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Implementing Computer Software Capabilities to Conduct Chemistry Experiments

Key words: *experiment, software, chemistry experiment, chemistry device, a tool, substance, solution.*

Annotation. *Using modern technologies, in particular computing applications, creates new possibilities for conducting chemistry experiments. Due to the implementation of computing technologies, it is possible to explore and study the essence of chemistry experiments as well as conduct study experiments using animations when the necessary tools are limited. Moreover, using mobile phones and technologies to record and disseminate the results of the experiments creates additional convenience and possibilities. Using applications and programmes to conduct calculations during the experiments helps in saving time and obtaining precise results.*

The methods of organizing chemistry experiments in the teaching processes of chemistry has been studied and developed by a number of scientists. Nevertheless, changes in the content of the subject matter, the introduction of modern technologies, and the changes in the requirements for the teaching process require adaptation of new methods and technologies. Given the fact that it is not possible to achieve appropriate results in the quality and efficiency in the chemistry education without making a full-fledged chemistry experiments, the solution to this problem can not be deferred.

Chemistry experiments always have specific risks. Early researchers had hardships during the experiments until the techniques and methodologies of these experiments were developed. They experienced burning, poisoning, explosions or wounded and injured themselves and even some of the experiments ended with the deaths of some of the scientists. In the history of chemistry there are a lot of relevant examples. For example, the English chemist G. Cavendish had a number of scars on his face as a result of the experiment with hydrogen and flame gas and the glass fractures. As a result of his dedication and selflessness for his scientific works, he became a member of Royal Society of London.

Using the mineral and organic chemical and material resources of the Republic of Uzbekistan creates possibility to assemble and develop chemistry devices and tools if some of the reactive materials are replaced by others and plant and animal products, household appliances, medical and household items are employed. These procedures do not only help to eliminate problems associated with the lack of equipment, tools and devices encountered during the chemistry experiments but also enhance the creativity of the students.

In the process of the implementation of the National Program of Personnel Training, focusing on school education, particularly strengthening the material and technical basis of secondary schools, has become one of the most important and crucial tasks on the agenda.

Taking into consideration the fact that many chemistry equipment and devices have short period of service life, the importance of the role of the chemistry teacher is evident. Prior to carrying

out the chemical experiment, it is a prerequisite to have theoretical knowledge of the work and a full understanding of the processes in order to conduct experiments appropriately and to obtain positive outcomes. Therefore, deep study of the theoretical foundations before carrying out the experiment is of great importance. Studying the experiment on the basis of popular methods, that is, through written developments and oral instructions, does not always give a good result and at the same time takes a lot of time.

These issues can be solved by using modern technologies, notably computing technologies and mastery of appropriately employing them. At the same time, experimental equipment is easier to master through the use of their software versions. For this purpose, an software with a number of possibilities has been created. The software is based on the Flash MX platform. The software also has the ability to interpret the processes in a sound way in addition to the use of different drawings to get a complete understanding of laboratory work (Figure 1)

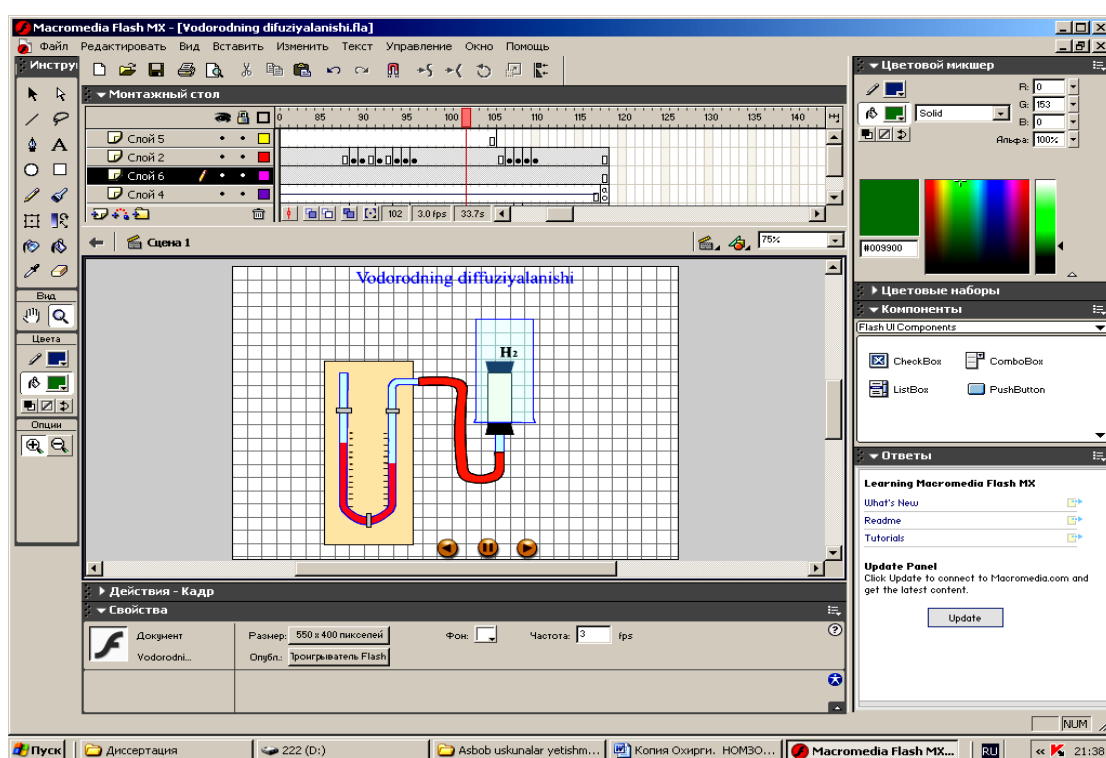


Figure 1. Creating an experimental animation using the Flash MX software.

From the main menu, one can access the necessary category by using the mouse. The following resources are divided into categories in the software: "Theoretical knowledge", "Assembling multi-purpose equipment for chemical experiments", "Conducting chemistry experiments in the absence of devices and reagents", "Chemists". The section "Theoretical knowledge" provides the basic concepts, principles and formulas related to the topic. These concepts should be used before starting the work so that the sessions can be successfully completed. The recommendations menu on the processes of assembling the tools and devices mentioned in the software are shown in Figure 2.



Figure 2. Toolkit collection unit.

The software is very useful in conducting multivariate experiments. The topic "The Study of the Physical Properties of Materials" provides tools and devices that can be used to study the basic physical properties of substances. For example, it is possible to explore the tools and devices intended to measure the density of solutions, to measure the boiling point temperature, and to detect electrical conductivity of the hard substances (see Figure 3)

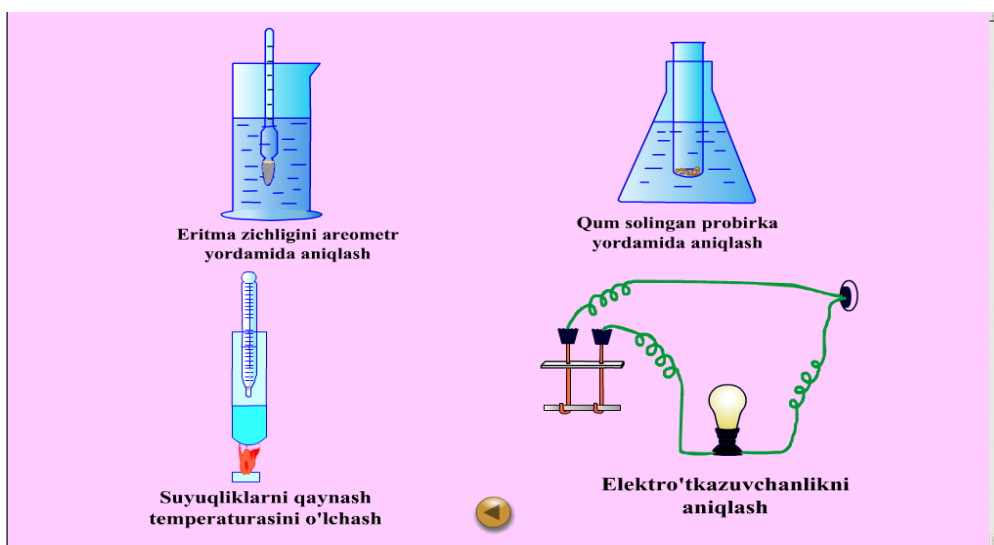


Figure 3. The study of the physical properties of the substances.

The unit "The methods of purifying the substances" introduces with the equipment that can be used to purify substances according to their such properties as boiling point, solubility in various solvents, aggregate status. It is possible to get understanding of the filtering apparatus used for separation of the substances used for separation of mixtures of boiling water with different means, separation equipment used for separation of interconnected liquids and deposition (Fig 4)

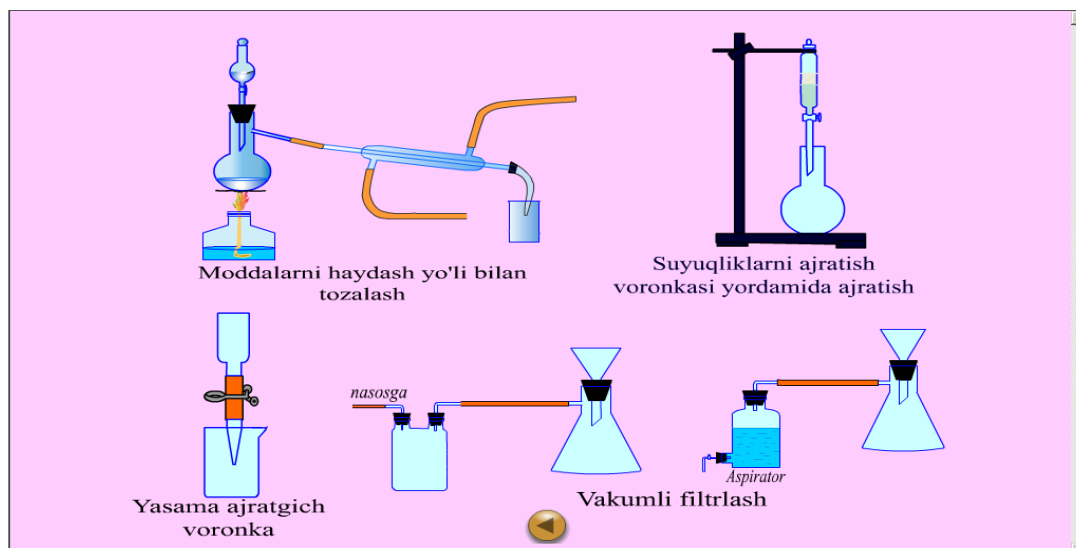


Figure 4. The methods of purifying the substances

The problem of reagent deficiency in chemical experiments in the field of education can be replaced with existing reagents that can replace them.

Existence of a number of variations of experiments will help to replace unavailable ones and to improve the chemistry education.

Employing the computer applications and software to organize and conduct a chemistry experiment helps to understand the basic concepts, definitions and formulas of general chemistry and to master the content of laboratory work in a short time.

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