

Use of Computers in Teaching Physics

Khudoiberdiyev Adham Hamdam o'g'li

Bukhara State University, Faculty of Physics and Mathematics, Department of Physics

ABSTRACT: One of the promising areas of application of information and computer technology in physics education is computer modeling of physical processes and experiments. It facilitates the teacher's teaching and clarifies the physical processes. In this article, we present our views on computer software and virtual labs in the teaching of physics.

KEYWORDS: Physics, virtual laboratory, modeling, complex programs, information technology, animation, experiment, computer, software, intellectual potential.

Introduction

On the basis of the Resolution of the President of the Republic of Uzbekistan Sh.M.Mirziyoyev dated March 19, 2021 № PQ-5032 "On measures to improve the quality of education and development of scientific research in the field of physics" the idea of accelerating the introduction of information technology and computers into society, people's lifestyles, general secondary schools, secondary special, vocational education and higher education institutions .

Virtual physics experiments are a relatively new field in both research and teaching, thanks to the implementation of computer-assisted physical models. The development of physics and the study of physics are inextricably linked with the construction and study of models of various physical phenomena. Therefore, the development of science-based approaches to the study of simplified equivalent models of physical laws by the intellect is one of the most pressing problems.

REFERENCES AND METHODOLOGY

"The most pressing issue in the learning process is the discovery of a new teaching method for each subject of physics. This is directly related to the reform of the teaching process, ie the introduction of new teaching methods that meet the real needs of students." [1]

Scientific and methodological research aimed at the development of students 'intellectual potential in the teaching of physics on the basis of pedagogical software is one of the most important issues in the development of students' thinking through computer models of physical phenomena.

Scientific and methodological research aimed at the development of students 'intellectual potential in the teaching of physics on the basis of pedagogical software is one of the most important issues in the development of students' thinking through computer models of physical phenomena.

Computer models of many physical phenomena are very easy to explain and help to develop students' cognitive abilities and imagination. For example, a material point, an ideal gas, a harmonic oscillator, the Rutherford experimental model, and charged particles are among them.

Physical models are also widely used in education. Educational computer models in the form of virtual physics experiments play an important role in the teaching of physics.

In addition to visually demonstrating standard physics laboratory experiments, virtual physics experiments can also demonstrate a variety of physical phenomena that cannot be performed in the classroom. Since this is the basis for the development of students 'intellectual thinking, one of our main goals should be to conduct the teaching of physics using pedagogical software, and thus to conduct scientific and methodological research on the development of students' intellectual potential.

It is impossible to study physics without an experimental part. Much can be said about the need to move to new standards of education, the need to introduce information technology in the educational process.

In the process of covering this article, the methods of objectivity, logic, analysis and synthesis of scientific knowledge were widely used. In the course of this research, the possibilities of using NI LabVIEW software technology to teach physics were objectively revealed. In today's world of education, the technology of teaching physics has been studied in

a logical sequence. In the course of the research, the works of the President of the Republic of Uzbekistan Sh.M.Mirziyoyev were identified as a methodological source

RESULTS AND DISCUSSION

Nowadays, more attention is paid to virtual laboratory work on various topics. They only need to be completed without completely changing the actual laboratory work provided. In addition, virtual lab sessions should only be used in sessions after the student has become familiar with the real devices.

Laboratory work in physics is divided into main sections of the program. There are 3D versions of laboratory work. A virtual laboratory is a hardware-software complex that allows you to conduct an experiment without direct contact with the actual installation or in its complete absence. In this case, it is necessary to distinguish between the concepts of "virtual laboratory" and "virtual remote laboratory". The basis of a virtual laboratory is a computer program or a set of relevant programs that perform computer modeling of specific processes. Remote virtual laboratory is a group organizational structure of several scientists belonging to different scientific centers and connected by mutually beneficial cooperation via the Internet. Compared with traditional laboratory work, virtual laboratory work has several advantages.

First, there is no need to buy expensive equipment and hazardous radioactive materials. For example, specially equipped laboratories are required for laboratory work in quantum or atomic or nuclear physics. Virtual laboratory work allows the study of phenomena such as the photoelectric effect, Rutherford's experiment of scattering alpha particles, the detection of crystal lattice by electronic scattering, the study of gas laws, nuclear reactors, and so on. Second, it is possible to simulate processes that do not have a course in the laboratory. In particular, most of the classical laboratory work in molecular physics and thermodynamics are closed systems, at the output of which a certain amount of electricity is measured, of which the required quantities are calculated using the equations of electrodynamics and thermodynamics. In performing virtual laboratory work in these areas of physics, students can use animated models to observe dynamic images of physicochemical phenomena being studied and processes not observed in real experience, as well as observe the corresponding graphical structure of physical quantities as well as experiment.

Third, virtual laboratory work can visualize physical or chemical processes more visually than traditional laboratory work. For example, it will be possible to study in more detail and detail the physical processes such as the motion of charged particles that create an electric current. You can also go into fractions of seconds or into processes that take years, such as studying the motion of planets in the gravitational field of a central body.

Another advantage of virtual labs over traditional labs is security. In particular, it is advisable to use virtual laboratory work when working with high voltage or hazardous chemicals.

However, virtuals also have drawbacks. The main thing is the lack of direct contact with the object of study, tools, equipment. It is absolutely impossible to train a specialist who has only seen a technical object on a computer screen. Perhaps there are those who previously wanted to see a surgeon who only practiced on a computer. Therefore, the most sensible solution is to combine the introduction of traditional and virtual laboratory work into the learning process, taking into account their advantages and disadvantages.

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a complex software developed by National Instruments (USA). It uses the intuitive graphical programming language G, which does not require knowledge of traditional programming languages. LabVIEW has a wide range of capabilities in computing and mathematical modeling, so it can easily compete with popular mathematical programs such as MATLAB, MathCAD, Mathematica, MAPLE.

With the help of this program, it is possible to perform such tasks as assembling electrical circuits, replacing faulty parts (resistors, batteries, capacitors, etc.), as well as performing physical experiments in the laboratory. Based on the experiments performed with the help of the program, we consider a model designed to study three resistive chains (Figures 1a, b, c) connected in series, parallel and mixed cases:

In studying the first scheme (Figure 1a), the following problem needs to be solved:

- a. measuring the current flowing through each resistor I ;
- b. Measure the voltage across each resistor and at the ends of the circuit

$$U = U_1 + U_2 + U_3;$$

c. Measure each resistance

According to Om's law for a part of the chain:

$$U_1 = R_1I, U_2 = R_2I, U_3 = R_3I \text{ and } U = RI$$

where the total resistance of the chain is $R = R_1 + R_2 + R_3$

In studying the second scheme (Figure 1b), the following problem needs to be solved:

a. Determine the resistance at each resistor and the total potential

$$U = U_1 = U_2 = U_3;$$

b. Measure the total current through the circuit:

$$I = I_1 + I_2 + I_3.$$

In this case, according to Om's law for a part of the chain:

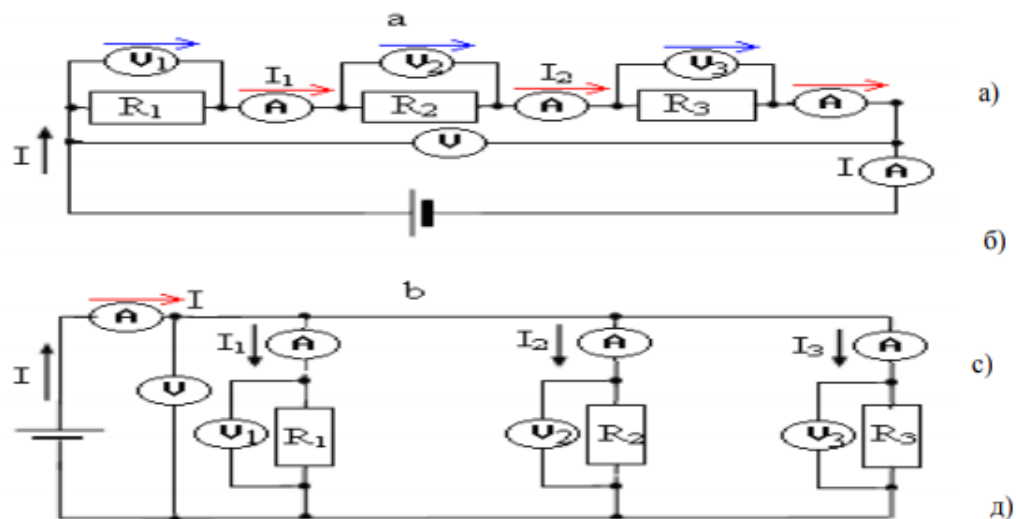
$$U = R_1I_1; U = R_2I_2; U = R_3I_3 \text{ and } U = RI,$$

The third case (Figure 1c) is the sum of the two cases discussed above. We measure the current, resistance, voltage, and conductivity of the elements used in these experiments by changing the measuring modes of the multimeter and pouring them into the appropriate mode.

The virtual experiment chain created on the computer monitor and Figures 1a, b, s show that if we perform this experiment in a real experiment chain, then four ammeters, four voltmeters, and resistors to You will need a plami. In the laboratory, using computer technology, it is enough to use one computer to organize and conduct laboratory work in a small group in the frontal style.

Figure 1d shows a virtual experiment stand modeled on a computer using the NILabVIEW training software. The figure shows a circuit that measures only the current flowing through a complete circuit and the voltage across the ends of the circuit. To measure the resistance, voltage drop, and current flowing through a part of the circuit, it is necessary to connect the clamp of the multimeter to the node of the corresponding element in the circuit.

Thus, the NILabVIEW program allows you to compare the exact measurement scheme in physics and use it in the laboratory, while maintaining the didactic goals and objectives of the lesson.



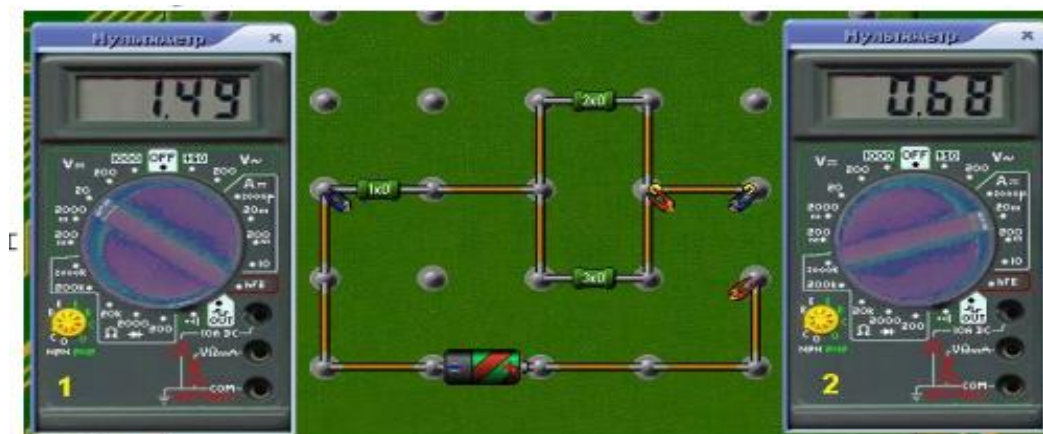


Figure 1 (a, b, s, d). Electronic circuit for the study of electrical circuits.

Organization of physics education and educational process on the basis of non-traditional teaching methods and technologies with the use of information technology in the teaching of physics in technical higher education institutions forms and develops students' skills of independent acquisition of polytechnic knowledge, further increases their interest in mastering science. It also paves the way for a unique research approach to the independent development of the Internet and the study of new topics.

The use of virtual laboratory work is important in the study of physics. Virtual laboratories come in handy to study the theory of deep understanding of physics and to calculate it differently, to solve qualitative and experimental problems. If the student is familiar with the theoretical questions in the lectures, then the theory is applied in laboratory classes, and in addition, practical skills are formed in conducting physical measurements, processing and presentation of results.

Without independent preparation for laboratory work, it is impossible for students to successfully and successfully defend the results of laboratory work. In preparation for the next lesson, you should first study the description of the work done in this guide. Therefore, for each work in the textbook, it is necessary to read the material that corresponds to the topic of the work. It is impossible to start work without mastering its basic theoretical principles, without being aware of the logic of the measurement procedure, without using the measurement tools associated with this work.

CONCLUSION

Students in the field of pedagogical software environment, information learning environment, intellectual learning systems, multimedia lessons, case laboratories, computer modeling of physical phenomena and software development used in various branches of physics. It is of great practical importance.

Without deviating from traditional methods of teaching physics, it is possible to improve the content of physics education by enriching and activating them with modern teaching technologies and programmed pedagogical tools, creating virtual laboratory works and methods of their effective use.

REFERENCES

1. Мирзакулов А. М. Йўлдашева Г. И, ФОТОЭФЕКТ ХОДИСАЛАРИНИНГ ВИРТУАЛ ЛАБОРАТОРИЯЛАРИ «World social science» • №1(1) • 2018 Pedagogical sciences
2. Девяткин Е.М., Хасанова С.Л., Чиганова Н.В. Комплекс электронных лабораторных установок по общей физике // Современные проблемы науки и образования.2016.№4 URL: <https://science-education.ru/ru/article/view?id=24956> (дата обращения: 30.10.2017).
3. Хасанова С.Л. Компьютерная модель виртуальной химической лаборатории / С.Л. Хасанова, Е.М. Девяткин, Н.В. Чиганова // Современные наукоемкие технологии. – 2016. – № 9-2. – С. 360-364.
4. Хасанова С.Л. Компьютерная модель виртуальной биологической лаборатории по разделу «Цитология» / С.Л. Хасанова, И.А. Симонова // Современные наукоемкие технологии. - 2016. – № 9-1. – С. 89-92.
5. Чиганова Н.В. Технологии разработки электронно-образовательных ресурсов / Н.В. Чиганова, С.Л. Хасанова, Е.М. Девяткин // Современные наукоемкие технологии. – 2016. – № 10-1. – С. 108-113.

6. Дмитриев В.Л., Каримов Р.Х. Применение облачных технологий, экспертных систем и принципа игрофикации при организации электронного обучения / В.Л. Дмитриев, Р.Х. Каримов // Современные наукоемкие технологии. – 2015. – № 12-3. – С. 413-416.
7. Дмитриев В.Л. Облачные технологии и игрофикация как основа научнообразовательной платформы для организации электронного обучения / В.Л. Дмитриев, Р.Х. Каримов // Профессиональное образование в России и за рубежом. – 2016. – № 2 (22). – С. 131-135.
8. Дмитриев В.Л., Каримов Р.Х. Организация электронного обучения на авторской образовательной платформе «облачная школа» // Информатика и образование. – 2016. – № 4 (273). – С. 25-28.
9. Каримов Р.Х. Использование принципа игрофикации при организации электронного обучения // Электронное обучение в непрерывном образовании. – 2015. - Т. 1. – № 1 (2). – С. 68-72.
10. Смирнов А.В. Новый курс «Информационные и коммуникационные технологии в физическом образовании» в системе подготовки бакалавров в педвузах / А.В. Смирнов, Н.В. Калачев, С.А. Смирнов // Физическое образование в вузах. – 2014. – Т. 20. – № 3. – С. 20-27.
11. Смирнов А.В. Методика применения информационных технологий в обучении физике: учеб. пособие для студ. высш. пед. учеб. заведений. – М.: Издательский центр «Академия», 2008. – 240 с.
12. Губский Е.Г. Виртуальный лабораторный комплекс по физике. Разделы механика и термодинамика // Энергобезопасность и энергосбережение. – 2009. – № 1. – С. 41-43.