

Research on College Physics Teaching Based on Online and Offline Mixed Mode

Xiaomei Wu*, Yanxiang Gong

School of Physics and Electronic Engineering, Taishan University, Tai'an, Shandong, 271000, China
*Corresponding author: wuxiaomei-71@163.com

Abstract: The characteristics of physics show its superior ability to educate people. However, for a long time, there are some problems in college physics teaching in China, such as backward teaching ideas, outdated teaching methods and single teaching mode, which lead to some students' low interest in physics learning. The mixed teaching mode is the product of the development of the information age. The mixed teaching mode is used to meet the individual needs of students for learning. The teaching method follows the student-centered and teacher-led method, making students the masters of learning. Based on this, this paper summarizes the meaning and characteristics of mixed teaching, focuses on exploring the application of online and offline mixed mode in college physics teaching, and summarizes the application effects of many teaching methods from four aspects: preview before class, study in class, and review after class and subject evaluation.

Keywords: Online teaching, Offline teaching, Physics teaching

1. Introduction

College physics is the core course of natural science and engineering technology, which can make students understand rich physical knowledge and cultivate students' scientific thinking and exploration ability. The characteristics of physics show its superior ability to educate people. However, for a long time, there are some problems in college physics teaching in China, such as backward teaching ideas, outdated teaching methods and single teaching mode, which lead to some students' low interest in physics learning [1-2].

The online and offline mixed teaching mode in the network environment is a new type of online teaching mode, which changes the single teaching mode of "teaching first" and "learning later" in the traditional classroom. With the help of mixed teaching mode, the advantages of online and offline channels can be integrated to ensure the role of "organizer" as well as "subject".

2. Overview of mixed teaching

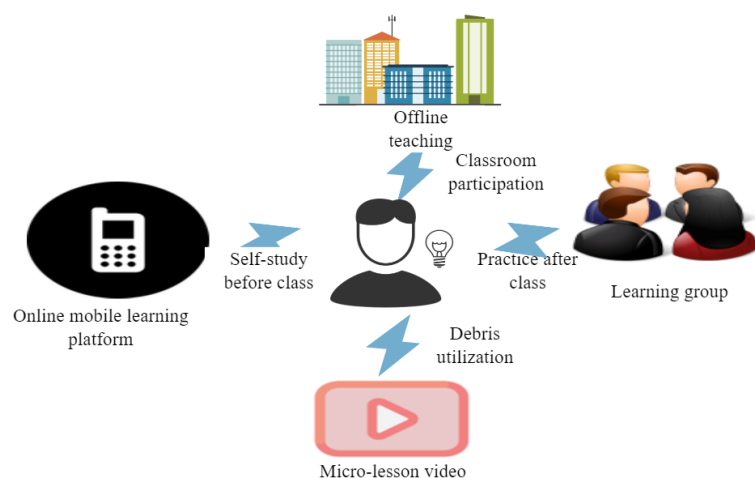


Figure 1: Online teaching mode

Online teaching refers to a teaching method based on the Internet, in which students can access teaching resources including pictures, videos, audio, texts, PPT and other forms through online interaction between teachers and students or self-browsing, so as to complete the learning process. The online teaching mode is shown in Figure 1.

Offline teaching refers to the traditional teaching method, in which teachers give students face-to-face knowledge at designated time and teaching place to complete the learning process. Mixed teaching is by no means a mechanical combination of online teaching and offline teaching. Instead, based on the characteristics of the course, the teaching content is divided and the teaching links and teaching methods are designed, so as to make full use of the respective advantages of online and offline teaching and realize the organic integration of the two.

The mixed teaching is the product of the development of the information age. The mixed teaching is used to meet the individual needs of students for learning. The teaching method follows the student-centered and teacher-led method, making students the masters of learning. Interaction can not only cultivate students' thinking ability and language ability, but also fully mobilize students' initiative and enthusiasm for college physics experiment learning. Using the platform to push relevant resources, students can learn and discuss independently, and teachers can give targeted explanations in offline classes to sublimate teaching content and solve students' learning confusion [3].

3. Necessity of mixed teaching in college physics

3.1 Raise the teaching standard

The co-construction and sharing of online resources can not only shorten the cycle of resource construction, but also realize the effective integration and utilization of teaching resources, which is the expected effect that teachers' independent construction is difficult to achieve. For teachers, on the one hand, the realization of teaching intelligence is conducive to the sharing of teaching resources among teachers and the stimulation of teachers' enthusiasm for teaching reform; On the other hand, it realizes the curriculum data, which is conducive to the accumulation of statistical data of students' learning, and provides scientific statistical data for teachers to optimize teaching programs. College physics involves knowledge in many fields, such as mechanics, kinematics, heat and optics, and is closely related to other disciplines. For students, especially those who are not majoring in physics, college physics is a very difficult course, with many contents, obscure, logical and practical characteristics. Teachers integrate, comb and optimize online resources and then provide them to students [4]; Students can study and expand selectively according to their own situation, and can also summarize and feedback online materials. In face-to-face teaching, teachers can reasonably arrange teaching content and progress according to students' online feedback results, and students can make better use of the classroom with questions and basic knowledge. In this way, theoretical knowledge and practical operation can be integrated, and students' innovative thinking and independent thinking ability can be effectively cultivated, thus creating a positive interaction between experiment and theory. Combine the experimental results and the experimental process better to make students interested in physical experiments, so that teachers can better carry out the teaching of physical experiments. The diversification of teaching models can improve students' initiative in learning physical experiments, better cultivate students' ability to use hands and brains in physical experiments, and ultimately achieve the goal of improving the teaching effect of physical experiments.

3.2 Arouse students' enthusiasm

The traditional teaching of college physics in China pays more attention to the teacher-centered, ignoring the core idea of "student-centered" teaching. Teachers make corresponding preparations before class and "recite" things directly in class. Under such a teaching mode, the teaching classroom atmosphere is always poor, students' attention is obviously not focused, and they have no positive attitude to ask questions about problems encountered [5-6]. College physics teachers use the online and offline hybrid physics (experiment) teaching mode to carry out physics teaching for students, and pay attention to the cultivation of students' physical practice ability and operation level, pay attention to the authenticity of students' physical experiments in the operation steps, and constantly cultivate students' practical ability and operation level, so that students can easily, quickly and effectively learn and master physical knowledge and skills. How to effectively combine online and offline teaching, let students effectively grasp the course content and improve the teaching quality is a problem that needs to be solved

at present. In the new era, in order to meet the needs of different majors for talent cultivation, college physics teaching has been constantly explored, and the syllabus and teaching plan suitable for professional development have been developed for each specialty, and different teaching materials have been selected.

The mixed teaching helps to strengthen the control of the teaching process, evaluate the students' ability to master knowledge in real time, and both students and teachers can accurately understand the learning progress and learning effect. Let students listen to lectures with basic knowledge and questions, which improves the pertinence and effectiveness of the learning process and makes classroom teaching more efficient. Mixed teaching is convenient for real-time evaluation of students' actual mastery of knowledge, and both teachers and students can accurately include the actual learning progress and effect. The richness of curriculum content can also fully mobilize students' interest in learning and promote the healthy development of learners' individualization. The online network resources are rich, and learners can understand the frontier development knowledge in the field of physics in a timely manner, instead of just staying in textbooks, thus broadening their horizons.

4. Design of college physics teaching mode based on mixed teaching

Online teaching is carried out through three links. Before class, it is necessary to upload teaching resources and arrange learning tasks in advance. In class, effectively use the online platform for teaching; it is difficult to correct homework, analyze grades and upload recording and broadcasting knowledge after class. After class, the teaching is conducted in strict accordance with the teaching plan and progress, combined with the contents of the syllabus, and comprehensive knowledge points are taught in class. In this way, students' learning ability is improved, teaching requirements are better met, and training objectives are achieved. The design of college physics teaching mode based on online and offline mixed mode is shown in Figure 2:

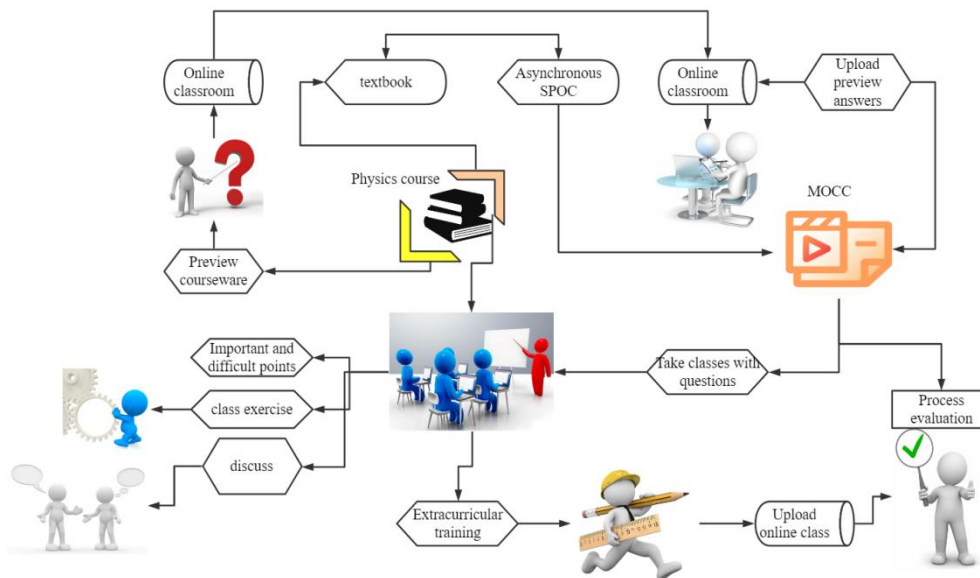


Figure 2: College physics teaching mode based mixed teaching

4.1 Online autonomous learning

Due to the limited teaching time of traditional physical experiments, teachers occupy most of the time in teaching students basic physical knowledge and skills [7]. Online learning content should be clearly divided between online and offline teaching content by professional curriculum development team or curriculum construction experts on the basis of full analysis of the curriculum system and content of this major. Combining the experimental results with the experimental process better can make students interested in physics experiments, so that teachers can better carry out the teaching of physics experiments.

The teaching behavior in the class has an established teaching plan. According to the typesetting content and class arrangement of the geography information subject, the teaching content of each class is

determined, and the learning resources uploaded before the class are also based on this.

Teachers collect and integrate some videos, documents, cases and other learning materials related to the teaching content before class, post them on the online platform, and ask questions to lead to the knowledge points of the new lesson. Teachers adjust the teaching content in time by counting and summarizing students' feedback, so as to arrange classroom teaching reasonably.

4.2 Offline classroom learning

In practice teaching, we should closely combine with students' majors and focus on the training objectives of students' majors, so as to highlight the training of professional skills in practice [8]. The role of online teaching is slightly weak, but high-quality network resources can be used flexibly in the classroom to improve the efficiency of classroom teaching and reflect the role of online teaching in the classroom. For example, teachers can use the sign-in software when they call the roll in class to reduce the time occupied by the roll call in class in the past.

The live teaching in the classroom can also be recorded and broadcast, so that students can play it back after class. For example, if they can't listen to the teacher's live class on time, they can arrange their own study after class. Or, the knowledge points that are not fully mastered in the classroom can be studied again by replaying the course [9]. In this way, we can cultivate students' scientific literacy such as expression ability, organization ability, role transformation ability and autonomous learning, and at the same time, we can also increase the assessment methods of usual grades and establish a more comprehensive and reasonable assessment system of usual grades.

4.3 Consolidation after class

Online teaching is not limited by space and time, which provides favorable conditions for teachers to detect teaching results in time. After the classroom teaching, teachers can set quizzes on the online teaching platform, and according to the students' test results.

After the preview, students are required to write a preview report, and before the class starts, students are asked about the preview in the form of spot checks to prevent students from copying the original content of the textbook, which not only reduces the preview effect of students, but also has a certain impact on the physics experiment teaching of teachers [10]. Deepen students' mastery and application of knowledge. At this time, the real classroom is more of a place for interaction between teachers and students. In online learning activities before and after class, teachers can provide immediate feedback on students' learning with the help of advanced teaching equipment and Internet platform.

4.4 Effect evaluation

Teaching evaluation is a very important link in teaching activities, and its evaluation method reflects the orientation of the whole teaching link. In the online cooperation task, students are in charge of part of the content in groups, and make full use of network data to further extend their learning and actively explore ways to deal with problems, so as to form the best group scheme. After that, offline teaching can enrich the classroom teaching form, and realize in-depth discussion of the topic through group defense.

The improved course evaluation method by adopting the mixed teaching mode should give consideration to both personalized assessment and universal assessment. Teaching evaluation adopts comprehensive evaluation which takes into account the effectiveness of online learning, practical ability, classroom performance and final exam results, which is in line with the current mainstream teaching reform direction.

5. Conclusions

College physics involves knowledge in many fields, such as mechanics, kinematics, heat and optics, and is closely related to other disciplines. For students, especially those who are not majoring in physics, college physics is a very difficult course, with many contents, obscure, logical and practical characteristics. The corresponding teaching mode is also coming out. The mixed teaching in the network environment is a new type of online teaching mode, which changes the single teaching mode of "teaching first" and "learning later" in the traditional classroom. Diversified learning and teaching channels make the integrity and cooperation of college physics teaching gradually show value, thus ensuring the

learning efficiency in multiple stages, optimizing students' professional ability, and helping students to study in other disciplines and enter the society.

References

- [1] Li Lei, Tao Ping, Wu Qingzhou, et al. Exploration of college physics teaching based on online and offline mixed teaching-taking Zijin College of Nanjing University of Science and Technology as an example [J]. *Physics Bulletin*, 2022(10):5.
- [2] Li Xiaofang, Zhang Xuling, Jia Dongmei, et al. Teaching design of college physics based on mixed teaching mode-taking the teaching design of "induced electromotive force" as an example [J]. *Physics Bulletin*, 2021.
- [3] Shi Ying, Liu Yujie. Research on promoting the reform of online and offline mixed university physics teaching with curriculum ideological and political construction [J]. *Physics Bulletin*, 2022 (S01):3.
- [4] Li S, Li R, Lou Y, et al. Research and Development of Teaching System of 3D Cardiac Anatomy Based on Virtual Reality[C]// *International Conference on Computer Science and Education*. 2020.
- [5] Wei W, Fang W, Wei J. Research on the Innovation of College Basketball Information Teaching Mode under the Background of Internet[J]. *Journal of Physics Conference Series*, 2021, 1744(4):042226.
- [6] Qi Yunping, Nan Xianghong, Shi Yulong, et al. Sub-wavelength all-optical diode with single slit and multiple grooves based on SPPs-CDEW mixed mode [J]. *Acta Physica Sinica*, 2017, 66(11):12.
- [7] Fan Yuxin, Zhang Ming, Xie Jingmei, et al. Exploring the ideological and political construction and practice of medical imaging course based on online and offline mixed teaching [J]. *Journal of Practical Radiology*, 2022(003):038.
- [8] Cheng Wangkai, Li Nan. Exploration and practice of online and offline mixed teaching mode based on cloud class in higher vocational microbiology teaching [J]. *Microbiology Bulletin*, 2018, 45(4):7.
- [9] Bai Dongmei. Research on the mode reform of online and offline interactive feedback in medical nursing teaching based on SPOC and flip classroom [J]. *Nursing Research*, 2019, 33(16):4.
- [10] Xie Dong, Fan Daihe, Wang Hui. Teaching design of "College Physics" based on mixed teaching mode-taking "vibration" as an example [J]. *Physics and Engineering*, 2022, 32(5):5.