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ПРИНЦИПЫ ИССЛЕДОВАТЕЛЬСКОГО ОБУЧЕНИЯ ПРИ ПРЕПОДАВАНИЯ ЗАНЯТИЙ ПО ФИЗИКЕ И БИОЛОГИИ

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PRINCIPLES OF RESEARCH TRAINING IN TEACHING CLASSES IN PHYSICS AND BIOLOGY

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Исследовательское обучение, напротив, подчеркивает относительность знаний, а весь учебный процесс пронизывает «приглашение к открытию». Таким образом, через обнаружение новых вопросов стимулируется над ситуативная активность ребенка.

В статье, даётся расширенное, и углубленное толкование принципиально нового для образования особого вида обучения — исследовательского обучения. Сформулированы принципы новой модели обучения, основные элементы образовательной программы и необходимый набор характеристик и требований, которым должен отвечать учитель, ставший на путь исследовательского обучения.

Ключевые слова: *исследовательское обучение, принцип ориентации на познавательные интересы учащегося, околофилософские разговоры, фасилитатор учения, исследовательская практика, мониторинг.*

Exploratory learning, on the other hand, emphasizes the relativity of knowledge, and the entire learning process is permeated by an “invitation to discovery”. Thus, through the discovery of new questions, the child's situational activity is stimulated.

The article provides an expanded and in-depth interpretation of a fundamentally new type of education for education - research education. The principles of the new teaching model, the main elements of the educational program and the necessary set of characteristics and requirements, which must be met by a teacher who embarked on the path of research education, are formulated.

***Key words:** research teaching, the principle of focusing on the cognitive interests of the student, near-philosophical conversations, facilitator of learning, research practice, monitoring.*

The world around us is changing rapidly, and to survive in it, a person is less and less able to rely on thought stereotypes and habitual behavioral models worked out by his ancestors or himself. For a full-fledged existence in an intensively changing environment, a modern person increasingly has to exhibit exploratory behavior.

History has retained many statements about the importance of stimulating and supporting the child's search activity and a lot of documentary evidence of how effectively teachers of different times used in their own practice the child's natural desire to learn about the environment. At present, in educational psychology, pedagogy and educational practice, there is an extremely high interest in the natural search activity of a child as the most important educational resource. This circumstance gave rise to a fundamentally new phenomenon for education - research education (the English-language analogue is "explorer education"). It presupposes an appeal to a fundamentally new model of education, where the cognitive activity of the child himself takes priority positions.

We are talking about a special type of education that is different from others, implying movement along the path of a fundamental revision of cultural and educational traditions and radically changing the goals of education, the attitude towards knowledge itself and the ways of obtaining it.

The fundamental ideas on which research education is based may include:

The principle of focusing on the cognitive interests of the student.

Research is a creative process, creativity cannot be imposed from the outside, it is born only on the basis of an internal need, in this case the need for knowledge. Hence the following principle arises.

The principle of freedom of choice and responsibility for one's own learning.

Only under the condition of its implementation, education is able to become adequate to the individual goals of the individual.

The principle of mastering knowledge in unity with the methods of obtaining them. The approach to the formation of a scientific picture of the spiritual and moral structure of the world dictated by the tasks of research education includes not only the development of a certain amount of information obtained through special research, but necessarily involves the opening of the embryology of obtaining new knowledge on the basis of mastering the methods of its detection. 'Science is inseparable from the reflection of how knowledge was

obtained, therefore, the student must master in education not only the final product in the form of some positive knowledge, but be well acquainted with the evolution of knowledge, as well as with the ways and ways to obtain it.

The principle of reliance on the development of the skills of independent search for information.

The main task of modern education is not only the communication of knowledge, but first of all the development of the child's needs and abilities to obtain this knowledge. Only on this basis it is possible to ensure the transformation of knowledge into a tool for the creative mastering of the world by a child.

A student not only consumes information, but generates knowledge himself. About philosophical conversations about the discovery of a child in educational and research activity “subjectively” and “objectively” something new is as senseless as it is fruitless. The knowledge offered to the student in traditional education is new only for him. In the conditions of research learning, when not knowledge, but the methods of obtaining it, is considered as the main value of education, it becomes unimportant how new the information acquired by the child is.

The principle of combining productive and reproductive teaching methods.

The psychology of assimilation testifies to the fact that the material that is included in the active work of thinking is easily and involuntarily assimilated. But far from everything that a child should master in education is revealed to them in the course of independent research. Therefore, the use of research teaching methods should be combined with the use of reproductive methods. Moreover, in the work of any researcher there are traditionally many tasks of a reproductive nature that can be considered routine, but do not become unnecessary.

From the point of view of research learning, it is fundamentally important to remember that ready-made conclusions offered for unconditional assimilation in a textbook or a teacher's presentation create an impression of completeness and indisputability of knowledge in the student. Such presentation of knowledge is economical and compact, but it omits the most important feature of any information - its relative nature, susceptibility to revision. This approach does not allow students to feel the very process of acquiring knowledge based on data obtained in specially planned and conducted observations and experiments. The idea is lost that such generalizations and conclusions themselves, in turn, become the foundation of new questions, give rise to the formulation of new problems.

Exploratory learning, on the other hand, emphasizes the relativity of knowledge, and the entire learning process is permeated by an “invitation to discovery”. Thus, through the discovery of new questions, the child's situational

activity is stimulated.

The principle of forming ideas about the dynamism of knowledge. When solving the problem of forming a student's scientific picture of the world in the content of education, it is necessary to take into account the idea that the ideas of science can be fully understood only in the context of their emergence and subsequent research due to them. The manner of a fragmentary, constitutive presentation in modern conditions is hardly applicable. Therefore, the content of research education should be built in such a way that the experience of humanity appears before the student not as a sum of dogmas, not as a set of unshakable laws and rules as a living, constantly developing organism.

The principle of forming an idea of research as a lifestyle. In research teaching, research is not just a set of methods and techniques of teaching, but is its content and meaning. In this way, the student develops an idea of research not just as a set of private cognitive tools that make it possible to productively solve cognitive tasks, but as a leading way of contact with the outside world, and even more broadly, as a lifestyle.

The traditional approach adopted in education is characterized by the consideration of the problem of the development of research skills and abilities as a service task, which is actualized only when mastering a particular discipline. In research teaching, the task of developing general research skills and abilities in children is considered not as a private way of learning, but as the main way of forming a special lifestyle, in which search activity will take the leading place. In these conditions, work on the development of general abilities and skills of research search among students appears as a task of independent value. This is not just one of the ways for the attentive development of any area of reality, but the foundation for the development of behavior based on the dominance of the manifestations of search activity in various life situations.

The teacher should be a facilitator of the teaching, not just a translator of information. The main factor in the development of a child's creativity, as evidenced by many studies, is not so much his inclusion in creative activity, as the presence in his environment of a "model of creative activity." In any creativity, and educational and research activities are not an exception, fundamentally non-formalized elements prevail, which can be broadcast and assimilated only in direct contact with those who are able to create themselves. This is possible only by eliminating verbalization and any moments of awareness. Most of these non-formalized, intuitive elements cannot be isolated and verbalized, since they are often not recognized either by the creators themselves or by those who observe their work.

The paradox of research learning is that a teacher working in the mainstream

of his ideas can teach a child even what he cannot himself. He must, of course, be a creator-researcher, but not a bearer of all knowledge in the world. In the conditions of research teaching, a teacher is not obliged to always know the answers to all questions, but he must be able to investigate various problems, find any answers and be able to teach this to children.

The principle of using copyright training programs. The curriculum, designed for creative educational and research interaction between a student and a teacher, "... cannot be purchased in a "supermarket" that sells frozen ideas; it must grow out of the lives of those people who will interact." The curriculum, being in research teaching is always author's, is built on the basis of the general educational program of the school [1].

The main elements of the educational program.

The educational program, built in accordance with the idea of research → research, includes three relatively independent subprograms:

- Training. Special classes for the acquisition of special knowledge by students and the development of their skills and abilities of research search.
- Research practice. Students' conduct of independent research and their implementation of creative projects.
- Monitoring. The content and organization of activities necessary to assess and manage the process of solving the problems of research training (mini-courses, conferences, defense of research works and creative projects, etc.).

During the training for the development of research abilities, students must acquire special knowledge, skills and research search skills. These include knowledge, skills and abilities to see problems; to ask questions; put forward hypotheses; to give a definition of concepts; classify; to observe; conduct experiments; make inferences and conclusions; structure the material; prepare the texts of their own reports, explain, prove and defend their ideas.

Programming of this educational material is carried out according to the principle of "concentric circles". Classes are grouped into relatively solid blocks, which are independent links in a common chain. After completing the first circle in the second and third quarters of the first grade, it is advisable to return to similar activities in the second, third and fourth grades. There is a need for these special training sessions in elementary school, and in junior high, and in senior classes, and even in higher educational institutions. The frequency of this work should be determined based on the individual characteristics of the students.

Naturally, while maintaining the general orientation of tasks, they should become more complicated from class to class. Moreover, many tasks used in these classes can be solved repeatedly by children of different ages. In these cases, the depth of the solution to the problem should be changed.

The main content of the work within the framework of the subprogram "research practice" is the conduct of independent research by students and the implementation of their own creative projects. This subroutine acts as the main, central one. Classes within its framework are structured so that the degree of independence of the child in the process of research search gradually increases.

The subprogram "monitoring" is also of particular importance. The child should know that the results of his research and creative design are interesting to others and he will definitely be heard. He needs to master the practice of presenting the results of his own research, to master the skills to argue his own judgments.

Preparing the teacher for research education.

A teacher trained to solve the problems of research education must have a number of characteristics, he needs to master a set of specific skills. In addition to those that should be characteristic of a successful researcher, special abilities and skills are required, specifically pedagogical. The main ones are:

- Have a hypersensitivity to problems, be able to see the "amazing in the ordinary." To be able to find and set before students real educational research tasks in a form understandable for children.

- Be able to captivate students with a didactically valuable problem, making it a problem for the children themselves.

- Be capable of acting as a coordinator and partner in a research search. Helping children be able to avoid directives and administrative pressure.

- To be able to be tolerant of the mistakes of students, made by them in an attempt to find their own solution. Offer your help or address to the right sources of information only in those cases when the student begins to feel the hopelessness of his search.

- Organize observation activities, experiments and various "field" research.

- Provide an opportunity for regular reports from working groups and the exchange of opinions during open general discussions.

- Encourage and develop in every possible way a critical attitude towards research procedures.

- Be able to stimulate proposals for improving the work and the promotion of new, original research directions. Closely monitor the dynamics of children's interests in the problem under study. Be able to complete research and work on the discussion and implementation of signs of loss of interest in the problem.

- Be flexible and highly motivated to allow individual students to volunteer to work on the problem while other students find ways to approach the new problem.

At present, developed research behavior is no longer regarded as a highly specialized personality trait necessary for a small professional group of scientific

workers, but as an integral characteristic of a personality that is part of the structure of ideas about professionalism and competence in any area of culture. And even more broadly - as a lifestyle of a modern person. Therefore, modern education no longer requires a simple fragmentary inclusion of research teaching methods in educational practice, but purposeful work to develop research abilities, specially organized teaching of children the skills and abilities of research search.

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