Explore the Effective Use of Multimedia Technology in College Physics Teaching

Shi Jian-hua, Liang hong

School of Science, Communication University of China Beijing 100024, China

Abstract

This paper aims to effective combination between college physics and multimedia to optimize the teaching procedure of physics as a serious basic course in college. Through combining multimedia technology with the teachers' subjective initiative, perfecting multimedia course system based on the network, multimedia simulation laboratory organic coupling with real experimenting, we discusses how the actual teaching use of multimedia technology, explore the application of the rules and characteristics of multimedia technology, we are able to develop the advantages of multimedia and explore its potential so that we make it better service in physics teaching and enhance teaching effect.

© 2012 Published by Elsevier Ltd. Selection and/or peer-review under responsibility of Hainan University.

Keywords: multimedia technology; college physics reform; teaching effect

1. Introduction

Physics is a natural science based on experiments. The knowledge, understanding and master of physics concept by students relies on the perception of physical phenomena. The content for teaching of university physics covers mechanical, thermal, electromagnetics, optics and modern physics with less relationship between them, and similar with that for high school physics curriculum, reducing students' interest. However, for traditional teaching of college physics, only certain physics experiments can be present to the students in the classroom, and the students can not access to dynamic and intuitive perceptual knowledge and clear physical pictures. Most students think university physics is difficult to learn. Although the multi-media teaching method has been applied, it is still insufficient. The usage and method needs to be improved, and the means need further improvement and exploration.

Effective application of multimedia technology in university physics teaching can change the form of information, integrating graph, text, sound and image on PC, improving the expressive force of the teaching content, so that the students can actively participate in multi-media activities via multi senses,
mastering the knowledge actively instead of passive acceptance. At the same time, it also provides a powerful tool for teaching and research, as well as reliable and technical support for smooth and efficient teaching. In addition to improvement of knowledge, application of multimedia can make the single straight teaching content intuitive, so as to inspire the enthusiasm of students, improving learning efficiency. Integrating graph, text, sound and images, the multimedia courseware can not only reproduce or simulate various physical experiments and phenomena, but also simulate the physical process, presenting physical laws more intuitively, so as to increase expression of the teaching content, mobilize students to participate in multi-media activities via multi senses, improve classroom atmosphere, attract the attention of students to better stimulate learning interest, while contribute to clarifying the physical ideas, processes and methods. Application of multimedia technology can provide students with vivid, clear, realistic emotional material in the classroom, so that students can perceive complete, clear and image physical phenomena which is difficult to observe or achieve, feel many scene which is impossible in traditional teaching in classroom, building physical model with initiative. Moreover, the students can understand physical concepts, laws and theorems more easily; at the same time, the teaching is easy and the efficiency is increased.

By effective application of multimedia courseware in university physics teaching, the writing and drawing amount of teachers on the blackboard will be reduced greatly. The teachers can spend more time for lectures, delivery more quality information in the classroom with same teaching hours compared with traditional means. Therefore, it is necessary to use multimedia courseware effectively in the university physics teaching, and significant to improve college physics teaching effectiveness and level.

2. Effective Usage of multimedia technology in University Physics Teaching

2.1 Effective Combination of Multimedia Technology and Teacher's Initiative

Most concepts and laws in common university physics textbooks are derived via abstract theories and complex mathematical formulas. For the students, it is very difficult to master and understand the physical concepts and laws via complex mathematical formulas in a short period. As a classroom teaching aid, the advantage of multimedia courseware in the physical classroom is dynamic simulation, which can simulate visual experiments via unique analog animation, creating good physical scenarios to stimulate students' interest. So the students can achieve distinct impression, grasp and understand physical concepts and laws quickly.

In practice, the multimedia courseware for university physics must be fine and simple, demonstrating critical contents. The multimedia should mainly solve important and difficult points for classroom teaching, explain and deal with physical theories, processes and phenomena which are difficult to clear via traditional methods and media.

Application of multimedia courseware in university physics to make up traditional teaching not only saves the time, meeting teaching requirements, but makes abstract physical content more visual and intuitive via combination of video and audio means. In addition to shorter teaching time and higher teaching density, the teaching efficiency and quality is greatly improved, so as to accommodate and promote combination of university students with their ability.

There are two sides to everything, including multimedia teaching as a new form of teaching means. The teachers must not weaken their dominance in the classroom just for using of multimedia courseware. To avoid using of multimedia lesson as another blackboard and teaching the students just via the video, the teachers should focus on guiding students to analyze physical phenomena and principles, inspire and coach students to think, deepening understanding of physical concepts, processes, laws and theorems, teaching students to analyze and solve problems.
2.2 Improving of Web-based Multimedia Courses

University physics covers mechanical, thermal and electromagnetic contents etc. Generally due to less class, the students’ questions can not be resolved in time, and difficult to review, weakening the enthusiasm of students to a certain extent. Qualified teachers can provide college physics multimedia course system, including complete teaching files, clear requirements and rich materials, covering course, submission and correction of homework, analysis of samples, simulation of exams and real-time Q&A etc.

Online University Physics Multimedia Paper Evaluation System is a new model of teaching management. This system provides the students with a set of university physics simulation exams for the students to simulate test on PCs and prepare for formal exams. Through the system, the students can test mastering of university physics by themselves in order to consolidate learning results. University physics examination mainly tests mastering of basic physics knowledge by the student, covering multiple choice, true-false, fill-in-blank, short answer, calculation and proofs. After the student submits the test, the scoring system gives the score immediately, so as to stimulate student’s motivation for learning. At the same time, the system must be able to collect and store student's number, name, profession, class, scores and other information, to provide raw data for analysis of the paper and mutual assessment between different courses, so as to provide the basis for teaching management, feedback of teaching information and improvement of the quality.

2.3 Combination of University Physics Multimedia Simulation Lab with Real Experiment

Physics experiment is the basis of physics, an integral part of physical education, promoting teaching of physical theories. Real experimental demonstration is an irreplaceable part of university physics teaching, playing a complementary role. Demonstration experiment is set to compensate the teaching content in class, which is mainly operated by teachers. A well-designed experimental demonstration will show the basic physical quantities in a simple form, helpful for students to establish a physical image of abstract concepts, contributing to understanding and mastering of the concept and laws, breaking through difficulties, broadening view of students, stimulating imagination, increasing interest of learning, and bringing up of students’ ability.

The simulation laboratory is an innovative model of physics experiment teaching, integrating lab equipment, teaching content, teachers’ guidance and thinking/operations of learners organically via PCs, forming a lab system to simulate virtual experimental environment. The system provides a powerful tool for physics experiment teaching, while overcoming the long-term class/time limitation of experimental teaching, extending the content concerning time and space, effectively improving the quality of preview, review and the experiment, comprehensively improving the actual ability, helpful for training of innovation and exploring spirit, so that the students can obtain systematical experimental theoretical techniques and complete skills.

Almost all physical process, phenomena and experiments can be reproduced vividly via multimedia means. Thus some teachers tend to use multimedia courseware instead of the real demonstration experiments in the class, completely dependent on the multimedia courseware. This teaching idea and method shall be corrected. The teachers must carry out real demonstration experiment in the classroom for students instead of multimedia tools as possible to demonstrate physical processes and phenomena. On one hand, this will train students to observe and analyze the real physical processes and phenomena, guide students to master the physical nature, understand and grasp the real nature; on the other hand, it will train the students to respect scientific idea and spirit of exploring for truth.
3. Conclusion

High-quality university physics multimedia courseware is the best means to provide a variety of audio-visual images, which can show a lot of physical processes and phenomena vividly which is difficult by common means. Especially, it combines the advantages of multimedia courseware for university physics and that of traditional teaching of physics, greatly improving teaching results of college physics. Therefore, it is very important to strengthen and improve research of university physical multimedia technology, focusing and strengthening combination of advantages of multimedia technology and traditional teaching, so as to improve the quality of university physics teaching.

Reference

[1] Zhang Xiao-zhen. Curriculum Reform and computer aided instruction [J]. Curriculum, teaching materials, teaching methods, 2002

[2] Li Hui-zhang. Physical design and development of multimedia courseware [J]. Tianjin Vocational Technical Teachers College, 2004, 14 (2)

[3] Chen Jian, Qian Wei-ying, Zhu Chun. The implementation of modern teaching physics program profiles [J]. Wuxi Institute of Education, 2004, 24 (2)

[4] Xia Hong-wei. Advantages of Using Multimedia Technology in Physics Teaching [J]. Journal of Inner Mongolia University for Nationalities, 2003, 8(4)