

The Application of Virtual Simulation Software in University Physics Teaching

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Keywords: *information technology, virtual simulation software, university physics*

Abstract. With the development of educational informationization, the deep integration of information technology and curriculum teaching has become the development trend of modern education. The traditional university physics teaching cannot meet the needs of teachers and students in engineering universities under the new situation. More and more teachers and researchers try to integrate modern education technology into the university physics teaching. This paper focuses on the application of virtual simulation software in university physics teaching. This study takes university physics teaching as the research object, and discusses the application of virtual simulation software in university physics teaching.

Introduction

The coming of information age brings the opportunity of reform and development to education. The vigorous development of information-based teaching is constantly changing the traditional classroom teaching mode, teachers' teaching mode and students' learning mode, and promoting the continuous reform of education[1-3].

With the continuous development of modern education technology, teachers and education researchers pay more and more attention to the integration of information technology and university physics teaching. Modern education technology is applied in university physics teaching, which is implemented in many teaching links such as lesson preparation, concept explanation, experiment exploration, teaching evaluation, etc., changing the traditional teaching mode[4].

From the perspective of implementation technology, virtual simulation software, which is based on the computer platform, carries out simulation experiments of the real system by virtual reality technology, then forms the corresponding mathematical model or mathematical-physical model. The virtual simulation software shows the experimental simulation environment of the essential process, and it can be considered to make the experiment break through the limitation of time and space for university physics teaching. It can simulate the operation process of various physical experiments and present the experimental phenomena intuitively and vividly, and promote students' involvement in university physics learning[5].

The application of virtual simulation software in university physics teaching meets to the requirements of the university physics teaching in the new era. On the one hand, it can enrich the teaching methods of university physics and solve the difficulties of university physics teaching. On the other hand, it creates a relaxed, open and convenient learning environment for students and improves their enthusiasm and initiative for university physics learning. In the process of university physics teaching, we should give full play to the unique advantages of virtual simulation software, and promote the review of university physics concepts and laws, the establishment of physical models, and the analysis and solution of physical problems[6].

The Significance of Virtual Simulation Software in University Physics Teaching

(1) Visually presenting the physical situation, enhancing the students' audio-visual experience

For the university physics courses, teachers often use the traditional mode which typical examples are explained and exercises are assisted. Students often lack interest in learning and are tired of learning in this mode for a long time. Moreover, in the face of complex and abstract physical problems, it is difficult for teachers to help students create physical situations to solve physical problems efficiently. By using the virtual simulation software, the physical situation of the physical problems can be presented intuitively and vividly. The students can be stimulated by audio-visual methods, and the interactive classroom can be formed. The enthusiasm of the students can be improved, and the students can be transformed from the traditional passive listeners to the participants. Therefore the students become the real masters of the classroom.

(2) Establishing physical model effectively and improving students' modeling ability

In the process of solving physical problems, whether students can correctly carry out physical analysis is the key to solve the problem, but in the face of complex physical problems, students are often at a loss to correctly carry out physical analysis. The search and establishment of the original physical model are particularly important for the original physical problems. The virtual simulation software helps students understand and master the original physical model, and analyze complex physical problems.

(3) Dynamically rendering the physical data and deepening students' cognitive understanding

It is difficult for students analyzing the changes of physical parameters under the conditions of conditions. The virtual simulation software can dynamically present the experimental phenomena and collect the data in time. The changes of physical parameters are analyzed quantitatively to deepen the students' understanding, thus teachers can complete teaching tasks more efficiently.

(4) Simulating and presenting ideal experiment to improve students' thinking ability

Ideal experiment and scientific reasoning are important means for the development of physics. It is required to cultivate higher imagination ability and reasoning ability on university physics in emerging engineering. The cultivation of students' physical thinking ability is also the main goal of university physics teaching. The simulation software helps students understand the corresponding laws of physical movement, and improve their scientific literacy and thinking ability.

The Application Strategy of Virtual Simulation Software in University Physics Teaching

(1) Student-centred and student-autonomy

The virtual simulation is an assistant teaching tool of theory teaching. The students are the key for the application of virtual simulation software. The purpose of applying virtual simulation software in university physics teaching is to help students understand the law of motion, master physical knowledge and solve complex problems. We should adhere to the principle of student-centered in the application of virtual simulation experiment in university physics teaching. First of all, we should understand the students' cognition and mastery of the physical knowledge, as well as the puzzles and difficulties in the process of solving the problems. Then, we should select the corresponding exercise cases and virtual simulation experiments to help students overcome difficulties.

The aim of university physics classroom teaching is to cultivate students' ability to solve physical problems, thus teachers should actively interact with students. When it is appropriate, students can be invited to the platform to demonstrate and explain the virtual simulation experiment, then they can actively participate in the classroom activities and experience the operation process of virtual simulation experiment and the display process of experimental phenomena. Teachers can recommend some high-quality and easy-operation virtual simulation experiment platforms to students, so that students can independently carry out physical exploration after class, find out experimental rules, and solve related physical problems.

(2) Gradation, diversity and synthesis of university physics knowledge for virtual simulation

The teaching content of university physics is rich, but the teaching time of teachers is limited. The current situations are that knowledge is difficult and time is tight for university physics teaching, it is particularly important for teachers to carefully design the teaching contents in the

preparation stage. In the teaching design of university physics, teachers should first have a certain understanding of the knowledge of the students to be taught, understand the difficulties in the process of solving specific problems of students, adhere to the principle of typicality, select some representative examples and exercises, use virtual simulation experiment to show the experimental operation process and phenomenon of typical examples, which help students understand the concepts and physical laws, and master methods and strategies to solve problems to improve the efficiency of classroom teaching.

In university physics classroom teaching, teachers should pay attention to the level of selected examples and exercises, according to the degree of difficulty of teaching content, from easy to difficult, step by step to help students master and review the knowledge, improve the ability to solve physical problems. The virtual simulation experiment used in teaching should also have a certain level, from the display of basic concepts and physical laws to the display of physical experiment phenomena under complex conditions, step by step to add conditions from simple to complex, which help students understand the concept laws and solve physical problems.

Conclusion

Virtual simulation is widely used in practical teaching by teachers because of its own characteristics. With the background of the integration of information technology and curriculum, more and more teachers and education researchers are actively exploring the integration of new education technology into the teaching of university physics, which can expand teaching methods and improve teaching quality. In this paper, the application of virtual simulation software in university physics teaching is studied. Based on the research of university physics teaching and virtual simulation software, combined with modern education concept, modern learning theory and students' cognitive and psychological characteristics, this paper attempts to integrate virtual simulation software with university physics teaching, and puts forward the application significance and strategy of virtual simulation software in university physics teaching. In conclusion, the application of virtual simulation software in university physics teaching can enrich the teaching resources of university physics teaching, expand the teaching means of teachers, improve the teaching efficiency, help students analyze and solve complex physics problems efficiently, and deepen students' recognition and understanding on physics knowledge.

Acknowledgment

This research was financially supported by 2018 Higher Education Department of the Ministry of Education Industry-University Cooperation and Education Project (No. 201802153095), 2018 Guangdong Province Higher Education Teaching Reform Project, on "Application and Exploration of Internet Plus Blended Teaching in Emerging Engineering Experimental Courses" (No. 659), Guangdong Province Industry-University Cooperation and Education Project (No. PROJ994047199556014080), 2019 specialty construction project on "Electronic Information Engineering" of Guangzhou College of Technology and Business (Grants No.TS201902) , and 2017 Construction Project of Applied Talents Training Course of Guangzhou College of Technology and Business (No. CX20170515).

References

- [1] Li-Li Y . Virtual Simulation Teaching Platform Based on Sensing Technology[C]// 2015 Sixth International Conference on Intelligent Systems Design and Engineering Applications (ISDEA). IEEE, 2015.
- [2] Fang-Yong T , Yan Z , Jing-Xiang L I . Computer Network Experiment Teaching System Based on Virtual Simulation Software Technology[J]. Computer Era, 2011.

- [3] Ye Y , Wu M , Xu Y , et al. Reform and practice for photoelectric specialty experimental teaching based on virtual simulation experiment platform[C]// Conference on Education & Training in Optics & Photonics. 2017.
- [4] Jingnan Z , Liuzhong Z , University H E . Study on application of virtual simulation in experimental teaching[J]. *Experimental Technology and Management*, 2013, 46(6):2292-2297.
- [5] Li L X , Ding D K , Li J F . The Application Study on Virtual Lab InMicro-Control System of Experimental Teaching[J]. *Applied Mechanics and Materials*, 2011, 120:609-613.
- [6] Hochrainer M J . Real-Time Hybrid Testing: Challenges and Experiences from a Teaching Point of View[M]// *Topics in Modal Analysis & Testing, Volume 9*. 2019.