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INFORMATION TECHNOLOGIES AS A FORM OF VISUAL PRESENTATION OF EDUCATIONAL INFORMATION

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Abstract. This article discusses the issues of the need to use visual aids in teaching chemistry. The classification of visibility is considered. Special attention is paid to the means of information technology, their capabilities in teaching chemistry, as well as the need to form the information and communication competence of future chemistry teachers.

Keywords: visibility, visualization, technical means, models, virtual laboratories, computer animations, scribes.

The principle of clarity in teaching chemistry is to develop conditions for the formation of a certain stock of images of chemical objects. Visibility is an integral feature of scientific knowledge. However, not all knowledge is visible, but only its specific components associated with sensory cognition, with the process of creating certain images. In teaching chemistry, the principle of clarity requires that all ideas and concepts created by students be based on perceptions obtained directly from the observation of the substances and chemical processes being studied. It is known that the principle of clarity in pedagogy was introduced by the Czech teacher Komensky Ya.A., who in his book "The Great Didactics" justified the didactic principles of teaching, one of which was the principle of clarity.

The basis of visual teaching of chemistry are the following provisions: students' direct perception of the studied substances, chemical reactions, production processes; students' perception, under the guidance of a teacher, not of the objects and phenomena themselves, but of their figurative and schematic images (photographs, diagrams, tables, maps, layouts, models, etc.) and operating with them. Students, perceiving figurative and schematic images of objects and phenomena, form an idea of them with a lot of imagination. Visibility reflects one of the main lines of the chemistry teaching process, determines students' attitudes to perceived objects.

In chemistry lessons, the visibility of the first kind is realized in the process of demonstrating simple and complex substances, various minerals and rocks, chemical phenomena, as well as phenomena occurring in solutions. To do this, there are various collections, handouts, chemical reagents, dishes, various appliances and apparatuses, etc.

In the process of theoretical deepening of the study of chemistry, knowledge of chemical objects becomes more and more abstract. The study of chemistry is being transferred to ever deeper theoretical levels. It is clear that in this case the use of natural objects becomes impossible either because of their small or, conversely, too large sizes. Therefore, students are shown models of various chemical or industrial facilities. These include models of atoms, their electronic shells, crystal lattices, molecules, models of factory installations, etc. Such models are usually called real models. The use of real models characterizes the visibility of the second kind.

The second kind of visibility can include on–screen manuals, as well as tables and diagrams revealing the devices of technical means of production of substances or energy, various schemes showing the relationship of substances, etc. The use of the second kind of visibility allows students to create images of the studied objects - atoms and molecules, their geometric shapes, various chemical bonds, to reveal the essence of chemical transformations, their mechanisms, etc. On models of factory installations, it is possible to demonstrate the general appearance of industrial devices, as well as the principles of industrial production of substances, their technological features. With the help of visual aids of the second kind, as in the case of using visual aids of the first kind, students create images of the studied objects. However, the images are already largely "compressed", symbolic.

Models (visual aids of the 2nd kind) allow us to reveal the elements of the structure of natural objects, some of their internal properties, which, due to their small size, cannot be considered by students.

Along with subject models, sign models are also widely used in chemistry lessons. These include symbols of chemical elements, chemical and mathematical formulas, equations of chemical reactions (chemical language). So, a chemical symbol indicates a chemical element whose atom has a certain chemical structure, mass, etc. The chemical formula shows whether this substance is simple or complex, the atoms of which elements are part of the molecules (qualitative composition of the substance), how many atoms are part of the molecules (quantitative composition of the substance). Based on the knowledge of the composition, it is possible to make calculations, the masses of atoms and molecules, to determine the ratio of the masses of atoms of chemical elements in a substance. The equations of chemical reactions are also iconic models. They show the substances involved in the chemical process, stoichiometric relationships between them. The equations reflect the law of conservation of mass in the process of chemical interaction, and therefore can also be used for various calculations. Along with these values, the concept of "amount of substance" is used in chemistry. It characterizes the number of structural elements of this substance – molecules, atoms or ions. Thus, chemical formulas and equations reflect a number of deep properties of substances, and therefore are also models. However, these models are of a special kind, they are depicted using formulas, letters and numbers.

With the help of sign models, conditional visibility, or visibility of the third kind, is realized. A chemical sign or mathematical formula, the equations of chemical reactions in the literal sense of the subject objects do not reflect. Therefore, the use of them, actions with them are associated with an understanding of what these signs and constructions of them mean. Thus, the study of the subject is transferred to the level of abstractions. At the same time, a system of designations created by science arises between the real object of nature being studied – matter, chemical transformation and the student, both the objects of study themselves and the processes occurring with them. As a result, the student must rebuild his thinking from images of real reality (visibility of the first kind), as well as model images (images of the second kind) into abstract images. But they must be constantly linked by the student with reality, and at

any moment he must be able to explain the object being studied in terms of abstraction.

That is why the choice of methods of teaching chemistry, using visual aids aimed at achieving educational goals that correspond to the content of the material being studied, the level of thinking of students, their knowledge, skills, skills, is the most difficult pedagogical task. Among teachers, methodologists, scientists, there are different views on the place of visual learning tools in the formation of chemical concepts. Some authors consider visual aids as an illustration of theoretical propositions. Others use them as a support for the formulation of theoretical propositions.

The problem of visual representation of specially selected chemical knowledge gives rise to a special language - the language of methodological activity. Not so long ago it was believed that the word of a teacher is a universal means of teaching. However, in the process of learning, a verbal description of the mechanism of a chemical process or phenomenon reveals its inexpressiveness and bulkiness. The word does not have clarity, so the teacher cannot simultaneously cover all the stages in the explanation and reveal in detail the physical principle of the device. For these and other reasons, various visual forms of representation of the essence of reducing educational information are used in teaching. The system of visual representation of concepts is in demand if it gives a new quality to the learning process, makes it more obvious and visual for the student to work with the content of concepts, shows the essence of phenomena and processes.

One of the ways to overcome the formalism of knowledge in the educational process is to develop the visual ability of students. All students have different ability to visualize auditory information. At least some of them may require special training, the development of imagination, for example, making drawings in a notebook, discussing details observed in the consciousness of objects, their slow approach and removal, rotation, description of the trajectory, speed of movement, color change of objects of molecules, atoms, electrons, protons. To successfully teach chemistry, the ability to visualize complex objects is required, since the perception of a symbol through the content embedded in it is usually visual.

The ability for students to visualize chemical objects and phenomena is a necessary condition for their success in chemical education. Chemistry teachers are familiar with such a common and often repeated error when solving computational problems for solutions, when the mass of the solution calculated by the student turns out to be less than the mass of the dissolved substance, which is presented by the student as an erroneous answer. The probable cause of failure is an ineffective non–visual thinking strategy. Another typical example is the monotonous presentation to the students of the definition of the concept stored in their minds in this case in sound form, testifies to their misunderstanding of the defined concept. If students find it difficult to study chemistry, then they certainly need the help of a qualified teacher. The most common reason for misunderstanding chemistry is the absence of visual models in the student's mind. Similarly, as the word "lemon" creates a visual and sensual image, so it is written.

In order for the training not to be formal, certain conditions must be met. Firstly, to support the internal representation, a graphical representation of models, internal representations should be used, that is, the student should sketch what he sees inside himself. Secondly, the teacher needs to use the words "imagine", "see inside yourself", immersing students in visual models inside their consciousness. Thirdly, the teacher should be able to diagnose the students' thinking style, mentally follow these styles with them and help students in case of learning problems.

Chemistry is an experimental science, therefore, natural objects and real chemical processes should be the most important and basic means of teaching. Only in cases where it is impossible to use them at school (safety regulations do not allow; there are no studied objects in the region, for example, a sulfuric acid production plant; processes take an extremely long time; the ultra-high cost of reagents and equipment, etc.), the teacher can apply audiovisual means of teaching chemistry. However, it must be remembered that even the most colorful film, video clips of chemical phenomena or a virtual experiment will not be equivalent in the educational process for the didactic effect with the chemical reaction that is carried out by students with their own hands in a conventional test tube.

The study of the relationship between the studied object and the means of visualization showed a rather complex interaction between them. Often, the visual external image of an object created with the help of models interferes with understanding the mechanism of its functioning (electron and formation of chemical bonds, atom and its structure, geometric shape of molecules, ionic structure of substances, types of chemical interaction, etc.). There is a problem of visibility in chemistry lessons. Studying it by methodological means should reveal the very understanding of what is visual, the visual possibilities of various means of teaching and forms of their presentation, as well as the methodical use of these visual means in teaching.

The combination of video, audio and text material, comprehensive coverage of the topic provide a deeper immersion in the material, contribute to its creative understanding, increases the motivation of learning.

The considered models, types of visibility, as well as difficulties encountered by students show that the implementation of even such a seemingly simple principle of didactics as the principle of visibility in teaching chemistry has its own characteristics. In this regard, during the methodological training of students in pedagogical universities, special attention should be paid to the implementation of this principle in practice. After all, chemical knowledge, like no other, is formed on models of a high degree of abstraction.

In recent years, scientists, both theorists and practitioners, have been actively developing the idea of using IT to visualize chemical processes, the possibility of studying abstract concepts and mechanisms of chemical reactions, and, accordingly, for the formation of professional competencies of future chemistry teachers, their competent use in chemistry lessons. In the works devoted to the use of IT in the process of preparing students at the university, their significant potential is indicated: the widespread use of the information educational environment of the university,

including distance courses, electronic manuals, knowledge control automation tools significantly improve the quality of the educational process.

Equipping with computer equipment, elimination of "computer illiteracy" of teachers of pedagogical universities, deployment of the Internet, design of various information, computer and multimedia (self)educational products, the development of new types of educational process (first of all, distance learning) and new forms of additional training, the creation of electronic databases for educational, informational and scientific purposes, the introduction of alternative methods of checking and self-checking knowledge, etc. - all this will require consideration of the problems of the methodology of using information, computer and multimedia educational products in all forms of educational process.

The relevance of the introduction of virtual laboratories, computer animations, videos, scribes into educational practice is due, firstly, to the informational challenges of the time, and secondly, to the regulatory requirements for the organization of training, that is, educational standards. The current requirements of higher education in order to implement the competence approach provide for the widespread use of active and interactive forms of classes in the educational process, including computer simulations, to enhance the visual character of the studied chemical processes and phenomena in combination with extracurricular work in order to form and develop professional skills of students. The formation of information and communication competence of a teacher is currently one of the most urgent tasks of the system of continuous pedagogical education. In the current conditions, a modern school needs teachers who possess the knowledge and skills to use information and communication technologies in their professional activities, who have formed information and communication competence. the formation of the IR competence of students, future chemistry teachers, which is provided by scientific and technical means (local, global networks; electronic libraries, computer training systems, multi and hypermedia technologies, etc.); methodological tools (computer programs, computer electronic textbooks, electronic manuals, methodological recommendations, etc.); tools (lectures, workshops, databases, telecommunication facilities, etc.) taking into account the specifics of the subject of chemistry.

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