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Research Article

THE USE OF PEDAGOGICAL SOFTWARE, THAT IS, VIRTUAL LABORATORIES, IN THE TEACHING OF PHYSICS

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ABSTRACT

The article considers the features of virtual laboratory work on physics in higher educational institutions. Their advantages and disadvantages compared to traditional laboratory practice. The importance of filling real experience with virtual is noted. Also, in the teaching of physics, opinions and opinions are made about the use of pedagogical software, that is, virtual laboratories.

KEYWORDS

Information technology, virtual laboratory, traditional experience, advantages and disadvantages of virtual laboratory work.

INTRODUCTION

Physics in the educational process of higher education institutions is one of the main subjects of the master's degree. Knowledge of physical phenomena and basic laws that explain these phenomena creates not only a fundamental basis for mastering the sciences of practical character in the future, but also the thinking abilities of future engineers. In the following years, with the development of Information Technology, the

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need for the introduction of modern technologies into the educational process arose. In many higher education institutions, laboratory equipment, which has long been outdated in the science of physics, poses a challenge in the modernization of the educational process. During the demonstration of the lecture experiment, as well as in the laboratory exercises, old, repaired devices are used.

MOOC-learning (Massive Open Online Courses, mass lectures from open source) is perfect for transferring ideas, formulas and other theoretical knowledge in lessons and lectures. But for the completeness of the development of many sciences, practical training is also necessary - digital learning has "felt" this evolutionary need and has created a new "form of life" - virtual laboratories, for school and university education themselves.

The availability of a wide range of virtual laboratories causes confusion among practitioners in terms of program selection and adaption to subject matter in pre-service and in-service teacher education. The purpose of this study is to provide physics educators, teachers, and pre-service teachers with information about the virtual laboratories that are currently being utilized in physics classes, as well as the scope, design, and features of such software. They are introduced and compared, their superior and weak aspects are highlighted, and target audiences, design characteristics, scopes and details, experiment analyses levels, levels of proximity to reality, and user friendliness are presented using data gathered from a literature review.

A virtual laboratory is an interactive environment in which simulated experiments can be created and conducted. Experiments are carried out using domain-dependent simulation algorithms. Virtual reality technology can be used to build a virtual laboratory that mimics the processes and behaviors that occur in real laboratories. Virtual labs, according to Alexiou, Bouras, and Giannaka (2005), are a low-cost way for schools to obtain laboratories for all courses.

These remote laboratories provide users, particularly teachers and students, with learning opportunities that would be impossible in traditional classrooms. Users can design, develop and achieve pre-determined experiments that simulate experiences and processes in real-world contexts. All students can be involved and participate, unlike the physical systems where only a few students can do the same and learn. Reportedly, the simulation design principles depend on research on students' learning and interactions with the experimentation tools in various learning environments.

Virtual laboratories can be combined with display technologies such as interactive projectors or smartboards for an all-inclusive class, as opposed to the limited area afforded by physical workstations. They can be used to supplement or replace existing ones, especially in courses where physical laboratories are not possible to construct due to a lack of resources and actual practices.

For educational institutions in impoverished nations when physical facilities are inadequate or non-existent, virtual laboratories are even more appropriate, significant, and cost-effective. Despite the fact that many secondary and tertiary schools have created physical laboratories, their full potential has yet to be realized due to a shortage of equipment.

In most situations, a well-designed virtual laboratory starts with historical notions, basic experiments, and models for learning the subject matter's universal principles. Animations, galleries, films, demonstrations, practices, and problem solving follow the principles.

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Dynamic assessment and feedback systems are built in, allowing students to map the experiments to prove, confirm, and/or test their knowledge. Workbenches with resources and instructional manuals for calculations such as those needed in a chemistry titration experiment are available.

Each lab concludes with references and connections to additional resources for further research. Students can add the virtual lab sites to their course portfolios or bookmark them. Students not only learn about the minds behind these experiments, but they also get to see them in action.

E-well-known Learning's flaw is that it mostly teaches theoretical subjects. The coverage of practical topics may be the next step in the evolution of online education. It occurs in two ways: the first is the outsourcing of contractual practice to physically accessible colleges (for example, in medicine), and the second is the development of virtual laboratories in many languages.

Virtual laboratories can be 2D or 3D; simple and complex for small students, and practical for medium-sized and students, high school, students and teachers. Their syllables are designed for a variety of subjects. Often this is physics and chemistry, but there are also very specific ones, for example, for ecologists virtual. Virtual laboratory: means for research on the history of experimentation. An online laboratory is a platform where historians publish and discuss their research in various fields of Science (from physics to medicine), on the topic of experiments on Art, Architecture, media and technology. It contains illustrations and texts on various aspects of the experiment: instruments, experiments, films, photos of scientists, etc. Students will be able to create their own account and add scientific articles for discussion.

The introduction of new technologies in the educational system, as well as comprehensive modernization, are the main issues that are being paid special attention. The introduction of information technology into the learning process must effectively complement existing teaching technologies or have additional advantages over traditional forms of learning. For example, the use of virtual laboratories in the teaching of physics makes laboratory training more lively and interesting, thereby improving the quality of Education. Virtual laboratory is a software application that allows you to carry out experiments without direct contact with a real laboratory or in their complete absence.

Compared to traditional laboratories, virtual laboratories have a number of advantages:

- Virtual laboratories are safer, it is convenient to use virtual laboratory work when working with high-voltage or hazardous chemicals;
- Virtual work is versatile, and also provides flexibility and ease of adaptation to various objects;
- It will be possible to conduct an experiment that is impossible in normal conditions or whose conduct is associated with large time and material costs;
- The use of a personal computer not only simplifies the control of its execution, but also the preparation for the execution of the laboratory work on demand;
- The use of computer allows well-read students to absorb instructional material more quickly and not wait for those who are left behind;
- The graphical capabilities of the virtual laboratory work allow you to see multidimensional processes that cannot be

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described with real devices or in a two-dimensional form;

- Reducing the cost of creating laboratory work allows for a significant widen of their base in a short time, thereby providing greater flexibility in training.

It should be noted that in addition to the advantages of using information technology in the teaching of physics, there are also disadvantages: the real experience cannot be completely replaced by computer equipment, which is very important in teaching students of the Faculty of engineering; lack of practical skills in working with computers;

In conclusion, analyzing the advantages and disadvantages of using Virtual laboratory work, I can say that information technology should not only complement traditional technologies, but also replace them. Computer experience makes the learning process more colorful, interesting and exciting, but it cannot completely replace the real experiment.

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