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Research Article

# ROLE OF INFORMATION TECHNOLOGY IN ORGANIZING PHYSICS VIRTUAL LABORATORY COURSES IN HIGH SCHOOLS

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## ABSTRACT

In this article, the issues related to the animated organization of virtual laboratory work using information communication techniques in the teaching of physics in general secondary schools are highlighted and an algorithm is presented.

## KEYWORDS

technology, laboratory, animation, software, multimedia, educational process, software and pedagogical tool, information technology, 3D model, electronic board, speed, distance.

## INTRODUCTION

The State Program based on the principle "From Action Strategy to Development Strategy" has been developed for the seven priority fields of development of our country in 2022-2026. It is focused on improving the quality of education in schools, enhancing the knowledge and skills of pedagogues to the international level.

According to the decision of the President of the Republic of Uzbekistan dated March 19, 2021 No. PQ-5032, a complex program of measures to improve the quality of education in physics and ensure the effectiveness of scientific research in the field of physics in 2021-2023 has been released

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Based on the above requirements, teaching general secondary school students on the basis of integrated knowledge of physics and using information and communication technologies in improving the educational experiment is an urgent pedagogical problem.

The advantages of teaching using information and communication technologies in general secondary education schools: the time for students to develop certain skills is reduced; the number of practice tasks increases; the pace of work of students accelerates; as a result of requiring active management in information and communication technologies, the student becomes an educational subject; it becomes possible to model and directly demonstrate processes that are difficult for students to observe and anylize; it becomes possible to provide the lesson with remote resources using communication tools; communication with information communications takes the character of a didactic game, and with this, students' motivation for educational activities increases, etc.

For this reason, scientific research in various branches is being conducted in all developed countries, as well as in our republic, to solve the problems of computerization of education.

Intensive application of information technologies to education, computerization of the educational process has become a leading pedagogical-methodical idea. The next main task is to base a comprehensive pedagogical-methodical theory by summarizing the results achieved in the field of information technology and computerization.

The use of information and communication technologies in general secondary schools in improving knowledge of physics and organizing laboratory classes gives effective results. For example; lack of laboratory rooms, non-availability of laboratory equipment, non-use of existing laboratory equipment. The best way to solve these problems is to develop a virtual version of laboratory work. While doing virtual laboratory work, the student not only learns more about physics, but also improves ICT literacy.

In this article, we aim to use virtual laboratory work on physics and advanced pedagogical technologies in the process of using it.This virtual laboratory, created on the basis of "first person" technology, provides the user with the processes of "Determination of the density of bodies of correct geometric shape and irregular geometric shape" in a virtual state. In the period when wide use of modern information technologies in the educational process is the need of the hour, virtual laboratories serve to fully cover this demand.

The purpose of the work: to learn to determine the density of various bodies with specific mass using a beaker and a scale.

Necessary equipment and technical tools: Pedagogical software tool developed for the organization and execution of demonstration experiments: a beaker for conducting demonstration experiments, a container of water, various objects with a clear mass and shape (cone,

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sphere, cylinder, ri rectangle.), there are 3D models of various objects (stone, crown, lamp, oval object) with definite mass, but no shape, and these devices have a virtual control feature.

**Algorithm and methodology of performing the virtual laboratory:**

Step 1. When creating this virtual laboratory work, it was taken into account that students would feel as if they are walking in a real physics laboratory. The student is warned to wear a lab coat when entering the laboratory room. If they do not wear a lab coat when entering the room, they will not be transferred to the next stage.

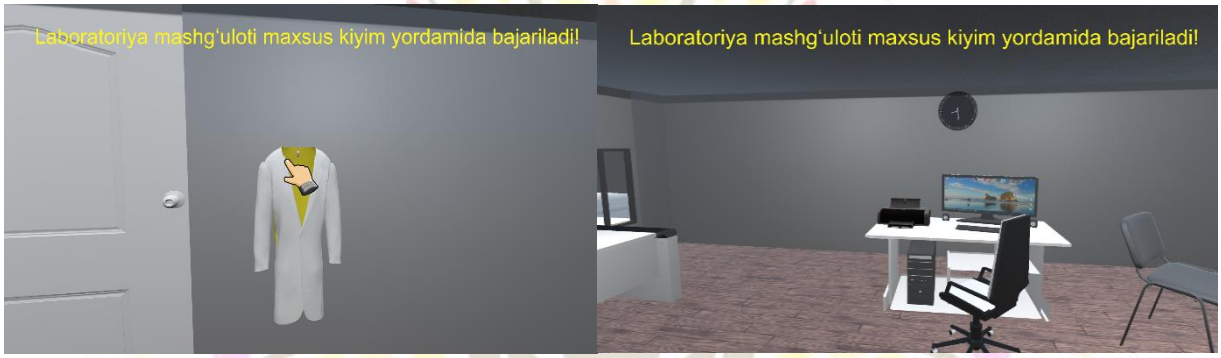


**Photo 1(a,b). A model of a special dressing room.**

Get permission to perform the experiment:

Step 2. A student who entered to the laboratory room goes to the table, activates the computer and answers the test questions after getting acquainted with the theoretical part of the laboratory work.

Step 3. Having familiarized himself with the theoretical part and the order of work, the student goes to the laboratory equipment and writes down the results in his notebook according to the sequence of work.

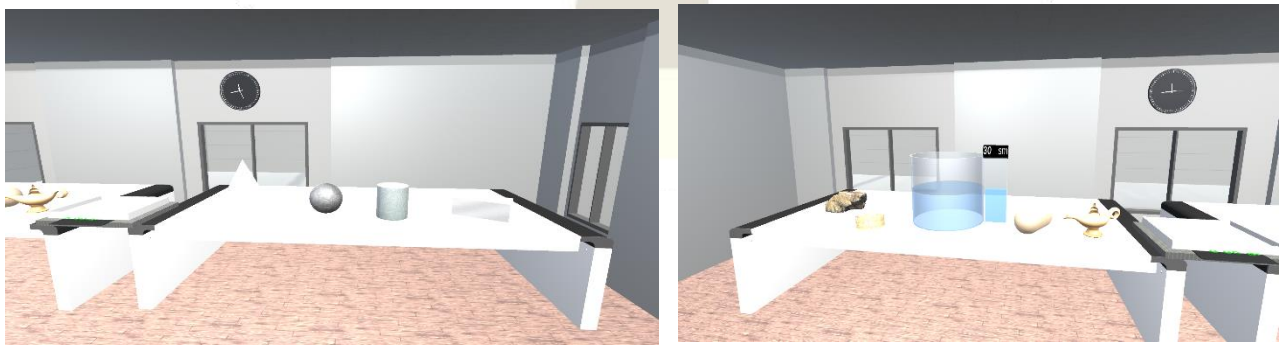

**Photo 2(a,b). A model of the execution of the experiment.**

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1 - task. In the course of work, shaped objects are weighed using a scale, and the density (r) of the objects is determined by calculating the quantities given in the theoretical part. (Photo 2a)

2 - task. The density of bodies that do not have a specific shape is found by submerging them in water, their mass is measured using a scale, and their density (r) is determined. (Photo 2b).

3 - task. When different objects are dropped into a liquid, the liquid rises to different heights. The volume of the rising liquid is equal to the volume of the body immersed in water

4 - task. The value of the density found in the first and second method is compared with the table containing the density of solid parts.

5 - task. Based on the obtained results and calculations, the table is filled and analyzed and concluded.

**table: for objects with a definite shape**

| N | The name of the bodies | m, kg | a, (m) | b, (m) | c, (m) | r, (m) | h, (m) | V, ($m^3$) | ρ, ($kg/m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Cone | | | | | | | | |
| 2 | Ball | | | | | | | | |
| 3 | Cylinder | | | | | | | | |
| 4 | A rectangle | | | | | | | | |

**table: for objects that do not have a definite shape**

| № | Bodies | Mass **m,** (kg) | Volume of water $\mathbf{V_1}$,($m^3$) | The height of the water **h (m)** | Body and water volume $\mathbf{V_2}$, ($m^3$) | Body size. $\Delta\mathbf{V}$, ($m^3$) | Density of matter. **ρ**, ($kg/m^3$) |
|---|---|---|---|---|---|---|---|
| 1 | Stone | | | | | | |
| 2 | Crown | | | | | | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | a kettle-like body | | | | | | |
| 4 | egg-shaped body | | | | | | |

Expected result:

The teacher: achieves transparency in the evaluation of students, evaluates them quickly and simultaneously, ……..

In the student: his interest in acquiring physical knowledge increases, his creative (creativity) ability develops ……..

With the use of interactive technologies in educational activities, we not only increase the knowledge of students, but also lead to the development of their creativity. In addition, we will be able to evaluate all students in a short period of time.

Nowadays, among the technical means of teaching, the most effective is the electronic board. Because today's youth, who grew up in the environment of computers, mobile phones, television, and the Internet, are very avid for exciting information and motivational factors. Since the electronic whiteboard incorporates projection technologies with touch devices, the student can not only see what he sees on the computer, but he can actively participate in the process: he can move back and forth and even pause the image, add to the viewed material. can make additions, change, edit, mark with different colors, comment on it. So, the electronic board is one of the factors that increase mutual activity.

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