THE METHOD OF DEVELOPING VIRTUAL LABORATORY PROGRAMS AND THEIR USE

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Abstract

The use of virtual laboratories in the modern education system is highly effective in teaching. Virtual laboratories are special computer programs that allow you to view models of a process or object on a monitor or laptop. A one-subject virtual laboratory program in biology for secondary schools was developed and tested, which led to increased student achievement.

Keywords: ICT, virtual laboratory, program, electronic content, microscope, microslides, reagents.

In the Republic of Uzbekistan, currently, in order to create modern information technologies and communications, develop a comprehensive system for providing electronic government services, transition to a new mechanism for communication between government bodies and the population, and provide school, secondary specialized and higher education with electronic educational tools, the demand for ideal software is increasing. At a time when information and communication technologies are confidently entering all spheres of our lives, in the field of education alone, significant work is being done on computerization and automation, and the use of information technologies in management. In particular, a clear example of this is the provision of educational institutions with educational laboratories and technical equipment, computers, multimedia electronic resources, electronic textbooks and teaching aids, while at the same time distance learning or modern pedagogy is being introduced into the education system (1).

The use of virtual laboratories in the modern education system is highly effective in teaching. Virtual laboratories are special computer programs that allow you to see models of a process or object on a monitor or laptop. A virtual laboratory is necessary in the following cases: in the absence of the conditions, materials, reagents and equipment necessary for laboratory training, for distance education and for scientific work.

Virtual experiments in the study of natural sciences and virtual laboratory work are promising areas of education and naturally attract the attention of students and teachers. The need to introduce virtual laboratories into educational practice and the widespread use of information technologies in production is a requirement of the modern era. Implementation of a competency-based approach in the educational process, current education standards provide for the widespread use in the educational process of active and interactive forms of conducting lessons, including computer modeling, in combination with extracurricular activities, and develop professional skills among students.

Virtual laboratories occupy a reliable place in the practice of teaching natural sciences, and the theoretical and methodological foundations of their use and the creation of virtual laboratory work on their basis are just beginning to take shape. Even the term “virtual laboratory work” has not yet received an established definition that clearly expresses its connection with other concepts, including the concept of a virtual laboratory and virtual experience in science education (2).

During natural science experiments, students acquire skills in observation, analysis, drawing conclusions, and working with equipment and reagents. This is a student experiment; experiments (help to study specific aspects of a scientific object), laboratory work (a set of laboratory experiments allows you to study many aspects of objects and processes), practical classes, laboratory workshop; home experience, research experience, etc. A chemistry experiment can be natural, mental, or virtual. "Virtual" means "possible without physical representation"; virtual reality – imitation of a real environment using computer devices; mainly used for educational purposes; for this reason, virtual experiences are sometimes called simulations or computer-generated experiences.

Dubovikova Z.N. offers the following classification of virtual laboratories:

- demonstration application (before real work) - display of the work being performed on a large screen using a projector;
- application for generalization (after real work) in frontal (clarification of results by demonstrating, forming and consolidating conclusions) or individual (mathematical side of the experiment, analysis of graphs, significance of numbers, comparison of the results obtained with real life) modes;
- experimental application (in a real workplace) - individuals (in small groups) perform tasks with little to no actual performance and conduct experiments on a computer (3).

The use of a virtual laboratory is of great importance in the formation of practical skills, the ability to use new laboratory equipment, independent observations when performing practical work, solving experimental problems and at the same time the formation of natural knowledge.

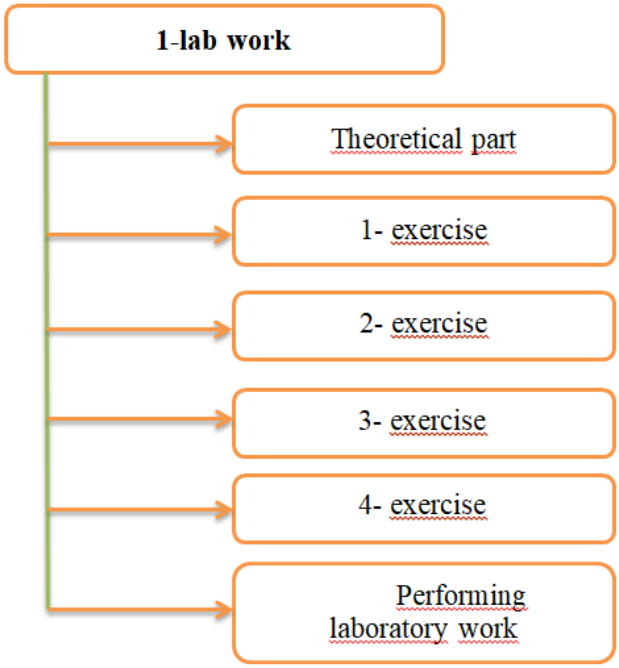
Virtual implementation of laboratory work helps to consolidate knowledge, develop skills, complete laboratory work in a short period of time and solve problems even with a small material base.

Programming a virtual biology laboratory for secondary schools in our republic is one of the main requirements of today. Conducting laboratory classes

in the student's virtual world, completing assignments on a computer or via a mobile phone (smartphone) leads to increased interest in science and higher learning efficiency.

We recommend the following virtual lab format found in the 7th grade biology textbook.

Window of the first page of the virtual laboratory:



The theoretical part includes the topic, purpose, sequence of work.

For example:

Topic: Magnifying devices and preparation of a temporary preparation from plant tissues.

Target. We get acquainted with the structure of a magnifying glass and a microscope, learn how to work, and develop the ability to prepare temporary preparations from plant organs.

1. Magnifying devices

Progress:

1. Review of magnifying devices.

2. Study the structure of a magnifying glass.

3. Introduction to the rules of working with a microscope.

4. Examine the microscope carefully and find its optical and mechanical parts.

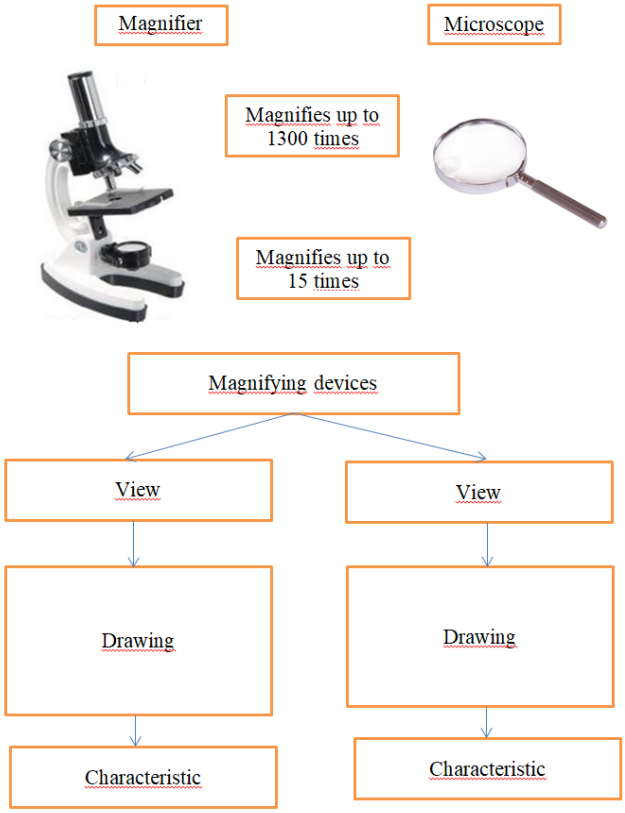
2. Preparation of a temporary preparation from plant tissue.

Progress of work: Various preparations are being prepared to study plant tissues and their cellular structure. The traditional sheet is used in the study of integumentary tissue.

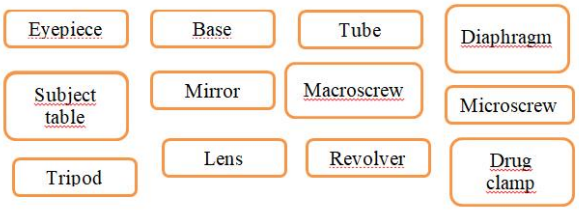
To do this, wash the sheet, clean the glass of the product and drop a drop of water on it. Then a thin section is made with a scalpel from the underside of the leaf and placed on a glass slide, moistened with a drop of water; a cover glass is placed on the moistened part of the glass slide using a dip needle and examined under a microscope. Using the same preparation, you can see the tissue of a potato tuber or frozen wheat grain, as well as the pulp cells (mesocarp) of pear or quince fruits.

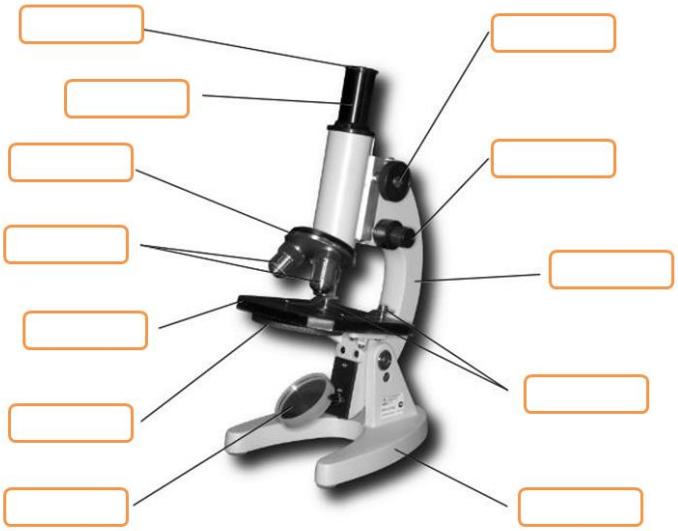
After reading this part completely, you will be able to open the second window, i.e. the "Task 1" window. Similarly, other tasks will open after completing the previous ones.

1- task: Arrange magnifying devices and their characteristics in the diagram.

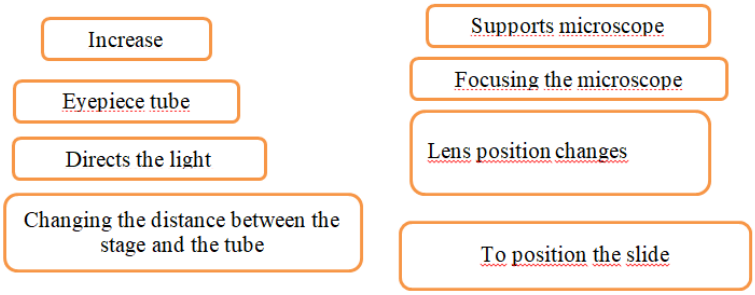


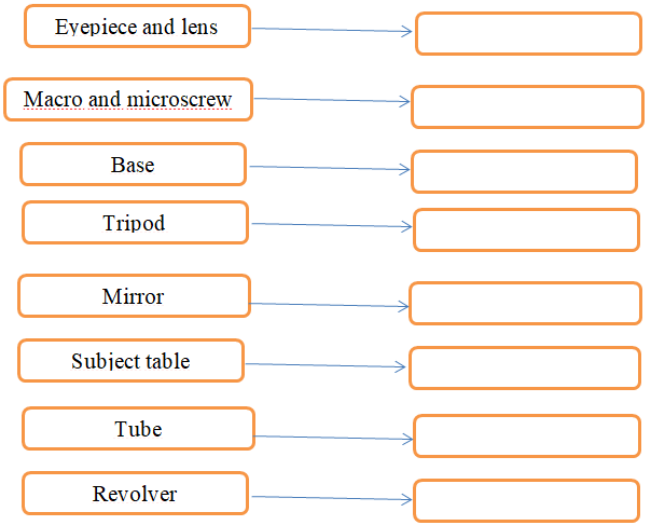
2- task: What parts does an optical microscope consist of?



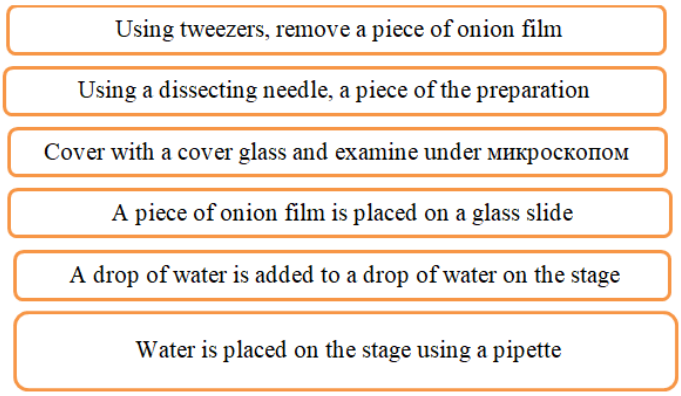


3- task: Determine the functions of the parts of the microscope.

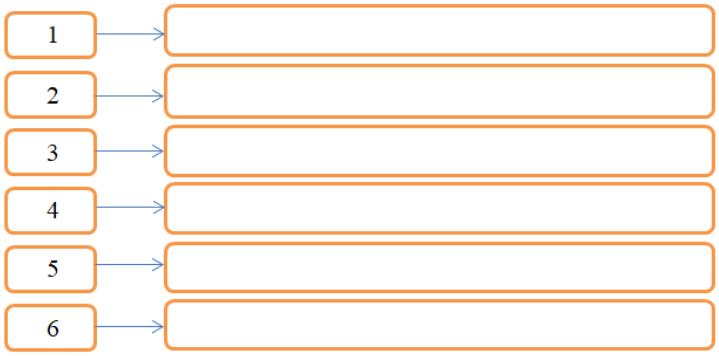




4- task: prepare a temporary preparation from plant tissue.



Determine the sequence of the process:



In numbered tasks, tasks are displayed on the screen in special windows, and answers to tasks are displayed in the same squares. To complete the task, the student uses the mouse to place the correct answer in the given cells. If the student has identified correctly, the square in the task lights up green; if incorrectly, the square in the task lights up red.

After completing the assignments, the final Lab Implementation window will open and the lab work will be performed using the mouse using the required materials and equipment. Under the microscope the following picture is formed.

The student will be able to record the laboratory work process in video format.

In the test version of the virtual laboratory, one laboratory work was programmed and tested at school. 97 students of the 7th grade of the 101st secondary school in Tashkent took part in it. Of these, 63 people (2 classes) were selected into the experimental group and 34 people (1 class) into the control group. When testing students' knowledge of the subject (oral and test), it was found that mastery, sequence of laboratory work, knowledge of equipment and ability to interpret results were higher in the experimental groups. Below are the test results.

In numbered tasks, the tasks are displayed on the screen in

point / group	86-100	71-85	55-70	Below from 55	Number of students
Experimental group	28% (16)	56% (37)	12% (8)	3% (2)	63
Control group	7% (2)	33% (11)	48% (16)	12% (3)	34

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