METHODS OF TEACHING NATURAL SCIENCE IN PRIMARY GENERAL EDUCATION

Akbarova Munira Asqarovna

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Annotation: The modern socio-cultural, ecological and economic needs of mankind put forward the natural sciences to one of the main places among other sciences.

Key words: methods, techniques, means, forms, organizing, interscientific, intersubjective, interdisciplinary

The high level of development of the natural sciences has a serious impact on society as a whole, on its culture and the humanization of human relations. This implies the need for a wide dissemination of natural science knowledge both among the entire population and at different age stages. This responsible mission is called upon to fulfill the pedagogical sciences, which include the methodology of teaching natural science. It studies the processes of familiarizing younger schoolchildren with nature, the development of the personality of children by means of the subject of natural science, while solving a number of the following specific tasks.

1. Why should younger students study nature? Answering this question, the method of natural science researches, determines the goals of learning in accordance with the social order of society, taking into account the content of the transmitted information and the age-related psychophysiological characteristics of students. mineralogy, astronomy, etc.

However, the content of a school subject cannot be identical to science. Therefore, the methodology of natural science transforms scientific knowledge into a school subject, which differs from science in terms of content. It includes brief and only reliable, scientifically proven information.

The transformation of scientific knowledge is also taking into account the data of pedagogy, psychology and physiology on the age characteristics of

3. How to teach, develop and educate children by means of natural science? The result, the product of the study are the methods, techniques, means and forms of organizing the activities of the teacher and students, taking into account the specific features of the content of natural science in elementary school. The most important feature of natural science is that the object of its study is the surrounding nature. This feature requires the use of appropriate methods (mainly practical), forms of organization of educational activities (excursions, practical, independent and extracurricular work) and teaching aids (specific textbooks, educational and visual aids)

2. Methodological foundations of the methodology of natural science. The methodological basis of the methodology of natural science is dialectical materialism and its theory of knowledge. Therefore, this technique considers the learning process as a kind of cognitive process in general. scientific knowledge about this world is also objective. The methodology of natural science explores the learning process in the inseparable unity and interconnection of the content, methods, forms and means of education; biological and

mental, social and spiritual consciousness and self-awareness. The activity of a teacher and a student, which is built on an objective unity of goals. The methodology of natural science should treat the learning process as constantly changing and improving on the basis of the laws of dialectics (transition of quantity into quality, unity and struggle of opposites, negation of negation), and, accordingly, to the personality of the student, as constantly developing and self-developing, not only in connection with age change, but also under the influence of influencing factors, primarily the learning process. The dialectical law on the transition of quantity into quality is constantly in effect in the learning process. The child accumulates factual information, from which the thought passes to a hypothesis, from it to a proof, and then to a generalization, in the process of which new knowledge is formed at a different qualitative level. The learning process cannot be viewed outside the dialectical law of development as a struggle of opposites. the activities of the teacher and the student as two sides of the learning process are not only interconnected, but also mutually opposed. For example, the requirements of the teacher and the capabilities of the student are often contradictory. In certain periods of the development of society, contradictions arise between the demands of society for the school and the real state of this process. The methodology of natural science cannot but take into account the following law of dialectics - the negation of negation, which also fully manifests itself in the learning process. An example of this can be continuity in learning, when previously acquired knowledge is deepened, improved and formed at a new level. This is how the movement from the concept of "parts of a plant" to the concept of "organs of a plant" occurs; from the concept of "reproduction as a simple increase in the number of individuals" to the concept of "reproduction as a biological process."

3. Intersubject communications.

First of all, the methodology of natural science is connected with philosophy, which equips natural science with a general method of cognition.

Natural science is closely connected with biology, geography, astronomy, ecology, and partly with physics, chemistry, medicine and other natural sciences. This connection is realized along the line of methodical selection and construction of the content of the initial natural sciences. The content and structure of natural science in primary Both in science and in the process of learning, generalization and comprehension of the results obtained in the process of applying these methods take place. However, the methodology of natural science is primarily a pedagogical science, since its main goal is not to discover new things in scientific natural science, but to explore ways of transmitting to students ready-made specially processed (adapted for children) scientific information. The methodology of natural science uses this information as a means of educating and developing students, applying general patterns, principles and rules of education. Consequently, this technique is inextricably linked with pedagogy and especially with its didactics, the theory of education and development. The methodology of natural science, when constructing a school subject, should take into account the data of child psychology on the patterns and mechanisms of the psyche of children, on the features of the development of their cognitive activity in general, and also in particular - their memory, attention, imagination, thinking, will and feelings. The methodology of natural science is associated with age-related physiology and hygiene, since, while developing the educational process in natural science, it must take into account the requirements for protecting and strengthening the health of children. Ethics, as a science of morality, provides material for developing rules of cultural behavior in nature, forming a responsible attitude

towards it, and educating positive moral qualities in a child. It is also important to take into account the patterns of a person's aesthetic relationship to reality, including nature, developed by the science of aesthetics,

So, the methodology of natural science has a wide range of interscientific connections.

4.Characteristics of the main research methods used in natural science. The method of natural science is a developing science. It explores and develops new, and also improves already known provisions, using both empirical and theoretical research methods. A characteristic feature of empirical research methods is the sensual perception of objects, and their results are expressed in establishing facts, initial empirical generalizations. Let's consider the types of empirical methods. Any research in the field of science teaching methodology includes a retrospective method that allows you to study the methodological heritage from literary sources, establish what has been achieved, and identify unclear and controversial judgments. To establish the necessary facts, the examination of the real educational process is of great importance. At the same time, methods such as observation, conversation, questioning, interviewing, studying school documentation are used. Observation is a direct purposeful perception of the pedagogical process. The researcher receives specific factual material, i.e., data characterizing the features of a particular educational process. The conversation is used to obtain the necessary clarification of what was not clear enough during the observation. A conversation can arise spontaneously or according to a pre-planned plan; it is conducted without notes, in free form. Interviewing is a type of conversation. The method is transferred from sociology. The researcher adheres to pre-planned questions in a certain sequence. Questioning is a method of mass collection of material using questionnaires. The answers to the questions of the questionnaires are written by those to whom the questionnaires are addressed. Questionnaires are used to obtain data that cannot be obtained in any other way. For example, not always the subject can openly express his attitude to the pedagogical phenomenon being studied.

The study of school documentation - journals, students' personal files, minutes of meetings, conferences, the work of methodological associations, etc. - will help to find many objective data that will help to clarify some patterns. The study of the work of students - written, graphic, creative - will help to study the individuality of each student, his attitude to work, the presence of certain abilities, etc. However, to judge the effectiveness of pedagogical influences, the value of methodological findings, give new recommendations to practice a specially organized test of a particular method, technique, means, etc., in order to identify its effectiveness, efficiency. Experiment involves creating something new. At school, it is carried out without disturbing the normal course of the educational process, when there are sufficient grounds to believe that the innovation being tested can improve the effectiveness of education or at least not cause undesirable consequences. This is a natural experiment. It necessarily implies the presence of more or less equivalent two groups of students: control, which work in the usual mode (according to the usual method, with the usual content) and experimental, where the studied component is introduced into the mode, content or methodology. The latter presupposes the obligatory development of experimental materials. Such is the laboratory experiment. It is rarely used in natural science research. As in the survey, during the experiment, observation, conversation, interviewing, questioning are used, oral and written checks are carried out. It is clear that research cannot stop at this empirical level.

At the stage of understanding the obtained facts, theoretical research methods are applied. These include comparison, opposition, analogy, systematization, classification, discovery of causes, generalization. They are closely related and interpenetrate each other. With the help of theoretical methods, the problem and relevance of the study are identified, the hypothesis, goals and objectives are determined. The third group of research methods is the methods of mathematical statistics. They make it possible to identify quantitative characteristics that substantiate qualitative conclusions. Mathematical methods are the following: registration - the number of successful and unsuccessful; attending and not attending classes; who completed the work with such and such an assessment, etc.; ranking - the arrangement of the collected data in descending or increasing order of any indicators, determining the place in this series of each of the studied components; scaling - the introduction of digital indicators in the assessment of individual aspects of pedagogical phenomena; sampling tests are usually used here; the definition of average values is the arithmetic mean.

Conditionality and tasks of familiarizing younger schoolchildren with nature. The previous experience of the formation and development of primary natural science education and the conducted scientific research testify to the need and possibility of familiarizing younger schoolchildren with nature D. N. Kaigorodov: before which our descendants will only shrug their hands"6. B. E. Raikov: “A person who does not know the basics of natural science is like a blind man who cannot understand his surroundings and gropes about”7. The social and economic needs of mankind put forward the sciences of nature to one of the first places among other sciences. One cannot ignore such a role of natural science education as the development of a child's personality. The study of the sciences of nature forms a worldview, observation, develops thinking, speech, will, feelings, emotions, environmental and sanitary-hygienic culture, positive moral qualities, practical skills, etc. The personal qualities listed above, including and erudition, are included in the concept of "cultural person". Consequently, as part of the conditioning of natural science education, there is another aspect - sociocultural. Such impending phenomena as climate change, increased penetration of ultraviolet radiation to the Earth, genetic changes, epidemics, the extinction of a number of plant and animal species, etc., cause serious concern. the state of the natural environment, but also everyday attention to nature.

At present, natural science primary education is represented by several options. The specific content of each option is laid down in a specific program and implemented in the relevant textbooks.

however, whatever the content, its selection should take into account some general principles, although each option may have its own specific principles. This principle was laid down by V. F. Zuev, then supported and substantiated by A. Ya. Gerd, we relied on retrospective scientific research and long-term teaching practice. 2. The content and structure of elementary natural science must comply with the principle of scientific character, i.e., the modern level of development of natural sciences. Even the most minimal content of educational material should be necessary and sufficient for it to reflect the integral content and structure of any theory. but also to be aimed at correction, clarification, correction of already existing knowledge. 3. It is necessary to take into account the didactic principles that should be guiding in the transformation of scientific knowledge into an academic subject. 4. An important principle in the selection and design of the content of natural science is the

principle of practical orientation. observation, feature recognition, experiment and modeling. It is also necessary to take into account the possibility of applying and testing the acquired knowledge in practice. The significance of this principle also lies in the fact that its use creates a reserve of specific ideas and initial concepts necessary for organizing the activity of comprehension. 5. Closely connected with the principle of practical orientation is another specific principle - local history. The beginning of this principle was laid by VF Zuev. Its essence lies in the fact that in elementary school the child must study the natural and social environment surrounding him. This creates a good basis for the formation of clear ideas about the nature and sociology of remote areas of the Earth. 6. The selection of natural science content, taking into account the principle of ecological orientation, is determined by the requirements of the time. In fact, any branch of human practical activity, even everyday life, requires ecological knowledge, ecological culture. The following provisions are the most significant in the environmental education of junior schoolchildren: - knowledge that leads to an understanding of some of the fundamental foundations of ecology, formulated by Commoner in the form of laws; - practical measures to restore the balance disturbed in nature; - rules of conduct in nature. 7. A necessary condition for the selection of content is the principle of generalization of knowledge. Its implementation requires solving the problem of continuity between the initial and subsequent stages of natural science education. 8. The content of primary science education must meet the social goals of the upbringing and development of the younger generation.

12. Interdisciplinary connections and continuity in teaching natural science.

Elementary natural science acts as a part, as a subsystem in a single system of school subjects both "horizontally" and "vertically". Therefore, there is a need to consider interdisciplinary connections and continuity in natural science primary education. Interdisciplinary connections in education, according to the definition of V. N. Fedorova, are a reflection in the content of academic disciplines of interrelations that exist objectively and are known by modern sciences. Therefore, interdisciplinary connections can be considered as the equivalent of interscientific connections. Interdisciplinary connections in the educational process allow eliminating repetitions in different academic subjects, deepening the study of the material without additional time costs, implementing mutual systematized consistency, and encouraging students to apply knowledge in everyday life. Interdisciplinary connections rationalize the educational process as a whole.

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