instead of a direct action dictated by the conditions of the problem, try to carry out the reverse action, change the generally accepted solutions to the reverse ones. For example:

There are very tasty chocolate sweets - "bottles with syrup". In their manufacture, they encounter a contradiction:

– The sweet jelly-like syrup needs to be hot so that it can be easily poured into a chocolate bottle, but then the chocolate melts.

- If the syrup is cold, then the chocolate does not melt, but it is very difficult to pour it.

What to do?

They do the opposite: the syrup is not heated, but frozen in the form of a bottle, and the chocolate is made liquid and the bottle is dipped into it.

2. Reception "Turn harm into favor."

This is a difficult, but at the same time wise technique. He requires to know the system well, to know what is bad in it, to try to turn harm into good.

For example:

At present, the number of working industrial enterprises and agricultural enterprises has sharply decreased. This is bad. So what's so good about it?

Answer: The ecological situation in many regions has become noticeably better.

Charles Darwin was sick a lot as a child. This is bad. So what's so good about it?

Answer: This tempered his will, and he gave humanity a new scientific concept of life on Earth.

Theoretical Express Research.

Theoretical express studies are focused on the study and generalization of facts, materials contained in various sources. The topics of such research should allow studying a variety of objects

in their real environment, in action, provide a lot of material and allow you to see a lot of topics for your own research, building various hypotheses.

Students in grades 5-6 successfully cope with this form of research. So, when studying the topic “Adaptation of animals and plants to environmental conditions”, the children, using the materials of the textbook, get acquainted with how cacti, camel thorn are adapted to living in arid conditions, how penguins and pinniped mammals are adapted to living in terrestrial-air and aquatic environments .

Possible research topics: “Adaptation of steppe plants to arid habitat conditions”, “Peculiarities of insectivorous plants”, “Plant adaptations for pollination”, “Insect adaptations for collecting pollen and nectar”. Based on the results of the research, the authors make brief reports, necessarily containing conclusions.

In grades 7-9, theoretical studies are drawn up in the form of an abstract containing a much larger amount of information in the chosen area of research. In the process of searching for information for writing an essay, the student acquires the skills of working with catalogs in the library, classifying and systematizing material, getting acquainted with the basics of designing text documents, learning to highlight the main thing, analyze data and draw conclusions. Working on an essay helps to understand the topic deeper, to assimilate it, develops the skills of organization and purposefulness necessary when studying any subject.

Conducting an educational experiment.

This includes all laboratory and practical work in biology, from the 6th grade to the 11th grade. Performing laboratory work, the student receives subjectively new knowledge.

When performing these works, students acquire the skills of observing, fixing and correctly formatting the results of observations, analyzing the data obtained, and drawing conclusions.

In the 6th grade, when conducting laboratory work, I organize a small study using a digital microscope.

For example, the study of the structure of the mold fungus mukor. A problematic issue in the study of a mold fungus may be to find a difference and identify its cause between the considered temporary micropreparations of a mold fungus that develops on a substrate in the initial period of development and during maturation of spores. Students perform work at their workplaces using a light microscope. The teacher demonstrates micropreparations using a digital microscope.

A learning experiment is one of the productive teaching methods.

Research-competitions

They are also effective in the classroom. For example, a competition for the best cheat sheet. Students in grades 10-11 are given this opportunity. The teacher prepares the text in advance. This text can be a textbook section: “The Theory of the Origin of Life on Earth”, “Origin of Species”, “Fundamentals of Cytology”, etc. When compiling a cheat sheet, the attention of students becomes selective, students try to choose the text that is the main, fundamental of the whole topic. Separate plots of the cheat sheet are united by logical connections. This method teaches students to rationally use scientific literature.

Non-traditional lessons (lesson-presentation "Ancient reptiles", lesson-discussion "The origin of man")

Students prepare for the discussion on their own. On the topic of discussion, they explore not only educational literature, but also additional ones, in order to show their significance in the

issue under discussion. When preparing messages, students often look for "tricky" questions to participate in the discussion.

Research projects.

Research projects can be considered the highest level of research activity of students. Having mastered the method of theoretical express research, acquiring the skills of practical experimental work, students quite successfully cope with the experimental part of the projects, carried out according to specially selected methods. However, one lesson is not enough to complete the educational project.

Every teacher wants his students to study well, to study with interest and desire at school. Parents of students are also interested in this. But sometimes both teachers and parents have to state with regret: "does not want to study", "could do well, but there is no desire." In these cases, we meet with the fact that the student has not formed the need for knowledge, there is no interest in learning.

In the teaching of biology, it is necessary to give an important place to research work - work related to the solution of a creative, research problem with an unknown result in advance. Educational research is aimed at acquiring by students the skill of research activities, mastering the research type of thinking, and forming an active position in the learning process.

What specific tasks are set when teaching students research activities? There are several of them, but the leading ones will be the following:

- to form and develop the creative abilities of the student;
- develop skills and abilities in posing problems and finding ways to solve them;
- create a motivating factor in learning and self-education;
- lay the foundations for a sense of individual responsibility for one's actions, decisions and actions;
- to develop the student's communication skills, etc.

The variety of objects and processes studied in biology lessons provides great opportunities for research activities, during which students learn to express their thoughts, work individually, in a group and in a team, construct direct and feedback. The organization of research activities allows the teacher to provide independent working out of the missed educational material - for example, to conduct an independent research on a given topic in the form of observation and record the results, as well as to motivate a successful student with a puzzling task - for example, to conduct research on the basis of a media lab using a computer and protect the results research.

At the first, elementary stage in the development of research skills, students awaken an interest in the external entertainment of the content of knowledge, interesting facts, and descriptions of specific phenomena.

At the second stage of development of research skills, an interest is formed in establishing causal dependencies, knowledge of essential properties, objects and phenomena. The research activity of the children is manifested in the desire to independently reveal the essence of the processes and phenomena being studied; the intellectual component of cognitive interests begins to prevail over the emotional.

At the third stage of the development of research skills, the ability to carry out activities not according to a model, but in an original way, in their own special way, is formed. The basis of this level is experimental creative activity.

In order to intensify research activity among younger students and form motivation, it is advisable to acquaint them with the research work of high school students. This system of gradual involvement of students in research activities contributes to the development of their interest in knowledge in the field of biology, as well as the identification of talented and gifted students.

During the research work, each student has the opportunity to realize himself, apply his knowledge and experience, demonstrate his competence, and feel success.

Research assignments fascinate children. Research activities are carried out in three stages: research games for children in grades 5-6; research projects for the middle link grades 7-8; research work grades 9-11. Receiving their own experimental material, students conduct an analysis and draw conclusions about the nature of the material being studied. For example, in the work "Feed the Birds in Winter", the children count the number of birds in the area of the school site, observe their behavior and draw conclusions about the nature of their diet and diversity. The work "Spring - a source of strength" allows you to learn a lot of interesting things about the properties of water, touch the history of your native land.

The experience of research activity is a necessary component of preparing schoolchildren to solve various educational, later life tasks, including the choice of a future profession.

In the course of work on educational research, the following research skills are developed: understanding the essence of the problem and formulating a problematic issue, formulating and substantiating a hypothesis, defining research objectives, selecting and analyzing literature data, conducting an experiment or observation, recording and processing results, formulating conclusions, preparing a report on the implementation of the study, as well as the development of such communication skills as the organization of intra-group cooperation, the joint development of methods of action, the public presentation of the work.

Involving students in research, their interests are taken into account. Everything that is studied should become personally significant for the student, increase his interest and level of knowledge. However, the proposed topics and research methods recommended for the student should not exceed his psychological and physiological capabilities. Research activity should cause a desire to work, and not repel with its complexity and incomprehensibility.

So, for example, theoretical express studies are focused on the study and generalization of facts and materials contained in various sources. The topics of such studies allow us to study a variety of objects in their real environment, in action, provide a lot of material and allow us to see a lot of topics for our own research, building various hypotheses.

It becomes possible to use more universal features of the child's personality - natural interest and curiosity in everything, the need for communication and play, and most importantly, it helps to lay the foundation for human development - the desire and ability to learn throughout life.

So, the research activity of students contributes to a better assimilation of educational material.

There is an increase in interest in the subject when using different teaching methods.

And research activity contributes to the development of students' skills of independent work, a creative approach to solving problems.

The skills of working with various sources of additional information are being developed.

Working according to his own action plan, the student changes the types of work (practical work alternates with theoretical work), which is important to reduce fatigue and implement a health-saving approach to learning.

Educational research becomes real not when we suddenly want to conduct it, but when we are able to prepare both ourselves and our students for this level of work.

The upbringing of a student-researcher opens up wide opportunities for the development of an active creative personality, capable of conducting an independent search, making his own discoveries.

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