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Research Article

DEVELOPMENT OF SCIENTIFIC POTENTIAL IN CHILDREN OF GENERAL EDUCATION SCHOOL

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ABSTRACT

In this article the ways for resolving problem of forma¬tion and development of scientific knowledge of school¬children are considered. These ways are in common line with development of pupils. Peculiarity dealing with formation of such knowledge of schoolchildren is re¬lated with settlement of the problems related to imple¬mentation of didactic principle of scientific character within training and criteria of selection of the content when working out a training course.

KEYWORDS

Scientific potential, the basics of chemistry, didactic principles, criteria of selection of the content, the content of education.

INTRODUCTION

By scientific potential we will understand the student's ability to use the accumulated scientific knowledge to explain and predict facts in the subject area of the theory.

"The concept of personality," as psychologist Arthur Reber said, "is a term so difficult to define and having such a wide range of use that a wise author uses it as the title of a chapter and then writes freely about it / without taking any responsibility." credit for the definitions, if they are presented in the text" [1]. We believe that this is precisely the situation that we are using.

By the concept of "personality" we will understand a person (student) as a subject of relationships and cognitive activity.

Thus, we will talk about the formation of theoretical scientific knowledge among schoolchildren and its application to explain and predict new facts.

From a methodological point of view, the formation of knowledge is a path consisting of three main stages.

At the first stage, an image of the object being studied is formed. At school, the formation of knowledge is often completed in this way. The object itself serves as a means of clarity. When the object being studied can serve as a means of teaching, then we call such visibility visibility of the first kind. Ya. A. Komensky also spoke about such visibility.

Without a formed image, obtaining theoretical knowledge about an object or a set of such objects is impossible due to the pointlessness of the formed mental structure.

The second stage is the formation of a conceptual apparatus and theoretical knowledge about a given object. As you know, a concept is a logical category. Therefore, the formation of concepts is a procedure for separating knowledge about an object from the object itself, narrowing the studied properties of the object to the most important of them. At the same time, when forming concepts, we become more and more abstract and move away from reality.

In the student's mind, a certain model idea of the object is formed, which is simplified to a model that can be compared with similar models of other objects.

It is known that models can be material and symbolic. They differ in the degree of abstraction and distance from reality. In the process of studying a phenomenon, as well as during teaching, such models are often used, replacing a real object. We call the replacement of a real object with a material model and the study of this model on the basis of a sign model visualization of the second kind. Often, the study of theoretical material in grades 8-9 ends with this knowledge formed.

Back in 1947, the famous methodologist chemist Yu. V. Khodakov raised the question of studying theoretical material in a chemistry course. He proposed moving the study of theoretical content closer to the beginning of the course, rightly believing that the generated theoretical knowledge has a number of features. The main such feature is its generality; the second feature is the methodological adaptability of this knowledge for its perception by schoolchildren of a given age; the third feature is the possibility of using it to explain and predict new knowledge.

Thus, to develop the scientific potential of a schoolchild, first of all, it is necessary to have specially

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selected content of an academic subject, including concepts, laws and theories that are understandable to schoolchildren of a given age. At the same time, along with subject models, iconic models are increasingly used in chemistry lessons. Thus, a chemical symbol indicates an atom of a certain chemical element, and therefore its structure, relative atomic mass, etc. The chemical formula shows whether the substance is simple or complex, what atoms are included in the molecules (qualitative composition of the substance), how many atoms are included in the composition molecules (quantitative composition of a substance). Based on knowledge of the composition, it is possible to calculate the relative molecular mass of a substance and determine the ratio of the masses of atoms of chemical elements in a substance. Thus, the formula reflects a number of properties of a substance, and therefore is its model.

Equations of chemical reactions are also iconic models. They show the substances involved in the chemical process and the stoichiometric relationships between them. The equations reflect the law of conservation of mass of substances during chemical interaction, and therefore can be used for various calculations.

With the help of iconic models, conditional clarity, or visibility of the third kind, is realized.

A sign, chemical or mathematical formula, or equation does not literally reflect objects or their properties. Therefore, the use of signs, symbols, formulas, equations and actions with them are associated with an understanding of what these objects reflect. Thus, models, chemical symbols, formulas of substances, equations of chemical reactions transfer students' thinking from the material level to the level of abstractions. This often results in great difficulties in schoolchildren's mastery of those academic disciplines where iconic models are widely used.

The modern approach to selecting the content of a chemistry course is based on an understanding of the fundamentals of chemistry.

The fundamentals of chemistry are currently understood to be such content that allows us to reveal the development of the invariant core of this science at theoretical levels determined by the most general natural science theories [2].

When developing criteria for selecting content, it is necessary to take into account the fact that the training course as a methodological system must meet didactic principles, the important of which at the stage of selection and design of content are scientific, accessible and systematic.

Let us consider how these didactic principles influence the selection of the content of a chemistry course.

The scientific principle, substantiated in 1950 by M. N. Skatkin, is understood in such a way that students at every step of their learning are offered for assimilation firmly established principles in science.

As you can see, understanding the scientific nature of the course as a reflection of true knowledge in it is not very constructive. If we teach chemistry, then, naturally, we cannot introduce facts or theories unknown to science. Therefore, the principle of scientificity in this understanding does not provide clear guidelines for selecting content and designing courses.

Determining the scientific nature of a course should be approached from the perspective of the internal characteristics of scientific knowledge, in particular, its systematic nature. Any truly scientific knowledge (in the broad sense) is a system consisting of facts, laws, concepts, various kinds of theoretical positions, etc. Moreover, each of these components is interconnected with others and, ultimately, can be deduced (predicted) from it. If we take into account this property of scientific knowledge, we can notice the difference in the scientific nature of the courses. Thus, a course that includes the most modern facts, concepts, theories, etc. may not be scientific enough if it does not reveal the connections between the components of the content. Conversely, if the relationships between the elements are sufficiently identified, then the course can be considered scientific even if it does not include any modern scientific theories or provisions. From these positions, the scientific nature of the course is determined by the number of connections between the elements of its content. The more such connections there are, the more scientific the course. Such an approach allows not only to judge the scientific character of, for example, currently existing courses, but also to determine the direction of practical steps to strengthen the scientific character of newly created courses.

The content of an academic discipline is a system that includes facts, concepts, laws, theories, various examples of the application of theoretical and factual knowledge.

The chemistry course is logically one of the simplest courses. Its content system includes only three subsystems of concepts. A study conducted by V. G. Nanov in 1965 showed great promise for studying the logic of development of the content of subsystems of chemical concepts to improve the chemistry course itself [3]. The study of connections between concepts and conceptual systems made it possible to identify the logical structure of the chemistry course, which is, in a certain sense, a model of its content.

Content prepared in this way, the peculiarity of which is that each subsequent concept is based on the signs of content on the signs of the content of already introduced concepts, is a necessary condition for the formation of scientific knowledge in schoolchildren -

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knowledge on the basis of which they can think pour, as well as explain and predict facts.

The following provisions can serve as criteria for selecting content for a chemistry course that meets the principles of science, etc.:

1. If certain facts, concepts, etc. relate to the subject area introduced earlier in the theory course, or can be derived from it through formal transformations, as well as substantive argumentation, or can be consistently attached to this theory, then they may be selected for a training course.

2. If facts, phenomena, etc. that allow one to predict the possible result of an experiment or observation can be obtained from a previously introduced theory, then they can be selected for the training course.

3. If empirical facts can be used to substantiate and confirm the theory (that is, they are the basis of the theory); can be attached to the theory in a consistent manner; illustrate the boundaries of the theory; allow us to approach the understanding of a new theory that explains in a consistent way known and new empirical facts, then they can be selected for a training course.

4. If the rules, which are specific instructions for action, are based on previously introduced theories, then such rules can be selected for the training course.

The following provisions can serve as criteria for selecting content for a course that meets the principle of accessibility:

1. If a general scientific theory determines the stage of development of basic concepts and generalizes (generalizes) individual facts, then such a theory can be selected for the course.

2. If the facts located in the subject area of the general theory, which determines the stage of development of basic concepts, serve to derive this theory or to confirm it, then they can be selected for the course.

3. If the facts are not in the subject area of the general theory and can serve to illustrate the limitations of this theory or to derive a new general theory, then they can be selected for the course.

Accessibility criteria also rely on connections between content elements—facts, laws, and theories.

Let's consider the criteria that must be taken into account in order to make the course systematic:

1. If in the content selected for an academic subject systems of various concepts (global structural elements) and levels of their development can be identified, then such content can be selected for the course.

2. If the local elements selected for a certain level of the course include content that builds on the previous

one and also provides information for the subsequent one, then such content can be selected for the course.

The constructive nature of these criteria lies in the fact that for each element of content it is possible to determine its place in the course based on an analysis of its connections with other elements.

Despite the fact that the constructed content corresponds to the logical structure of the course and, in this regard, it contributes to the formation of scientific knowledge among schoolchildren, on the basis of which schoolchildren can explain, systematize, classify facts, and also predict new facts, The scientific potential of schoolchildren will be small. To develop it, it is necessary to improve teaching methods and use teaching techniques that can help activate the thinking of schoolchildren.

Now that we have shown, albeit briefly, what course should be taught to schoolchildren in order to develop their scientific potential, let us consider the third stage of the formation of scientific knowledge. It consists in transforming theoretical knowledge into an instrument of cognition, into an instrument for obtaining new knowledge. The results of this stage depend to a large extent on the content being studied, its logical coherence, and on the methodological solutions used in the learning process.

It should be noted: if teaching occurs in such a way that students are only required to reproduce educational material (2nd level of formation, according to V.P. Bespalko), then we will not receive any improvement in the scientific potential of students[4]. It is necessary to at least bring students' knowledge to the third level (the ability to apply knowledge in a familiar methodological situation). To do this, first of all, you should show the methods of applying knowledge themselves. For this purpose, in the process of explanation, pay attention to the methods of classification, comparison, specification, etc., regularly offer schoolchildren tasks in which students would have to carry out some actions with the acquired knowledge, explain known and predict facts still unknown to them. This is seen as the way to develop the scientific potential of schoolchildren.

I would like to note that the development of scientific potential in the literal sense of the word should be combined with practical work, observations, and manual labor of schoolchildren.

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