

# Exploration and Practice of Online and Offline Mixed Teaching in Functional Experiment Teaching

Xiulan Yang

Department of Pharmacology, Basic Medical School of Yangtze University, Jingzhou, Hubei Province, China

## Abstract

During the novel coronavirus pneumonia epidemic prevention and control period, in order to stop the epidemic spreading to the campus and ensure the safety of teachers and students, the Ministry of education proposed a new educational measure of "stopping classes and not stopping teaching, stopping classes and not stopping learning". After the epidemic, how to integrate the online classroom with the real offline classroom has become a topic of concern for many teachers. In this paper, based on the characteristics of medical functional experiment course and the online open course learning platform, combined with the medical virtual simulation experiment teaching platform, we discussed how to carry out online and offline Hybrid Teaching in medical functional experiment course, so as to stimulate students' enthusiasm in learning functional experiment course and improve the teaching effect of experimental course, and to provide reference for teaching research in the post epidemic era.

## Keywords

Functional experiment; Online and offline; Mixed teaching; The teaching reform.

## 1. Introduction

At the beginning of the spring of 2020, a sudden outbreak of New Coronavirus pneumonia broke out in the whole country and around the world. In order to effectively control the epidemic, the Ministry of Education issued the "guidance on online teaching organization and management in the period of epidemic prevention and control" in February 4, 2020 [1], in order to guarantee the online teaching of colleges and universities during the epidemic prevention and control period. To achieve "stopping classes and not stopping teaching, stopping classes and not stopping learning". In the face of adversity, this unprecedented nationwide promotion of online teaching has made China's online education fully popularized and rapidly developed in a short time, prompting teachers to conduct in-depth exploration, practice and thinking on online teaching, so as to ensure the teaching progress and teaching quality during the epidemic prevention and control period [2-4].

Medical functional experiment is an important experimental course in the basic medical education stage of medical colleges and universities. This course organically integrates the theoretical knowledge and experimental skills of physiology, pathophysiology and pharmacology. It is particularly important to cultivate students' ability to operate, analyze and solve problems. At the same time, it is also one of the effective ways to cultivate medical students' operational skills, scientific research ability and innovative thinking [5-7]. With the development of information technology and the popularization of "Internet + education", the traditional teaching method based on teacher lecturing has been unable to satisfy the development needs of students in Colleges and universities. In the light of the actual situation of the college and the characteristics of medical specialty, the mixed teaching mode of "online" and "offline" is adopted in functional experiment teaching. It fully mobilized the enthusiasm

and initiative of students, improved the teaching effect of experimental course and students' comprehensive ability to analyze and solve problems, and laid a good foundation for the cultivation of high-quality medical talents.

## **2. Analysis of Learning Situation of Online and Offline Teaching in Functional Experiment Teaching**

The traditional teaching mode of offline functional experiment is teacher-centered. Teachers teach and demonstrate in class with multimedia courseware. Students are free to group experiments according to the teaching content, and teachers guide and answer questions in real time. The main teaching effect of this traditional mode is not ideal, students generally respond to the problems of teaching pertinence is not strong, the success rate of the experiment is low, the experimental operation time is insufficient and so on. Moreover, with the expansion of college students nationwide, teaching resources have become relatively insufficient, especially in medical colleges. Due to the particularity of the experimental teaching content of medical functional science, a large number of experimental animals and controlled and expensive experimental drugs are needed, and the cost of opening experimental courses is high, which can not meet the students' desire to repeatedly operate and explore the experimental mechanism, It seriously limits the cultivation of students' practical and innovative ability.

Online teaching is based on distance teaching and network teaching, which provides a good development environment. Online teaching has great flexibility in time, place, method and object, which can reflect the people-oriented education concept. But in the specific practice of online teaching, some problems are exposed, such as: for teachers, due to the rich amount of online teaching information, it is difficult for teachers to prepare lessons, the amount of lesson preparation increases, and online teaching can not feel the degree of students' acceptance of knowledge in real time; For students, online teaching has weak binding force on students, and online learning is easy to lead to students' inattention and the decline of management; There are also network delay, online teaching software is not perfect, the operation is complex, and even some online teaching equipment (mobile phones, computers, printers) can not meet the defects [8].

Online and offline hybrid teaching is the organic combination of traditional classroom teaching, that is, offline teaching and online learning. It not only makes full use of the powerful function of rich online learning resources and convenient interaction, but also plays the leading role of offline teaching teachers in guiding, inspiring and monitoring the teaching process, and undertakes the personalized learning guidance of counseling, communication and discussion.

To sum up, the application of online and offline Hybrid Teaching in medical functional experiment teaching has important theoretical and practical significance.

## **3. Online and Offline Hybrid Teaching Design**

### **3.1. Revise Teaching Objectives and Optimize Teaching Contents**

In order to do a good job in the online resource construction of the course, this study established a functional experiment course construction team. According to the national standard of undergraduate professional teaching quality in ordinary colleges and universities, combined with the talent training program of our university, we reasonably formulated the teaching plan and syllabus. Analyze the situation of students, combined with the characteristics of the course and learning situation, formulate the learning objectives of the course and the teaching objectives of each course, discuss the teaching content, and list the key points and difficulties. The experimental teaching content is selected to reduce the basic experiments, increase the comprehensive and design experiments, and increase the case discussion. We

should properly handle the relationship between real experiment and virtual experiment, and adhere to the principles of "virtual + reality" and "Online + offline".

### **3.2. Prepare Online Teaching Resources**

The preparation of teaching materials should be combined with students' cognitive law, and the teaching content should be arranged step by step. In order to enrich the teaching content, enhance students' intuitive learning and reduce the difficulty of students' self-study, teachers should upload teaching materials one week in advance, mainly including courseware, teaching plan, video, animation, pre-class learning guidance, after class self-test questions, etc. According to the needs of online teaching, the teaching plan should be adjusted, and the knowledge points should be fragmented, so that students can achieve their learning goals in effective time. Especially for some theoretical or abstract concepts or mechanisms, we need to prepare animation or micro video for students to learn by themselves.

### **3.3. Implementation of Online and Offline Mixed Teaching Activities**

#### **3.3.1. Preview Online Before Class**

According to the teacher's learning guidance and task list arrangement, students will study independently, including reading courseware, teaching plan, textbooks, animations, videos and other online resources, making a learning outline or context, summarizing the problems encountered in the process of self-study, and discussing within or between groups as a group. Students by watching "online" experimental teaching video and complete the online test, to the operation of the laboratory and medical function to the relevant experimental methods accomplish know fairly well, still can't solve the problem through QQ group or WeChat group of online platform, such as feedback to the teacher, so that the teacher in the classroom a targeted to disabuse, targeted to improve teaching. At the same time, teachers use the digital function of the teaching platform to grasp the students' self-study situation in time and urge the students who do not actively participate in it.

#### **3.3.2. Offline Q&A Guidance in Class**

In class, first of all, student representatives share the gains and unresolved problems after learning the task list. Then, the teacher explained the questions raised by the students and the problems that appeared in the preparation before class, and randomly checked one student to explain the experimental operation process, the use of experimental equipment and matters needing attention. Then, the teachers and students communicated and interacted, and the teacher summarized. Finally, students do experiments in groups. If they encounter problems, they can consult the teacher on the spot or solve them with the help of relevant micro videos and virtual simulation resources, and the teacher gives real-time guidance. After the experiment, teachers organized students in groups to summarize and analyze the experimental results, give an overall evaluation, summarize the key points and difficulties of the experiment, and emphasize the writing of the discussion part in the writing of the experiment report.

#### **3.3.3. Reflection and Consolidation After Class**

After class, students can flexibly arrange time according to their own actual situation, and with the support of micro video and virtual simulation platform, they can carry out targeted review and complete experiment report and reflection summary. For the problems existing in the experimental operation, online resources such as virtual simulation platform can also be reused for special experimental operation to solve the problems. For problems that cannot be solved, you can feed back to the teacher through online platforms such as QQ group or WeChat group to solve them.

### 3.4. Teaching Evaluation

In order to make the assessment of the experimental course of medical functional experiment more fair and transparent, and to mobilize the enthusiasm and participation of students, the evaluation mechanism of the experimental course of medical functional experiment adopts the multi-type evaluation system, and the course learning evaluation runs through the whole process of the experimental course learning. It is mainly composed of five parts: online learning assessment (10%), offline classroom (including experimental participation and experimental operation) (10%), experimental normal time score (10%), experimental operation examination score (20%), and final theory examination (50%). The total score is 100, and  $\geq 60$  is considered qualified.

## 4. Discussion

During the epidemic prevention and control period, the nationwide implementation of online teaching has promoted a great change in the way of education, management and learning [9]. With the acceleration of global informatization, especially the coming of 5G era, the "online" information technology represented by the Internet will usher in another significant period of development opportunities. In the face of this golden opportunity of reform, higher medical education, especially the function experiment teaching strategies should be as soon as possible from the mode of traditional, curing, the advanced teaching concept, and lectures depth integration of modern information technology, to achieve "online hybrid" teaching reform and innovation, highlighting the guiding ideology of "student-centered", which is based on knowledge, Taking ability as the main line, it focuses on cultivating students' comprehensive ability to acquire new knowledge, and helps students grow into "compound" talents adapted to the construction and development of the medical system in the new era [10].

According to the professional characteristics of medical students in universities and the global information revolution, this study, starting from the learning habits and abilities of students, preliminarily explored the online and offline hybrid teaching mode in the experimental teaching of mechanical science, and made full use of the online and offline favorable resources to fully mobilize students' enthusiasm and initiative in learning. It improves the teaching effect of experimental courses and students' comprehensive ability to analyze and solve problems, etc., which lays a good foundation for the training of high-quality medical talents. It is hoped that this study can also provide reference for the teaching reform of other courses.

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