GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 12, December (2023)

SOME ISSUES THE INTRODUCTION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE TEACHING OF CHEMISTRY

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ABSTRACT

A huge technical achievement of the 20th century is the effectiveness of computerized education. Today it is difficult to imagine education without digitization, because through it the teacher's activities are simplified, the level of learning efficiency increases. Various information and communication technologies are used in education, which not only facilitate the work of teachers, but also create great opportunities for teaching. Using the capabilities of a virtual laboratory in teaching chemistry not only increases students' interest in the subject, but also significantly affects the level of their development.

Keywords: digitized education, information and communication technology, interest in science, chemical experience, and virtual laboratory.

Chemistry has always been viewed as an abstract subject for students. One of the urgent problems of chemical education is the need to introduce information and communication technologies (ICT) into the educational process as a means of modeling their reality. In the following years, the influx of ICT into education has increased significantly. By virtualizing the level of visibility of complex processes, animating and demonstrating reactions using video clips, performing a virtual laboratory, students can better understand science, it will be easier for them to understand real facts and objective reality.

As you know, the effectiveness of learning largely depends on the level of intellectual activity of the student, which is achieved by the perception of existing knowledge and skills. The more diverse the level of perception of the educational material, the easier and more firmly it is absorbed. If the material (information) is presented in didactic electronic form, i.e. in the form of computer games, then the effectiveness of assimilation of this information will be much more noticeable on the part of students.

The use of ICT in the educational process (in the form of animations, video clips and presentations) is one of the main ways that contribute to the development of chemistry teaching methods among other disciplines.

Digitization of learning allows you to visually identify learning when learning new material and includes much more concise and important information necessary for learning.

And in this case, ICT will become an effective assistant to a chemistry teacher. Of course, conducting experiments in the laboratory has undeniable advantages, but when studying toxic, flammable and explosive substances, for example, halogens, oxygen or some organic experiments in organic chemistry, the virtual world makes it possible to conduct a chemical experiment without risk to health. If the classroom does not have the necessary equipment for conducting experiments, using a virtual laboratory makes up for this disadvantage.

The purposeful introduction of new information technologies into the educational process contributes to the constant updating of the content, forms and methods of teaching and

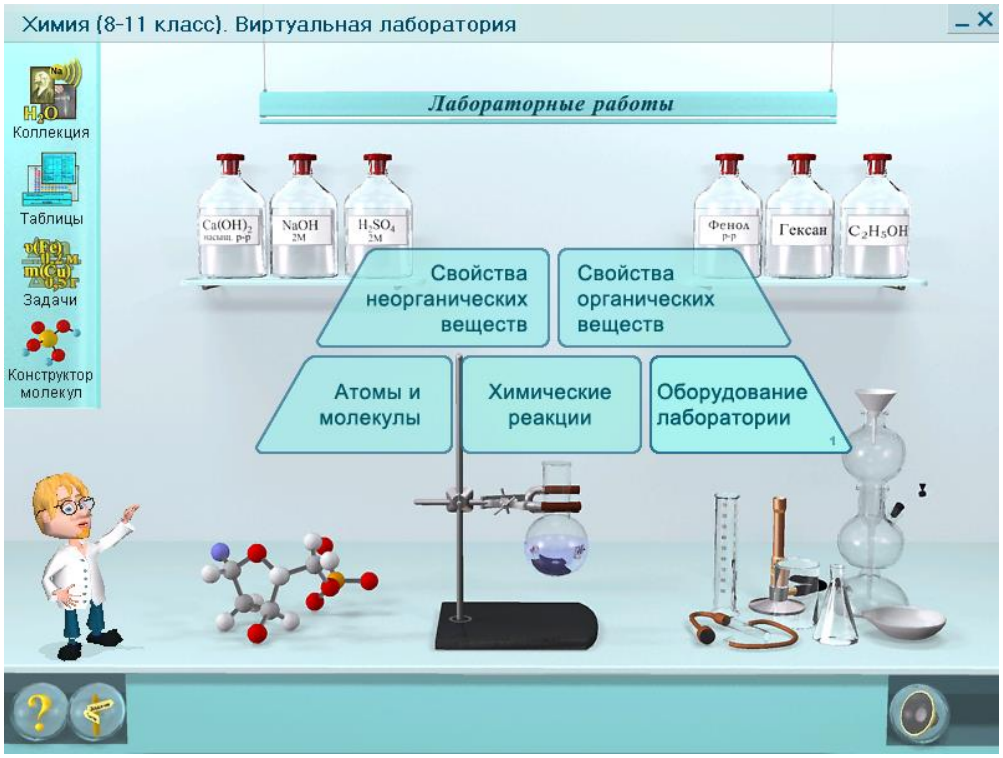
upbringing, allows the teacher to solve problems related to the development and use of educational software products of a qualitatively new level.

The software product "Chemistry (grades 8-11). The Virtual Laboratory has a number of useful functions, and the electronic manual is aimed at increasing students' interest in studying chemistry. The electronic manual contains more than 150 interactive practical and laboratory works on a school-wide chemistry course. The topic of the experiments fully corresponds to the standard general education program in chemistry and corresponds to chemistry textbooks recommended by the Ministry of Preschool and Secondary General Education of the Republic of Uzbekistan.

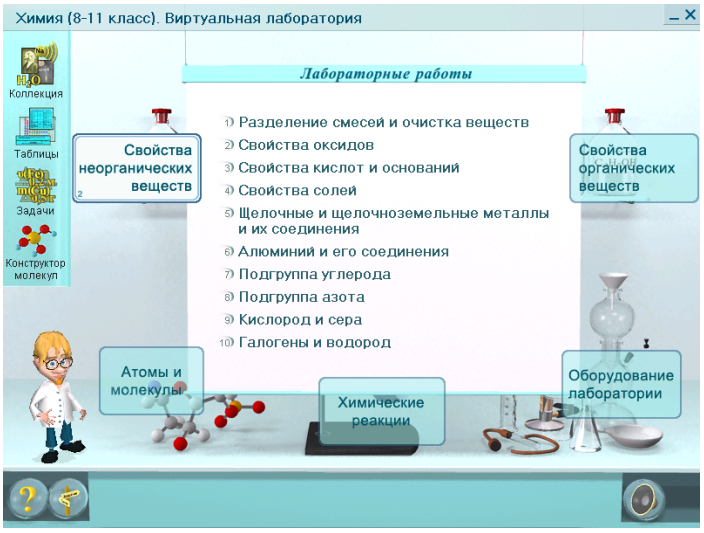
One of the most important factors in improving the effectiveness of education is the introduction of modern innovative technologies and virtual education technologies into this process. The organization of this process in accordance with these technologies and requirements is directly related to the extent to which chemistry teachers understand the essence of innovative technologies. In this sense, the research work was carried out on the basis of scientific research and conducted pedagogical experimental work aimed at creating a methodological system to ensure the effectiveness of teaching "Inorganic Chemistry" in secondary educational institutions based on information and communication technology.

Thanks to the use of a "Virtual laboratory", it is possible to achieve modern quality of chemical education, provide methodological support for the educational process, as well as increase the independence and creative activity of schoolchildren in the learning process through the use of interactive tools and forms of education.

The interface of the experiments of the electronic manual "Virtual Laboratory" looks like this:



The database "Virtual laboratory" on the topics of "Inorganic substances":



The teacher can pre-define virtual laboratory experiments that will be provided to students through their interface and organize the writing of comments:

When studying the topic "Basic classes of inorganic compounds" in the 8th grade, we used the electronic manual of the "Virtual Laboratory". Mastering knowledge on a new topic is the main stage of each lesson. Having studied the topics related to all classes of inorganic compounds, experiments were conducted using a "Virtual laboratory" and in the generalization lesson we tested the knowledge and skills of students on the following questions (questions are recommended in the form of slides):

1. What chemical properties do oxides exhibit?
2. What experiments should be carried out to obtain representatives of another class of inorganic compounds from oxides?
3. How are the bases classified by composition?
4. Define the class of acids?
5. How are acids classified by composition?
6. Give the formulation of the salt?
7. What are the essential signs of salts?
8. What class of compounds do you recommend to use to produce salts?
9. What is the relationship between the main classes of inorganic chemistry?

After the answers of the students, the appropriate conclusions were drawn:

1. Oxides as binary compounds are involved in the formation of representatives of the corresponding class of inorganic compounds. Oxides are among the most widespread compounds in nature.
2. In order to obtain other representatives of the class of inorganic compounds from oxides, addition, substitution and exchange reactions must be carried out. The fact that these processes have occurred can be found out by signs such as gas release, precipitation and color change.
3. Bases are classified according to the number of hydroxyl groups contained in them and solubility. Water-soluble bases are known as alkalis.
4. Acids are complex compounds consisting of hydrogen atoms and an acid residue that replace metals. Acids are one of the largest class of inorganic compounds that are produced in large

quantities in the chemical industry and serve as raw materials for the production of other compounds.

5. Acids are classified by composition into oxygen-containing and oxygen-free acids. The amount of oxygen-free acids is less than the amount of oxygen-containing acids.

6. Salts were complex compounds consisting of metal atoms and oxygen residue. According to their composition, they are divided into medium, acidic, basic, double and complex salts. Salt formation is usually applied to medium salts.

7. Salts, as compounds widespread in nature, are widely used in everyday life, medicine, various industries, etc. They can be obtained through the interaction of other classes of inorganic compounds.

8. All other representatives of the class of inorganic compounds can be used to obtain salts. Because they are derivatives of the same class of compounds. The production of salts from bases and acids is known as neutralization reactions.

9. There is a genetic link between the main classes of inorganic chemistry, and representatives of one class can form representatives of another class. Such a genetic link between them is constantly used in chemical reactions.

The final stage of the lesson is always organized by reflecting the students' own activities with a problematic situation.

They gave the subject their opinion with a "+" or "–" sign (students mark their relationships in their notebooks):

1. I understood the topic I have covered.
2. From this topic, I learned that compounds of the main class of inorganic chemistry are widely used in our daily lives.
3. I got satisfactory answers to all the questions that I thought about during the lesson.
4. For more information on this topic, I will still have to work on the Internet.
5. I worked conscientiously in the lesson.

In conclusion, it can be noted that the creation of an educational environment for active learning that increases the motivation of students, the introduction of information and communication technologies is an integral part of learning success. The use of virtual laboratories presented in this article in chemical education is based on the simulation of practical work. New approaches to learning are needed to solve this problem. The creation of such learning methods makes it easy to integrate them with three-dimensional graphics and animation components in real time. We can say that this approach makes it possible to effectively develop a multifunctional virtual chemical laboratory. We believe that this approach can be useful when creating virtual learning environments.

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