

Experimental Teaching Design of Electric Circuit and Electrical Engineering Based on the Hybrid Teaching of Three-dimensional Learning Space

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ABSTRACT. *In modern educational concept, emphasis is placed on the principal position of students in learning. In the process of teaching, teachers take the lead and guide students to conduct independent learning and research-based learning, which can further stimulate students' enthusiasm for learning and is conducive to cultivating students' innovative consciousness. Especially in the process of cultivating students' engineering practice ability and innovative thinking ability, it is necessary to change the teaching concept in time, give students the autonomy of experiment, let students study and experiment independently. Based on this, this paper aims at the application of 3d learning space hybrid teaching mode in the teaching design of circuit and electrical experiment, hoping to provide valuable reference for peers.*

KEYWORDS: *Three-dimensional learning space, Hybrid teaching, Electrical circuits and electricians, The experimental teaching*

1. Introduction

In modern teaching activities, network and personalized learning needs have become a focus in the field of education. For this reason, we need to not only dare to reform the teaching practice, but also ensure the completion rate of online courses. Only in this way can information technology be effectively integrated into the high-quality personnel training system. At the same time, information technology can also be used to train students' practical ability.

2. The Advantages of Three-Dimensional Learning Space Hybrid Teaching

2.1 Effectively Improve Students' Cognitive Level

Bloom, an educational psychologist, classifies educational goals. He believes that people's cognitive level can be divided into six levels: memory, understanding, application, analysis, evaluation and creation. In the divided levels, the conventional learning behaviors of "listening, seeing, speaking and doing" can be used to memorize, understand and apply the knowledge content. And in the two levels of evaluation and creation, its main purpose is to realize the connection between various knowledge, and to complete knowledge transfer by summarizing the purpose of knowledge. In this way, learning efficiency and depth can be effectively improved, and effective methods can be found in time to solve more complex problems. In short, in the process of hybrid teaching, if we simply provide students with corresponding video resources and lack of specific interactive links, it is easy to cause that the learning depth can only be kept in the first three levels of cognitive level. Therefore, in order to effectively improve the cognitive level of students, we need to cultivate students' ability to analyze and identify problems under the guidance of teachers so that students can be active. Actively find out, and through in-depth exploration of the problem, conduct in-depth evaluation and Reflection on its problems. The hybrid teaching model of 3d learning space can make use of online micro-class video to let students have a preliminary understanding of knowledge, and then combine with relevant tasks pushed by teachers to ask students to repeatedly apply and analyze knowledge. Then through the classroom teaching time, interactive discussion with students. Through this learning mode, students can consolidate and recognize the knowledge they have learned, and make logical reasoning for problems in a comprehensive way, so as to develop effective strategies for solving problems and enhance students' innovation ability.

2.2 Realize the Transformation from Knowledge-Oriented Application Ability and Innovation Ability

With the continuous development of network information technology, the speed of knowledge update will be faster and faster. Especially for students who have not yet formed a scientific learning method, they will obtain knowledge information in a fragmented way. The surface involves a wide range of knowledge, but in practice it is difficult to start. Therefore, it is necessary to correct the current students' learning behavior in a timely manner and guide them to change from knowledge-oriented application ability and innovation ability. The traditional online teaching mode mainly USES video, pictures, language narration and other methods to explain knowledge. This teaching method can enable students to have the ability to solve common problems. However, the current speed of knowledge update is getting faster and faster. In the process of practical application of knowledge, we need to be able to relate all kinds of knowledge with innovative thinking and find effective ways to solve problems. In short, students are required to have a comprehensive knowledge and ability system. Especially in the process of teaching science and engineering knowledge, because the related technology changes faster, we can only solve each new problem by correcting and adjusting the method in real time.

2.3 Promote Students' Innovation through Personalized Learning

Innovative thinking is a requirement of quality education, from a certain level of analysis, the nature of innovation and personality has a very close relationship. The unified standard in traditional education can effectively pass on the knowledge system, but it is very difficult to train students' divergent thinking. Therefore, in the process of carrying out the hybrid teaching mode, it is necessary to build an interactive, argumentative and investigative learning environment between online teaching and classroom. Only in this way can students better meet the needs of personalized learning, further stimulate students' interest in learning. It is beneficial to the expansion of students' way of thinking, to construct the knowledge structure in the right way of questioning, and to realize the cultivation of students' innovative consciousness.

3. Hybrid Teaching Design Method Based on 3d Learning Space

3.1 Design a Reasonable Curriculum Structure

The organization structure of online course teaching resources needs teaching operation as the center, and based on this to formulate specific teaching implementation plans. The hybrid teaching of 3d learning space mainly relies on the information-based teaching technology and utilizes the online open course platform, smart classroom and mobile learning interactive software in its technology to complete the teaching.

In the teaching process of electrical experiment course, the classroom is reversed and students' status is the main body. Using the "online preview + offline operation" hybrid experimental teaching method, let students finish watching and learning the experimental video and other learning resources in their spare time before class, and put forward specific problems and requirements for students in the experimental preview link, trigger students' thinking, and enhance students' initiative and autonomy. When students enter the laboratory, they don't need a tutor to teach them. They can complete the on-site experiment operation independently. When they encounter faults on the way, they can diagnose and eliminate them by themselves. If they can't solve the problems themselves, they can consult the tutor again. The flow chart of hybrid experimental teaching is as follows:

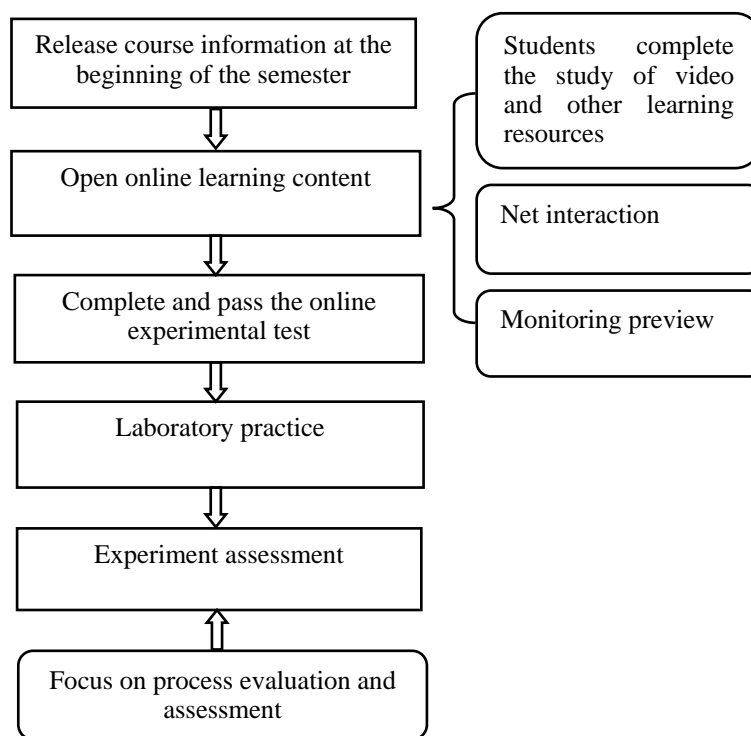


Fig.1 Schematic Diagram of Mixed Experimental Teaching Process

Through this kind of teaching mode, the video can provide students with independent learning, and according to the teaching module curriculum knowledge for students to the main line at the same time, also can provide other teaching resources for students, for students free to watch the study teacher needs to be based on the teaching content, for students to design the corresponding interactive tasks, make the whole teaching activities can include drawing examples of question and answer choice to judge inferred content diversity.

3.2 Effectively Implement the Teaching Operation Plan

Three-dimensional space hybrid learning teaching mode, its main purpose is through optimizing experiment teaching contents, “the online preview” and “offline” operation, planning the experimental teaching evaluation method three aspects put forward the corresponding experimental teaching reform measures to really improve the students' practical ability and innovative thinking ability, meet the social demand for high-level personnel. Make good use of the interactive features of mobile terminals, assign learning tasks for students in advance, and assign on-site tasks or supplement and improve tasks in face-to-face classroom teaching. At the same time, the results of the class discussion can also be recorded in the mobile terminal, so that students can replay the results of the class discussion after class. The operation of the hybrid teaching model of three-dimensional learning space mainly involves students' learning process, teachers' progress and other aspects. At the same time, the results of the class discussion can also be recorded in the mobile terminal, so that students can replay the results of the class discussion after class. The operation of the hybrid teaching model of three-dimensional learning space mainly involves students' learning process, teachers' progress and other aspects.

3.3 Construct Large Class for Face-to-Face Discussion + Small Virtual Class for Mobile Terminal

In modern teaching philosophy, emphasis is placed on highlighting students' learning subjects. Therefore, based on the open course resources, it is possible to complete the real-time interaction between teachers and students, students and students, and promote students' in-depth learning by constructing a face-to-face discussion class and a mobile terminal virtual class. Centering on the educational principle of “leading learning in class --

helping students in class -- delaying learning in class". The teacher can make the teaching tasks into videos according to the chapters and connect the knowledge contents through the way of textual knowledge asking. In addition, according to the arrangement of learning objectives, preparation problems, conceptual problems, extraction method problems, extended application problems, so that students can through the way of unit mind map to report and comment. The teacher used the platform data statistics to analyze the running process of the virtual classroom, and obtained corresponding feedback according to the completion rate of learning tasks, test scores, and video playback rate.

In the production of online teaching video, it relies on 72 class hours of Electrotechnics I, 56 class hours of Electrotechnics II and 48 class hours of Electrotechnics III. In addition, the experimental items include: superposition theorem and Davin's theorem, RL Series circuit and the improvement of its power factor, three-phase AC circuit, inching and forward and reverse control of three-phase asynchronous motor, single tube voltage amplification circuit, DC stabilized power supply, counting, decoding and display circuit, rectangular pulse response of RC circuit, integrated operational amplifier and its application, each experimental item The class hours of are 2.

4. Implement the Teaching Content and the Necessary Conditions of 3d Learning Space

In the three-dimensional space hybrid learning teaching mode, need to meet the following conditions: (1) has issued a series of micro teaching resources micro class platform. (2) the wisdom of the access network classroom and associated hardware equipment, equipped with interactive mobile APP for its teaching. (3) have rich experience in teaching and can effectively control the excellent teachers classroom rhythm.

5. The Expected Effect Analysis of the Hybrid Teaching of Three-Dimensional Learning Space in the Course "Circuit and Electrical Experiment"

In essence, teaching is a process of teaching and learning, which needs the tacit cooperation between teachers and students. The quality of teaching effect mainly depends on whether teachers can refine professional knowledge into the most simple and clear language and pass it on to students. I hope that through the construction of three-dimensional learning space hybrid teaching mode, to provide students with a "good interaction, high participation rate" learning atmosphere, and by the recognition and acceptance of students, can actively participate in the practice.

6. Conclusion

In a word, by building a three-dimensional learning hybrid teaching model of the space, can help the teacher to build autonomous learning for the students of knowledge architecture based on feedback information in the learning process, teachers can adjust the teaching content, and according to the actual learning to learning tasks through effective guidance, let the students to carry out deep learning, make a further improve students' innovative thinking

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