USING INTERNET RESOURCES IN PERFORMING LABORATORY EXERCISES IN ATOMIC PHYSICS

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Annotation: *this article provides information on the importance of pedagogical software and virtual simulators in the development of students' intellectual potential when teaching physics, available opportunities and the electronic platform "Amrita Virtual Laboratories, universalizing education."*

Key words: *visual simulator, visual model, physical experiment, virtual laboratory, modeling, atomic physics, modeling.*

One of the most important stages of the educational process is the formation of creative approaches to learning, the implementation of the process that serves to create and provide a methodology based on the development of the student's cognitive abilities.

Specially created visual simulators based on a computer model for each topic are an ideal visual model of a physical process and, depending on the teacher's professional skills, allow the student to imagine the full essence of the physical law. The development of physical science and the study of physics are inextricably linked with the construction and study of models of various physical phenomena. Therefore, one of the urgent problems is the creation of scientifically based approaches to the study of simplified equivalent models of physical laws by intelligence.

In a computer model of physics, based on programming technologies, the addition of many factors serves to provide a natural model of a physical process. A computer model of this physical process ensures the naturalness of the physical experiment being conducted.

Visualization is one of the main methods in education that allows a deep understanding and understanding of physical phenomena and laws. Dynamic objects and events that are difficult to understand are best learned through visualization rather than learning by looking at static images. Virtual physical experiments are a relatively new direction both in scientific research and in the educational process due to the implementation of physical models with the help of computer technologies. Real laboratory conditions do not allow all experiments to be carried out. Therefore, it is necessary to include interactive modeling methods in the educational process

along with the traditional forms of lectures, practicals, seminars and laboratory sessions.

In teaching physics based on pedagogical software tools, scientific-methodical researches aimed at the development of students' intellectual potential are the most important current problems, and students' thinking is developed through computer models of physical phenomena.

Currently, performing models of physical phenomena and virtual physical experiments with the help of computer technologies has a practical effect on the development of the intellectual potential of students of higher education.

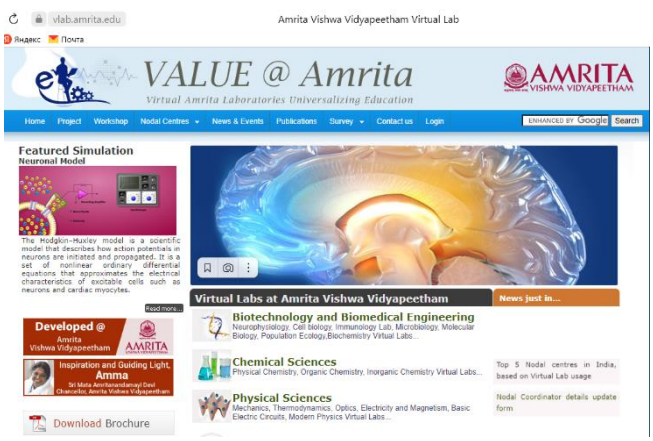
Computer models of many physical phenomena are very easy to explain a physical phenomenon and serve to develop students' cognitive abilities and imagination. For example, material point, ideal gas, harmonic oscillator, model of Retherford’s experiment, charged particles are among them.

Virtual labs are media-rich online learning environments that allow users to conduct physical laboratory experiments anytime and anywhere in a computer-simulated environment. In addition, virtual experimental models compensate for the lack of equipment in the educational institution.

There are not enough tools and equipment to demonstrate the topics of the atomic physics department of higher education and to conduct laboratory exercises. Therefore, it is appropriate to introduce existing virtual simulators in the in-depth study of physical phenomena by students.

Taking into account the above factors, we use the electronic platform "Virtual Amrita Laboratories Universalizing Education" (VALUE) to organize atomic physics laboratory classes in the educational process. This electronic platform provides students with free and universal access to mathematically accurate simulated, animated and remote experiments in physics, chemistry, biotechnology, mechanical and computer engineering through the use of web browsers, and theory-based experiments with digital learning tools. and enables learning of concepts.

The link http//:vlab.amrita.edu is used to access this platform. Figure 1 shows the working window of the platform. In the mirror by choosing the "Physical Sciences" "Modern Physics Virtual Lab" sections, we have the opportunity to perform laboratory work in a virtual laboratory environment, such as checking the photoeffect laws, determining Planck’s constant, determining the elementary electric charge using the Milliken experiment, which are available in the atomic physics curriculum. We will have (Fig. 1b).

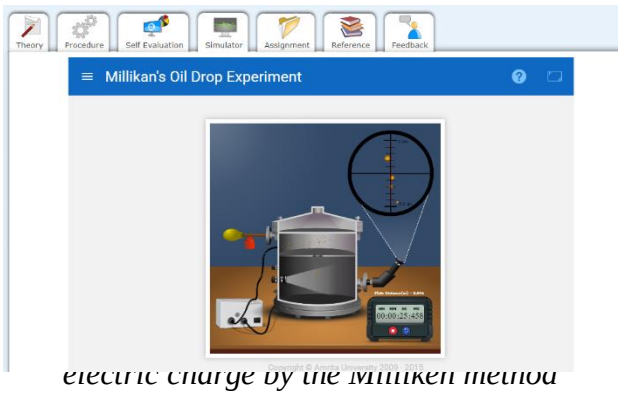


(a) *(b)*

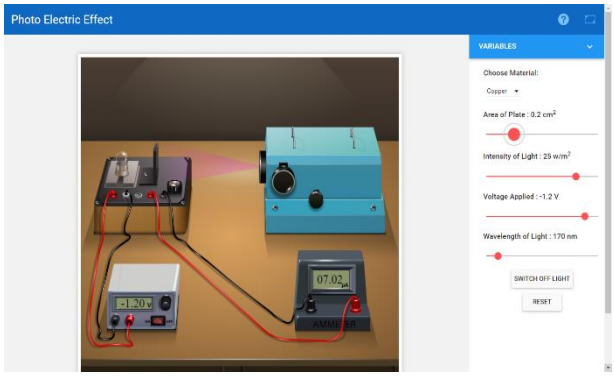
Figure 1

In addition to simulated experiences, this virtual learning environment has a number of additional features, including illustrated theoretical notes, animations, modeling, interactive quizzes, as well as workbooks and more as needed. There are video lectures that can be viewed multiple times. Figure 2 shows a working window of some virtual laboratory works related to atomic physics. Users will connect and measure the chain in these windows.

Figure 2



electric charge by the Millikan method



In conclusion, it can be said that the use of virtual laboratories in the educational process allows to see experiments that are difficult or impossible for one reason or another in certain laboratory conditions, saves the time of the teacher and students, gives practical experiences to students. and provides ample opportunities for the development of a new approach to higher education and scientific and methodological research. Of course, a virtual laboratory cannot replace a real physical laboratory. However, virtual work is the only option when the necessary equipment is not available.

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