: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889, 2024-
5 ResearchBib IF: 8.848 / 2024

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-10

USE OF NEW PEDAGOGICAL TECHNOLOGIES IN TEACHING PHYSICS IN TECHNICAL HIGHER EDUCATION COUNTRIES

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Abstract. *This article considers the importance and methods of using new pedagogical technologies in the teaching of physics in technical universities. The article examines the impact of modern teaching methods, interactive learning methods and modern technologies on physics education. Also, researches and experiments conducted with the aim of deepening students' knowledge, developing independent thinking and increasing practical skills through new pedagogical approaches are presented.*

Key words: *pedagogical technologies, physical education, interactive teaching, educational methods, independent thinking, higher education, educational innovations, practical skills, improving student knowledge, modern educational methods.*

Introduction

Today, in such a period of development, the application of scientific, technical and technological achievements to educational processes is one of the main requirements of the "National Personnel Training Program". The use of innovative pedagogical technologies in educational processes is important in improving the consciousness and knowledge of students, as well as in the formation of their thinking abilities. The goal of innovative pedagogical technology is to increase the effectiveness of education and training at each stage of the subjects taught in educational institutions, to achieve a high level of mastery with less time and less effort. In this case, every subject taught in subjects should be planned with the goal of what the student should know, work, and apply by the end of the lesson.

Methodology

Taking into account the above, a new, original laboratory designed for long-term use, which reflects the most important physical processes, effects and laws in physics, and can directly arouse students' interest in physics It consists in creating a series of "Virtual laboratories". A virtual laboratory consists of a realistic simulation of a specific process. The procedure for conducting laboratory exercises using virtual laboratory work is slightly different from that of real laboratory exercises. This difference is determined by the virtual nature of laboratory work, the need to use a computer, the possibility of repeating it many times, and having enough time to do more than one task during one session.

Virtual physics laboratories using IT technologies have several main functions and advantages:

Availability and flexibility: Students can experience anytime and anywhere, which is especially important for distance learning.

Safety: Virtual labs eliminate risks associated with conducting experiments that can be dangerous in real life.

Modeling and simulation: allows you to imagine physical phenomena and perform experiments that are difficult or impossible to do in reality.

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Interactivity: Students can interact with laboratory elements, change parameters and immediately see the results of their actions.

Data Analytics: The ability to collect, process and analyze data in real-time, which helps advance data science.

Feedback and Evaluation: Automated systems can provide instant feedback and evaluate the results of experiments.

Integration with other learning resources: Virtual labs can be linked to lectures, tutorials, and other resources to create an integrated learning experience.

Variety of Experiments: A wide range of experiments covering different areas of physics, from mechanics to quantum physics.

Arousing interest: Using modern technology and games can increase students' interest in learning physics.

Collaboration and Group Projects: Opportunities for students to work together on experiences that develop teamwork skills.

These features make virtual labs a powerful tool for teaching physics, allowing students to deepen their understanding of material and build practical skills.

Today, there are many ways to create virtual physics laboratories. Examples of these include:

Several functions of virtual physics laboratories are concrete examples of the use of IT technologies:

- Modeling physical processes:

  Example: Using programs like PhET Interactive Simulations, which allow you to simulate body movements, electrical circuits, and other physical phenomena. Students can change parameters (such as mass or force) and observe changes in the system.
- Availability and flexibility:

  Example: Platforms like Labster offer 24/7 access to virtual labs. Students can take courses and experiments from anywhere in the world using only the Internet and a computer.
- Interactivity:

  Example: Virtual labs from Simulations Plus, where users can drag and drop components (such as resistors in an electrical circuit) and see changes in the circuit in real time.
- Security:

  Example: Virtual experiments, such as working with hazardous chemicals in a chemistry lab, allow students to learn reactions without risking their own health.
- Data analysis:

  Example: VPL virtual laboratory (Virtual Physics Lab) includes tools for collecting experimental data and graphically visualizing them, which helps in analyzing the results.
- Feedback and rating:

  Example: Systems like Smart Science Lab provide automated reports on experiment results and advice on how to improve assignments.
- Various experiences:

  Example: LabXchange virtual labs offer a variety of experiences in mechanics, optics, and thermodynamics, allowing students to choose topics that interest them.
- Gamification:

  Example: The Gizmos platform includes game elements where students earn points for completing tasks and can compete with each other, making learning more fun.
- Cooperation:

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VOLUME-4, ISSUE-10

Example: Platforms like Collaborate allow students to work in groups on virtual experiments, share results, and discuss problem-solving approaches.

- Integration with other educational resources:

Example: Virtual labs on platforms like Canvas or Moodle can be combined with lectures, tests, and other learning materials to create a unified learning environment.

These features and examples show how IT technologies can significantly enrich the physics learning experience [1].

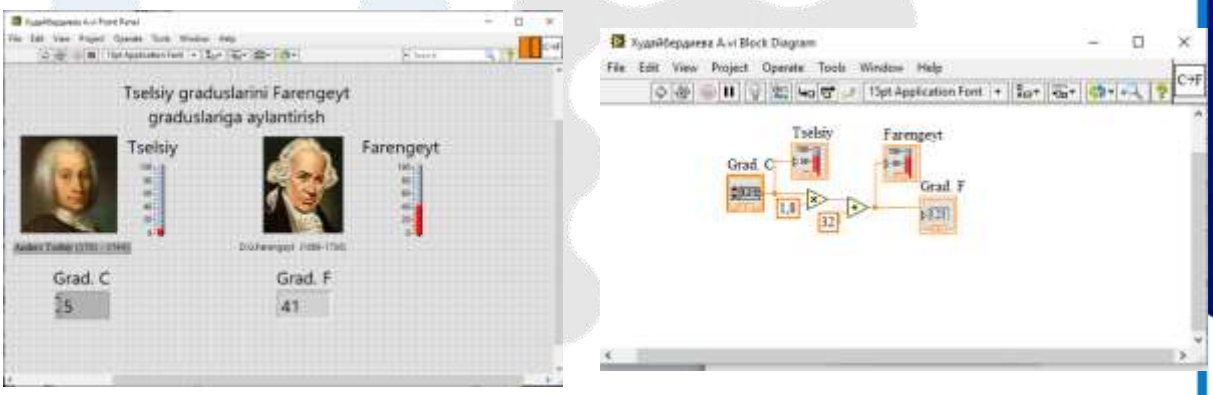
Results and discussion

many developed countries, the best way to solve the problem is to recommend PYTHON, a simple and modern programming language for researchers and teachers, which does not take up much space on the computer (total size 25 MB) and codes spoken in English [2].

Among them, one of the most convenient programs for virtual laboratory training is the LabVIEW program. In the LabView application, using special block diagrams, quantities can be related to each other based on an equation. This is similar to building an algorithm in the form of a block diagram. There is a possibility to graphically express the results of the quantities in the block diagrams. LabVI EW includes data collection, processing, display and storage for a set of devices. LabVIEW has a search tool and debugging, code tuning.

Figure 1(a,b) shows the front panel (a) and block diagram (b) of the virtual stand made in LabVIEW software that converts degrees Celsius to degrees Fahrenheit [3,4].

Figure 1-a, b.



Virtual laboratory work (VLI) created in the LabVIEW graphical programming environment allows the realization of the above goals. VLI reflects laboratory work and physical processes that cannot be carried out in a teaching laboratory under normal conditions. VLI is not a dry animation, but each process is a reflection of a real event, and the appearance is a three-dimensional image of the real equipment, the initial data and the parameters to be changed are in textual form. not graphically, i.e. it is done by pressing the button, turning the desired screw, just like in real equipment. This provides students with virtual reality.

Figure 2-(a,b,c) shows the circuit of the amplifier built on the optotransistor (a), the image on the oscillograph (b), and the characteristics of the amplifier on the Bode plotter (c) performed in the Multisim program [5].

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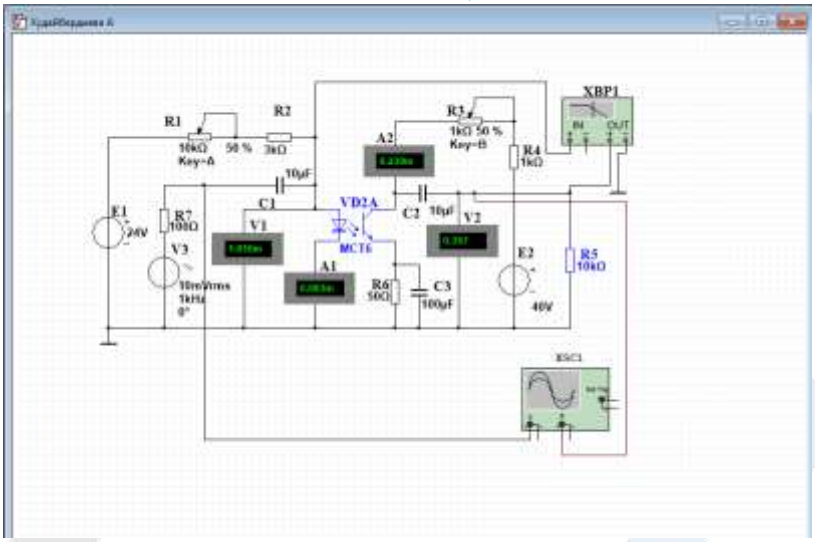

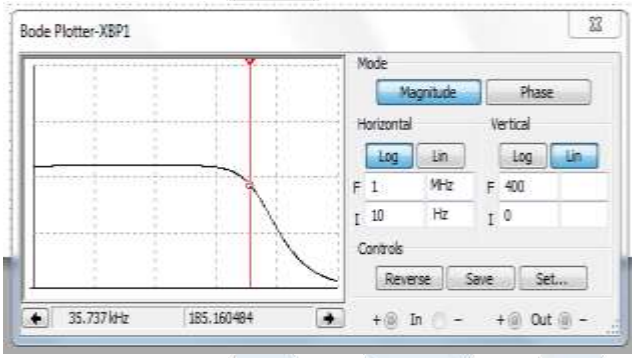

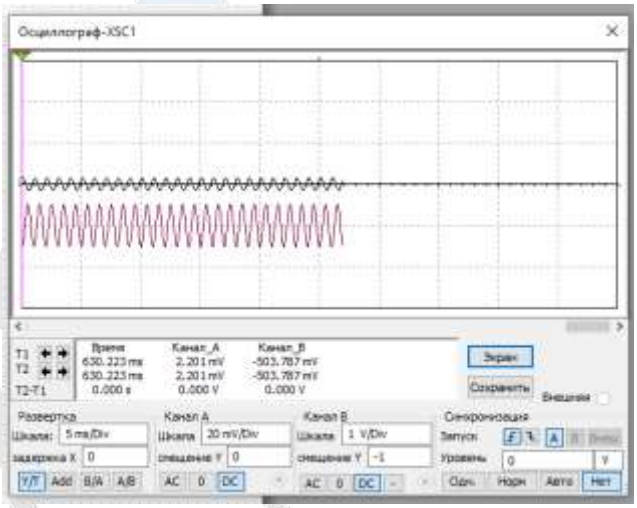

Figure 2a, b, c

Conclusion

Thus, if laboratory exercises in physics taught in educational institutions are conducted in the form of a "virtual laboratory", on the one hand, time is saved, and on the other hand, it can be used as a simulator for students before performing real laboratory work. is highly effective.

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