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Exploration and Analysis of AI in Cardiovascular Module Practical Teaching

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Abstract

Objective: This paper aims to explore the application effect of AI hybrid experimental teaching. **Method:** 53 clinical medicine students from the 2023 cohort were selected as the control group, and 59 clinical medicine students from the 2024 cohort were selected as the experimental group. The control group used traditional teaching mode, while the experimental group used AI blended teaching mode. After the teaching is completed, the theoretical level and skill operation of the two groups of students will be assessed, and their performance in various skills will be compared. The satisfaction of the two groups of students with the teaching methods will also be investigated. After the course ended, the theoretical and skill operation scores of the experimental group students were significantly higher than those of the control group. In the experimental group, the success rate of shock experiment, mechanism of shock description, clinical symptoms of right heart failure, and clinical pathological correlation scores of the experimental group were higher than those of the control group, and the differences were statistically significant ($P < 0.05$). Meanwhile, the satisfaction level of the experimental group students with the teaching method was also higher than that of the control group. **Conclusion:** By integrating AI software into a hybrid experimental teaching model that combines online and offline methods, this approach solved the problem of lack of deep learning in traditional blended learning experimental teaching, and improved students' initiative and efficiency in self-directed learning.

Keywords

Cardiovascular Module, Experimental Teaching, Education Reform,

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Artificial Intelligence, Intelligence Assisted Teaching

1. Introduction

In 2016, the State Council released the "Thirteenth Five Year Plan for National Science and Technology Innovation", in which artificial intelligence was included as one of the new generation information technologies in the plan; The "China Smart Education Development Report 2023" released by the Ministry of Education points out that smart education is the advanced stage of digital education development, and proposes four stages of smart education development: resource sharing, data-driven, AI integration, and ecological reshaping [1]. At the 2026 World AI Conference, President Xi Jinping regards artificial intelligence as another epoch-making major technological revolution following the steam engine, electricity and the Internet. How to cultivate innovative medical talents with innovative spirit, practical ability, and international competitiveness is a new challenge faced by university educators. Educators should combine the characteristics of the times and the laws of education, and use modern means such as information technology and digital technology to carry out the reform of medical experimental teaching in the context of "Internet plus". Pathophysiology is a fundamental medical discipline that studies the etiology, pathogenesis, outcome, and prognosis of diseases. It serves as a bridge between fundamental and clinical disciplines [2]. AI has been introduced into the teaching of various medical disciplines and has achieved good teaching results [3] [4]. This article selects the cardiovascular module in functional experiments and takes the integration of artificial intelligence into medical functional hybrid experimental teaching as an example to explore the reform and exploration of medical functional hybrid experimental teaching, providing reference for further deepening the digital reform of education.

2. Data and Methods

1) General Information: 53 students from class 2023 clinical major were selected as the control group (retrospective), and 59 students from class 2024 clinical major were selected as the experimental group. The average age of the control group students was (20.54 ± 1.95) years old, using the traditional teaching mode. The average age of the experimental group students was (20.72 ± 1.48) years old, and the online case-based teaching mode was adopted; Both groups of students participated in online teaching. The experimental group and the control group underwent a preliminary examination before entering the test, with scores of (82.28 ± 4.37) and (83.15 ± 5.62), respectively. There was no statistically significant difference ($P > 0.05$) in the basic information (age, gender, and test scores) between the experimental group and the control group, indicating comparability. This project was approved by the ethics committee of the Department of medicine of Yangtze University and obtained the consent of all participants.

2) Research methods: The control group adopts the traditional mixed experimental teaching mode and completes the experimental teaching content required by the teaching outline in the form of lectures. The experimental group adopts a hybrid experimental teaching mode of integrating artificial intelligence into medical functional science under the background of educational digitization, Doubao AI was used to help students to be proficient in the operation process, evaluate the operation effect, etc.

3) After the online course on observation indicators is completed, a written test (100 points) and an operational test (100 points) will be conducted on the course focus and outline requirements, and the written test scores and practical operation scores of each student will be recorded. The assessment score is automatically calculated online, and the simulation operation includes the following 5 items: Mechanism Description of Shock Microcirculation Theory, Hemorrhagic Shock Experiment, Clinical Manifestations of Right Heart Failure, Acute Right Heart Failure Experiment, Correlation with Clinical Practice (each item is 20 points, a total of 100 points). After the course, a satisfaction survey will be conducted on two groups of students using a questionnaire.

4) Statistical analysis was conducted using SigmaStat 2.03 Demo. Metric data were expressed as ($\bar{x} \pm s$) using t-test, while count data were expressed as (%) using χ^2 test. $P < 0.05$ indicates statistically significant differences.

3. Results

1) Comparison of various skill scores between two groups of students: Analyze and compare various assessment indicators based on the skill operations of the two groups of students. The Acute Right Heart Failure Experiment in the experimental group, was higher than that in the control group, but the difference was not statistically significant ($P > 0.05$), this was maybe after completing the previous shock experiments, students became more proficient in surgical procedures, as the surgical steps for shock and heart failure models are largely identical. Mechanism Description of Shock Microcirculation Theory, Hemorrhagic Shock Experiment, Clinical Manifestations of Right Heart Failure, Acute Right Heart Failure Experiment, Correlation with Clinical Practice scores in the experimental group were all higher than those in the control group, and the differences were statistically significant ($P < 0.05$). See Table 1.

2) Comparison of assessment scores between two groups of students: After the online teaching ended, an online test was conducted. The experimental group had higher theoretical exam scores and skill operation scores on the virtual simulation platform than the control group, and the difference was statistically significant ($P < 0.05$). See Table 2.

3) The satisfaction rate of the experimental group students with the course was 88.14% (52/59), which was significantly higher than that of the control group students at 71.70% (38/53), and the difference was statistically significant ($\chi^2 = 4.779$, $P < 0.05$).

Table 1. Comparison of skills scores between two groups of students.

Group	N	Mechanism Description of Shock Microcirculation Theory	Hemorrhagic Shock Experiment	Clinical Manifestations of Right Heart Failure	Acute Right Heart Failure Experiment	Correlation with Clinical Practice
control group	53	15.36 ± 2.41	15.63 ± 2.39	16.24 ± 2.86	16.85 ± 2.52	16.28 ± 2.64
experimental group	59	17.15 ± 3.55	17.40 ± 3.27	17.39 ± 2.59	17.60 ± 3.18	17.47 ± 3.06
t		−3.086	−3.239	−2.233	−1.373	−2.192
P		0.003	0.002	0.028	0.173	0.031

Table 2. Comparison of assessment results between two groups of students ($\overline{x} \pm s$, points).

Group	N	Theoretical Score	Practical Score
control group	53	70.79 ± 6.52	86.52 ± 9.38
experimental group	59	77.59 ± 8.46	90.47 ± 7.65
t		−4.725	−2.452
P		<0.001	0.016

4. Discussion

Functional experimental teaching, as a key link connecting basic medical theory and clinical practice, occupies an important position in the medical talent training system and is an indispensable component of cultivating innovative medical talents. Traditional functional laboratory courses still focus on confirmatory animal experiments, with very few comprehensive and exploratory projects. The singularity of experimental types keeps students in a passive state of receiving knowledge for a long time, lacking opportunities for comprehensive application and practical exploration of knowledge [5]. Insufficient emphasis is placed on cultivating students' research thinking ability and clinical application ability. Medical laboratory courses are limited to classic experimental content, making it difficult for teachers to integrate the latest research results and clinical developments into teaching content in a timely manner. This not only leads to a lag in teaching content, preventing students from accessing the latest medical knowledge and technology, but also greatly limits their opportunities to broaden their academic horizons and keep up with the pace of disciplinary development. The evaluation system is not very complete, and experimental reports and assessment of experimental operation skills are the two most common methods for evaluating the effectiveness of experimental course learning. However, the traditional evaluation system emphasizes results over the process, and the evaluation process relies on teachers' subjective judgment. The evaluation criteria are not clear and objective enough, and are easily influenced by subjective factors such as personal prefer-

ences and emotions, resulting in biased evaluation results and a lack of fairness and objectivity [6].

Through the integration of AI software into the blended experimental teaching mode, it was found that students have a more solid grasp of theory, higher practical skills, and overall higher satisfaction with the teaching. This indicates that the problem of lacking deep learning in traditional blended learning experimental teaching has been solved, and students' initiative and efficiency in self-directed learning have been improved. Of course, there are also some issues, such as how to choose diversified AI software, training and supervision of AI software usage, how teachers can provide their own AI proficiency, and so on [7].

In short, although the application of artificial intelligence technology provides new opportunities for expanding students' abilities in various aspects, in the face of the irreversible trend of technological development, it is particularly crucial to enhance teachers and students' understanding and application abilities of technology, so as to ensure that technology serves people, rather than making them become vassals of technology [8]. Ultimately, no matter how technology develops, the direction and goals of education should always be determined by humanity itself, and the future of education will still be in the hands of people.

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Conflicts of Interest

The authors declare no competing interests.

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