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Application of online and offline hybrid teaching in college physics experiment

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Abstract: With the development and progress of network technology, the teaching mode of college physics experiment is also increasing, which speeds up the pace of experimental teaching reform. After analyzing the feasibility of online and offline hybrid teaching, combined with the characteristics of college physics experiment teaching, the online and offline hybrid teaching mode is applied to college physics experiment. The experience of online experimental teaching is summarized, and the online and offline mixed teaching mode is reflected and prospected. The mixed teaching is gradually and widely applied to the network teaching in colleges and universities, which can effectively make up for the shortcomings of the current traditional classroom teaching in colleges and universities, and promote the reform of the teaching mode in local colleges and universities.

Keywords: Online and offline; Mixed teaching; College physics experiment; Teaching model.

1. Introduction

College physics experiment is an important basic experimental course for students majoring in science and engineering in colleges and universities. It is the first practical course to enter the university. It helps to cultivate students' practical ability and rigorous scientific research style, and makes full preparation for the research and practice of future professional courses. With the continuous progress of information technology, and the impact of the COVID-19 that has not been completely eliminated in recent years, traditional experimental teaching forms and modern Internet technology are rapidly integrating, educational teaching methods are constantly updated in this process, and teaching reform is also constantly deepening. On May 26, 2022, the Ministry of Education pointed out in the Notice of the Leading Group of the Ministry of Education to Respond to the COVID-19 on Printing and Distributing, Deploying and Overall Planning the Epidemic Prevention and Control, Education and Teaching in the Current Education System that the online and offline teaching transformation should be done in a safe and orderly manner. Affected by the 2020 epidemic, Jilin Institute of Architecture and Technology has used some online teaching platforms to carry out online teaching practice for half a year, summarizing the online teaching effect and problems in online teaching. Guo Liping applied blended teaching to senior high school English teaching, enriched English learning resources, developed students' learning interests, and broadened students' horizons.

Online and offline mixed education has gradually become a new form of education that is more in line with students' cognitive rules. On this basis, taking the application research of online and offline teaching in college physics experiments as an example, this paper expounds the practice and reflection of online and offline hybrid teaching from three aspects: pre-class preview, in-class teaching and after-class summary. The teaching design is student-centered and adopts a variety of flexible teaching methods. The mixed teaching design is carried out from the whole process of pre-class, post-class and classroom, making full use of the interactive function to understand students' knowledge in time, and putting forward corresponding solutions to common problems in mixed teaching for reference.

2. Feasibility of online and offline mixed teaching

2.1. The traditional experimental model has disadvantages

The traditional offline physics experiment course is basically based on the teacher's explanation. Many experimental teachings is that students listen to the teacher's explanation. The teacher first operates by himself, and then the students do the experiment. Some students didn't know the experiment content in advance before class, and all depended on the teacher's explanation in the experiment class, and all depended on the teacher, so their ability of independent learning was not strong. During the experiment, such problems often occur. The teacher has explained the solution to a problem many times, and sometimes even one-on-one professors, the experimental results are still not so good. For example, in the spectrometer experiment, it is necessary to make the telescope axis and platform perpendicular to the central rotating axis. If the students have not prepared in advance, they just rely on listening to the teacher in the experiment class. It is not easy to understand the leveling idea of "half adjustment method". Without mastering this method, it is difficult to successfully complete the following spectrometer experiment. Not only that, offline traditional experimental teaching is constrained by time and space, some experimental instruments and equipment are expensive and small in quantity, and the laboratories in colleges and universities lack teaching resources. Students can only go to fixed laboratories to do experiments in batches, and one student can only participate in one experiment. There are often multiple experimental teaching courses that use one laboratory together, increasing the burden of teaching teachers and management teachers.

2.2. Online education has broad prospects

As the COVID-19 has not been completely eliminated, students and teachers in some areas are isolated and cannot return to school. Under this circumstance, experimental teaching is difficult to carry out. Therefore, the development of online and offline hybrid

teaching is crucial, and the number of online education users is gradually increasing. The number of online education users in 2016 was 104 million, and the number of online users in 2020 was 351 million, an increase of 247 million; The number of online users will be 446 million in 2021. It shows that more and more people are involved in online education, which implies that the market capacity of online and offline hybrid teaching is strong and has broad prospects for development.

2.3. Online and offline mixed teaching is conducive to students' development

Compared with traditional teaching, online and offline hybrid teaching has stimulated students' interest in learning, mobilized their enthusiasm for learning, and changed from the traditional "educator-centered" to "learner-centered". Mixed teaching embodies the educational idea of "people-oriented". Students are the main body of learning. "people-oriented" requires students to be the starting point and foothold of educational activities, fully respect, care for and trust students, properly guide and care for students, return the classroom to students, and let students play the main role of education. Mixed teaching promotes students' all-round development. While students learn scientific and cultural knowledge, they cultivate their innovative spirit and practical ability; It also promotes the development of students' personality. Each student has different cognitive characteristics, different learning needs and different interests. Therefore, online and offline teaching takes into account students' personality differences and fully develops students' personality.

2.4. Online and offline mixed teaching reduces teachers' burden

Under the background of quality education, teachers have changed from the imparter of knowledge to the guide of students' learning and the promoter of students' development; Teachers change from faithful executors of courses to builders and developers of courses; Teachers have changed from "teachers" to researchers and practitioners of reflection in education and teaching. With online teaching, students have more opportunities to learn independently, and teachers' teaching burden is relatively reduced. In previous college physics experiments, the teacher may have to explain a question many times. Now, in addition to online learning resources, the video of the teacher's online teaching can be played back. Even if the students don't understand and have doubts over and over again, they can also answer the doubts by watching the video playback after class, which greatly reduces the teacher's teaching task.

3. Practice in College Physics Experiment

3.1. Pre-class preview

In traditional experimental teaching, students can only preview the physical experiment textbook to understand the purpose, principle, instruments and steps of the experiment. There are only words and pictures, no physical experimental instruments, and cannot be operated by hand. The understanding is not deep, and the preview effect is poor. If there is an online experiment remote control system, students can not only read the experiment books in advance, but also actually operate the experimental instruments remotely, fill in the experiment preview report, find out the key and difficult points in the operation of the experiment, and improve the experiment effect.

3.2. Teaching in class

The traditional teaching method is a single teaching method of "teacher-centered and teaching content-centered", which strengthens the continuous learning in the whole process through multiple delivery channels, that is, traditional offline teaching. Offline teaching is dominated by teachers, students are passively accepted, and lack learning autonomy and innovation ability, which is not conducive to the cultivation of students' comprehensive quality and innovation ability. With the rise of online learning platform and the deepening of information-based teaching, hybrid experimental teaching combines the advantages of traditional experimental teaching with the online experimental remote-control system, which can not only play the role of teachers' guidance, but also stimulate students' initiative, enthusiasm and innovation in learning. The online and offline mixed experimental teaching changes the traditional problems of students' low learning initiative, insufficient cognition and participation, expands the teaching time and space, and highlights the key and difficult points of the experiment. On this basis, classroom teaching focuses on improving "combing knowledge points and cultivating the ability of analysis and judgment". The offline classroom teaching mode closely pays attention to the deepening of the course teaching content, and realizes the internal connection with online expansion and extracurricular scientific research innovation practice.

3.3. Summary after class

The traditional offline experimental teaching is to process and analyze the experimental data after class, fill in and submit the paper experimental report. Online and offline hybrid teaching can record and process experimental data on the remote-control system, submit experimental reports online, and teachers can review and grade online. In the information age, every educator needs to use modern information technology to change the traditional teaching methods, break through the limitations of the original teaching methods, and explore and summarize new teaching methods. Through the mixed teaching mode, students and teachers have more learning methods and better learning results, which also reflects the fundamental purpose of education and teaching reform. In the future, school reform needs to focus on the integration of online education and offline education, accumulate and develop high-quality educational resources such as online teaching, further promote online and offline hybrid teaching based on "digital classroom resources", make full use of the advantages of online teaching, and make online classes an important channel for knowledge transfer.

4. Reflection and prospect of online and offline mixed teaching mode

4.1. Reflection on online and offline mixed teaching mode

In order to solve the problems existing in offline teaching experiments, improve the quality of students' classes, and make full use of the advantages of online experimental teaching, a hybrid online and offline experimental teaching mode was explored. The cultivation of practical ability is the core of college physics experiment teaching. At the current

level of educational technology, online and offline hybrid teaching is a good supplement to the traditional physics experiment teaching, but it cannot completely replace the traditional physics experiment teaching. This kind of online and offline hybrid experimental teaching is to solve the problems existing in traditional physics experiments. Although this new teaching mode cannot be used to by teachers and students, it is the most convenient and effective teaching method that combines the characteristics of college physics experiment teaching to give full play to the maximum benefits of teaching.

Hybrid experimental teaching not only attaches importance to the evaluation of the experimental report, but also attaches importance to the operation in the experimental process, increases the proportion of experimental operation in the experimental assessment, helps students improve their practical ability and other comprehensive abilities, encourages students to learn independently online, and breaks the "high scores and low abilities" status quo among students. A hybrid experimental teaching mode combining online autonomous learning and offline guided teaching has been formed. Students use the experimental remote-control system teaching platform to operate experiments online and remotely, plus the guidance of online and offline traditional experimental teaching, and the hybrid classroom teaching mode combining the two, to achieve full preview before class, independent practice in class, and convenient submission of reports after class, it effectively enhances students' experimental skills and problem-solving ability.

4.2. Prospect of college physics experiment teaching mode

With the progress of science and technology, the university physics laboratory is constantly improving and upgrading, and the experimental instruments are also constantly updating and iterating. In the Internet era, the information dissemination speed is fast and the scope is wide, making more educators make contributions to the experimental teaching reform and laboratory construction. At present, online teaching has become an important way of education for primary and secondary school students, especially in the case that the epidemic has not been completely eliminated, online experimental teaching is gradually popularized in colleges and universities, and students have become the main body of independent learning, fully reflecting the application of high-tech information in education. Online education is the trend of the reform of the experimental teaching industry in the future. Under the background of quality education, online and offline mixed teaching mode can not only better communicate with teachers and students, but also pay attention to students' learning conditions at all times. Students can conduct experiments anytime and anywhere, effectively improving the experimental effect. The use of online experimental teaching system helps students' innovative spirit and practical ability on the one hand, and improves teachers' professional ethics on the other hand. "Internet plus education" is a new teaching method integrating network science and technology with education, and a modern reform is being carried out in the teaching field [8-9]. The practice of online and offline hybrid experimental teaching helps to promote the development of college physics experimental teaching and promote the comprehensive development of students.

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