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Reform and Research on Experimental Teaching of Functional Experiments under the background of national first-class undergraduate major

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Abstract: Objective: To explore the application effect of offline and offline hybrid teaching mode in functional experiment teaching reform under the national first-class undergraduate professional background. Methods: Undergraduates majoring in clinical medicine were selected as the research subjects. The 2021 level was used as the experimental group to adopt the online and offline mixed teaching mode, while the 2020 level was used as the control group to adopt the traditional experimental teaching mode. The teaching effect was evaluated by examinations and questionnaires. Results: Students in the experimental group had higher satisfaction with the mixed teaching mode, and their test scores were significantly higher than those in the control group. Conclusion: The teaching effect of online-offline mixed teaching mode is better than that of traditional teaching mode. It can cultivate students' self-learning habit, improve students' comprehensive ability of analyzing and solving problems, and effectively improve the teaching quality.

Keywords: First-class undergraduate major; Functional experiment; Reform in education; Online and offline hybrid teaching.

1. Introduction

The clinical medicine specialty of our university was approved as a national first-class undergraduate specialty in 2022. [1] However, the Ministry of Education has not yet issued specific assessment indicators for the construction of national first-class specialties. How to cultivate medical professionals who meet the requirements for the construction of national first-class specialties has become a new issue faced by universities in the process of "double first-class" construction.

Functional experiment is a compulsory course for clinical medicine majors at Yangtze University, and is an important component of basic medical experiments. It is mainly composed of physiology, pathophysiology and pharmacology [2]. Functional experiment is a highly practical course that plays a key role in cultivating clinical thinking ability and comprehensive quality of clinical medical students [3].

Online and offline hybrid teaching is a teaching mode that organically integrates online teaching based on information and network technology with face-to-face offline teaching between teachers and students in traditional classrooms. It breaks the space-time boundaries of knowledge dissemination in traditional modes and establishes a student-centered concept. It is an important research direction in current college teaching reform and a" booster "to promote the reform of higher medical education [4-8].

Focusing on the requirements for the construction of national first-class undergraduate majors and first-class undergraduate courses, combined with the construction of the team of functional laboratory teachers at Yangtze University and the experimental and practical training conditions, and in accordance with the talent cultivation objectives of clinical medicine majors, this article appropriately applies the online and offline hybrid teaching model in the teaching of functional laboratory courses, with a view to better promoting the development of functional laboratory courses for clinical medicine majors in our university, Improve the teaching quality of medical students in our school and cultivate high-quality medical talents.

2. Object and method

2.1. Object

A total of 198 students majoring in clinical medicine in the 2021 and 2021 levels of our school were randomly selected by cluster sampling method, with 96 students in the 2021 level serving as the experimental group and 102 students in the 2020 level serving as the control group. The age is 20-22 years old, and both groups of teachers are senior associate professors or teachers with rich experimental teaching experience. Comparing the general data of the two groups of students, the difference was not statistically significant ($P>0.01$) and was comparable.

2.2. Method

The experimental group implemented a mixed teaching mode of "online self-learning + offline teaching". The teacher team carefully analyzes and discusses teaching objects, teaching objectives, and teaching content in the early stage, and designs teaching strategies. The teacher issues online preview tasks to students before class. During class, the teacher teaches important experimental operation procedures in person. The students complete experimental operations, and communicate with students and teachers in the same group whenever there are questions. The teacher guides the students on a tour, and assesses the students' operation process and experimental results; After class, students will consolidate and review through online resources to complete the experimental report.

The control group implemented traditional experimental teaching methods. The teaching content is the same as that of

the experimental group. According to the requirements of the experimental teaching syllabus, the teacher teaches the experimental principles, experimental methods, experimental steps, and results analysis and discussion in the form of PPT. After each experimental class, an experimental report is assigned as an assignment, and the assignment is corrected by the teacher, implementing a percentile system.

The two groups of students in the final exam reviewed their own according to the outline requirements, and there was no significant difference in the difficulty and reliability of the test papers between the experimental group and the experimental group.

2.3. Evaluation of teaching effect

2.3.1. Comparison of final results

Compare the mastery of basic knowledge, basic theories, and basic skills of functional experiments between the two groups using the final theoretical examination scores and the final overall evaluation scores.

2.3.2. Questionnaire survey

After teaching, students' subjective feelings about the online and offline hybrid teaching mode of functional experiment courses are understood through a questionnaire star. The questionnaire includes 14 aspects, and the satisfaction rating is 5 levels: very satisfied, somewhat satisfied, generally satisfied, somewhat dissatisfied, and very dissatisfied. The questionnaire was conducted anonymously, with a total of 96 students using online and offline mixed teaching. All of them submitted the questionnaire, with a submission rate of 100%.

2.4. Statistical processing

SPSS 18.0 statistical software was used for analysis. The measurement data were expressed as $x \pm s$, and the comparison was conducted using t-test, with a statistically significant difference of $P<0.01$.

3. Results

3.1. Comparison of final exam scores

The final examination scores and final overall evaluation scores of the students in the experimental group were both higher than those in the control group, with an average score significantly higher than that in the control group, with a statistical difference ($P<0.01$). The results are as follows (see Table 1).

Table 1. Comparison of final exam scores between two groups of students

Target	Number of people	Final Written Test Score	Final Overall Evaluation Score
Control group	102	75.61 ±6.37	81.71±8.48
Experimental group	96	81.73±7.26	86.22±6.86

3.2. Questionnaire Results

The results of a questionnaire survey of 96 people in the experimental group indicate that most students are highly satisfied with the online and offline hybrid teaching mode of functional experiments. The results are as follows (see Table 2)

Table 2. Questionnaire Results of Experimental Group Students on Online and Offline Hybrid Teaching Mode (n (%))

Survey items	Very satisfied	Somewhat satisfied	Generally satisfied	Somewhat dissatisfied	Very dissatisfied
Overall satisfaction	91(94.79)	3(3.13)	2(2.08)	0(0)	0(0)
Improved knowledge mastery	90(93.75)	5(5.21)	1(1.04)	0(0)	0(0)
Improved communication skills	89(92.71)	6(6.25)	1(1.04)	0(0)	0(0)
Improve comprehensive ability to analyze and solve problems	86(89.58)	4(41.67)	6(6.25)	0(0)	0(0)
Improved ability to expand thinking	91(94.79)	4(41.67)	1(1.04)	0(0)	0(0)
Cultivate innovative spirit and practical ability	88(91.67)	6(6.25)	2(2.08)	0(0)	0(0)
Improve comprehensive quality	87(90.63)	7(7.29)	1(1.04)	1(1.04)	0(0)
Improve self-study ability	94(97.92)	1(1.04)	1(1.04)	0(0)	0(0)
Improve learning interest	90(93.75)	5(5.21)	1(1.04)	0(0)	0(0)

4. Discussion

Functional experiment is a comprehensive course formed by the integration of physiology, pathophysiology and pharmacology experimental teaching. It is an important product of experimental teaching reform. Its teaching content breaks the boundaries of disciplines, promotes the intersection and integration of related disciplines, and has extremely important practical significance for the cultivation of various abilities of students [9]. The teaching team of our school's functional science curriculum closely combines the central task of building the school's "dual first-class" and national first-class majors, and thoroughly analyzes the academic situation of undergraduate students majoring in clinical medicine. In response to the main problems such as insufficient ideological guidance, poor initiative of students, and weak innovation awareness in the teaching of functional science experimental courses, we have systematically adopted the reform of online and offline hybrid experimental teaching mode, it conforms to the spirit of the college's motto of "Shangde Qinjin Sincerity, Benevolence Changxin". Director Wu Yan of the Higher Education Department of the Ministry of Education pointed out that curriculum is the core element of talent cultivation, and without good courses, all jobs may fail. Curriculum is the most micro, but it solves the most fundamental problems. Curriculum is the most micro issue in education, but it solves the most fundamental issue in

education. Curriculum is also the work of implementing the "last mile" concept that focuses on student development. Mr. Wu Yan also emphasized that in terms of curriculum, we should focus on four aspects: content system, gender orientation, curriculum ideology and politics, and practical teaching.

In the traditional teaching of functional experiment courses, teachers give priority to teaching, lacking the cultivation of students' autonomous learning ability, speculative ability, and innovative ability. Students passively accept knowledge. During the experimental operation process, students have low learning enthusiasm and initiative, lack independent thinking, and even some team members do not operate manually. Moreover, due to the influence of experimental space, time, and experimental animals, problems in the experimental process are not handled in a timely manner, The experimental failure rate is high. While completing teaching tasks, teachers lack sufficient communication with students, making it difficult to fully understand students' learning dynamics and mastery of various knowledge points. Therefore, there is no way to teach students in accordance with their aptitude, resulting in low enthusiasm among students, and poor teaching effectiveness.

Based on traditional teaching models, online and offline hybrid teaching skillfully integrates with online information-based teaching. It not only utilizes online teaching resources to expand students' learning time and space, saving the use of experimental animals, but also uses limited classrooms to solve difficult and targeted questions and conduct discussions and exchanges. When there are problems, it can provide guidance and exchange at any time, improving the success rate of the experiment, and effectively improving the intrinsic motivation of students' learning, Students have developed a good habit of autonomous learning, exercised their comprehensive ability to analyze and solve problems, and can effectively improve the effectiveness and quality of experimental teaching.

In summary, the appropriate application of the online and offline hybrid teaching mode in the experimental teaching of medical function can not only increase the communication between teachers and students, guide students to effectively learn, help cultivate students' self-learning ability, improve their comprehensive literacy, but also improve teachers' teaching and learning abilities to a certain extent. In the future, we will continue to improve the content of experimental teaching, constantly explore new and effective experimental teaching methods and means, change teaching ideas, promptly study and solve new problems encountered in experimental teaching reform, and continuously improve teaching quality to cultivate "complex" medical talents adapted to the new era.

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