



TEACHING CHEMISTRY WITH VIRTUAL LABORATORIES IN SECONDARY SCHOOLS

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ABSTRACT

This article provides detailed information about the importance of teaching and learning using virtual laboratories in the school chemistry course, and you will get information about the implementation of virtual laboratory work in the form of a video lesson in teaching the topic of halogens. This article is about facilitating the experimental part of chemistry.

KEYWORDS: *virtual, digital technology, experimental, practical, halogens*

INTRODUCTION

Today, in order to improve the teaching of chemistry in general secondary schools, it is important to carry out scientific and methodological research, to communicate the results and news obtained to students, to produce and isolate the necessary substances in laboratory conditions and to organise interesting experiments. The use of alternative options and the use of computer technology in the organisation of a chemical experiment, the use of computer games in the organisation of a chemical experiment, the importance of digital technologies and the introduction of the targeted use of virtual laboratories.

Digital technologies are associated with innovations in educational programmes and imply the establishment of a completely new type of social and economic development based on computers and knowledge.

At present, general secondary schools are organising lessons integrated with comprehensive modern computer technologies. At the same time, the quality indicator of chemistry education is increasing with the growth of computer technology. Today, it is difficult to imagine young people without modern computer technologies to thoroughly master chemical knowledge. In addition to chemistry in schools, it is necessary to provide basic guidelines for the effective use of computer technology and programming, covering this area of digital technology.

As mediating elements of learning processes, digital technologies allow teachers to move away from the traditional hierarchical model. They form the frameworks and networks through which students write, read, learn, interact, co-construct and define their identities. The implementation of digital technologies in educational processes enhances the quality of educational processes and creates the basis for making lessons interesting and understandable.

One of the tasks of education is to prepare people who are able to exercise their rights as loyal and participating citizens in a society where knowledge is an important source of social and economic development.

Teaching students using multimedia tools has the following advantages

- 1) There is the possibility of a deeper and more perfect reduction of the given materials;
- 2) The passion for close contact with new areas of learning will increase;
- 3) As a result of shortening the time of education, the possibility of saving time is achieved;
- 4) The acquired knowledge will be remembered for a long time and it will be possible to use it in practice if necessary.

Digital technologies - it is also important to train students to use information correctly and effectively.

As chemistry is one of the experimental exact sciences, knowledge and skills are also strengthened in more laboratory activities. In many cases, laboratory training requires the use of toxic and harmful, flammable and explosive reagents and complex equipment. Reviewing them in a virtual state with the help of a computer before starting to perform laboratory work directly - leads to saving reagents, ensuring safety and increasing the efficiency of the educational process. For this reason, many virtual chemical laboratories have been developed.

LITERATURE ANALYSIS AND METHODOLOGY

Nowadays, virtual laboratories have been created for chemistry, as well as for all sciences, and most of them correspond to foreign countries. Therefore, for the effective use of virtual laboratories, it is an urgent task to translate their instructions for use into Uzbek and to develop appropriate methodological instructions. Practical training and laboratory work are of great importance in the teaching of chemistry, as they reinforce theoretical knowledge.

In practical experiments, laboratory equipment and reagents are not always sufficient. In addition, there are experiments in which unfavourable conditions may occur during the performance of some laboratory work. Using experiments in

teaching the subject of halogens in general schools " on the subject v ideodars laboratory experience in the form of laboratory from the students before performing of work purpose, necessary equipment, work performing order with will be introduced. Including this one laboratory of work purpose the extraction of halogens learning that it is necessary equipment potassium permanganate, hydrochloric acid, iron,

tripod, pipette, test tube, iron spoon, gas pipe, gas burner, glass plate composition, work perform in order, the need to observe safety rules, to know the physical and chemical properties of the substances taken for the experiment and formed as a result of the reaction, to properly install the test tube, to hermetically close the stopper, to use the reagents correctly stressed, work automated way done is shown (Fig.1).

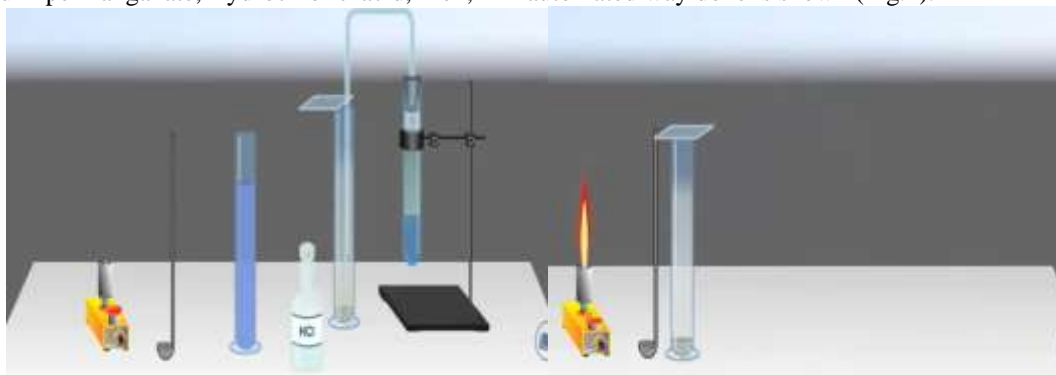


Figure 1 . A view of the performance of virtual laboratory work in the form of a video lesson.

When doing laboratory work, it is said to pay attention to the colour of the solution, after the reaction, the reaction process is analysed based on the colour change and the conclusion is given. The reaction equation is displayed on the computer

screen (Figure 2). This helps students to develop the necessary knowledge and skills to carry out laboratory work independently.



Figure 2. Reaction Equation of Virtual Laboratory Work

The control part of the laboratory work is made up of theoretical materials of the laboratory work and tests that control the knowledge acquired during the laboratory experiment.

In order to check and consolidate the knowledge acquired, the student enters the "evaluation" part of the virtual laboratory, from where he can check and consolidate his knowledge by carrying out tests related to the laboratory work in question (Figure 3)

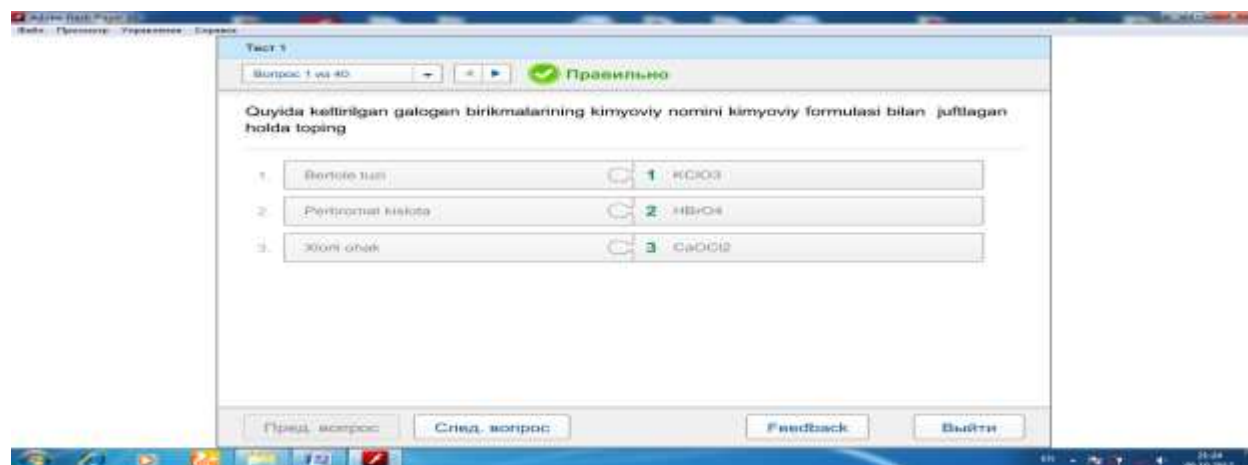


Figure 3. Test execution page.



Currently, there are various chemistry programmes that allow you to perform laboratory exercises in chemistry (Crocodile chemistry 605, Chemistry (class 8-11), Virtual laboratory, Periodic table, Chemsk12, Chemical calculator, ChemDraw Ultra 11.0, CHEMIX 12, GaussView ,Chembalance Wizard32, Khumua42) is the subject of research.

This makes the teaching process more productive and of higher quality if the teacher conducts classes using virtual laboratories to reinforce theoretical knowledge during the course and conducts experiments while working individually with each student during the course.

CONCLUSION

The importance of using virtual laboratory work is that it eliminates the need to build complex apparatus, store and replace equipment and reagents, and repair and wash chemical containers. All laboratory work is stored electronically and in one place on computer memory or external storage. The computer is safe, easy to use and requires the user to work only with specific programmes.

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