

Exploration and practice of a new paradigm for teaching experimental courses in pharmacy under the background of digital empowerment-taking pharmacology experiment as an example

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Abstract. Pharmacology experiment is a very important professional core course for pharmacy majors, as well as a cross-discipline based on medicine, pharmacy and life sciences, which is highly valued by pharmaceutical colleges and universities. To promote the "Internet + higher education", to reform the traditional "test" pharmacology experiment teaching mode. This work aims to apply to the teaching of the Pharmacology experiment course by combining virtual simulation technology with micro classes and online and offline teaching. The results showed that this new teaching mode reform not only stimulated students' interest and initiative in the course, but also improved their ability to analyze and solve problems. In addition, it helps to produce innovative pharmacy professionals who can adapt to the needs of the society or the market.

Keywords: Pharmacology experiment, Education Reform, Virtual Simulation.

1. Introduction

Pharmacology experiments is a required course for Pharmaceutical Sciences majors. Through pharmacology experiments, students can not only verify the theoretical knowledge in books, promote the combination of theory and practice thereby deepening understanding [1]. It also helps to cultivate students' hands-on ability, rigorous working attitude and scientific thinking method, laying a solid foundation for future scientific research and work. At present, most of the traditional "demonstration + simple repetition" teaching mode is used in the pharmacology experimental course of domestic institutions, which only focuses on the demonstration of knowledge and experimental operations, but not on the experimental principles. Especially for students with relatively weak theoretical knowledge, it is difficult to understand the mechanism of action of drugs and the dynamic metabolism of drugs, which can easily lead to less interaction between teachers and students, and poor initiative and low interest of students in learning. As for the experimental part of pharmacology, due to the influence of "exam" education for a long time, students in colleges and universities generally pay attention to the theoretical knowledge and ignore the experimental skills operation of the wrong ideas, enthusiasm is not enough, the students' hands-on innovation ability does not get the attention it deserves [2].

In recent years, as the country's teaching requirements for colleges and universities continue to improve, many colleges and universities in the teaching of experimental courses to add different elements, especially virtual simulation technology and online micro courses for the leading [3] [4]. Compared with the traditional teaching mode, virtual simulation technology has the advantages of vividness, image, and not limited by time and space. While the online micro-teaching platform uses video as the main carrier, which is characterized by being focused and short and concise [5]. Meanwhile, over the past twenty years, "digitally-enabled teaching" has gradually developed from "a method that should only be found in famous schools" to "entering the homes of ordinary schools". Both artificial intelligences, the Internet of Things, big data and other technologies to provide solid material support, but also inseparable from the Ministry of Education in the "Ten-Year Development Plan for Education Informatization (2011-2020)" in "education informatization to drive the modernization of education to promote the development of the cause of education [6]. This is to give

full play to the advantages of modern information technology, focusing on the comprehensive and deep integration of information technology and education" policy support [7].

In the face of such a teaching status quo, based on the analysis of existing problems, we refer to the reform experience of pharmacology experimental teaching in domestic institutions. We actively embrace "digital teaching" to solve the bottleneck of experimental teaching with pharmacology experiments. This group intends to combine virtual simulation technology with online micro classes and offline teaching and apply it to the teaching of Pharmacology Experiment course. The aim is to improve the quality of teaching with the help of modern high-tech means. At the same time, students are trained to become high-quality talents with professional knowledge and practical ability.

2. Methods

Before the beginning of this work, we first analyzed the current teaching mode of pharmacology experiment courses in many Chinese universities through literature reading and field research. The results show that most colleges and universities use a traditional teaching model, but there are some colleges and universities that practice a flipped classroom or a combined teaching model. Compared with the traditional model, this model can improve students' class participation rate. At the same time, we found that although the level of knowledge of students in pharmacology theory is not poor in many schools, the level of teaching in laboratory courses still needs to be improved. We plan to implement the following approaches to curriculum reform. First of all, a systematic evaluation of the teaching model based on student learning. Secondly, based on the evaluation results, we design a reasonable reform program to apply virtual simulation teaching in pharmacology experimental online resources. To better realize the in-depth combination of teaching, learning and doing, and to establish an integrated teaching method. A combination of offline teaching and learning is conducted, while learning is deepened through hands-on learning. In addition, we plan to evaluate students' teaching performance and teachers' reformed teaching mode by comparing the traditional and reformed teaching methods, which have been implemented simultaneously at Jiangxi Normal University of Science and Technology (JNUST).

We chose Grade 22 pharmacy and pharmaceutical pharmaceuticals preparation students for the study. Pharmacy classes as the first group were the control group and they implemented the traditional teaching model. Pharmaceutical pharmaceuticals preparation was the second group became the experimental group, and they implemented the pharmacology experiment digital empowerment virtual simulation teaching mode.

For traditional exam-oriented education, schools follow the syllabus to stipulate the class time and the use of laboratories, and the teaching materials are ordered by the school, which lacks diversity. The teaching methods were traditional demonstration and simple repeated experiment, which can lead to a lack of concentration and a feeling of boredom. The experimental part in the laboratory used the traditional single-space teaching mode. In contrast, in the experimental group, we used the reform teaching method. Teachers make full use of the rich online open course teaching resources and virtual simulation technology, so that students learn online virtual resources to play the role of PBL teaching mode on the cultivation of students' innovation ability, and the organic combination of the two to establish a new teaching method. After mastering the basic experimental skills, they visit the human physiology and pharmacology rooms in Jiangxi University of Traditional Chinese Medicine and other medical schools in stages. Then, students are fully mobilized by discussing important issues in small groups. Finally, both groups of students were given a final exam on both the theoretical and hands-on practical sections. At the end of the semester, a satisfaction survey was conducted using an anonymous online poll as one of the indicators to evaluate the reform methodology. What's more, all the reformations were listed in the Table 1.

Table 1. Differences in teaching methods

Comparison of two teaching methods	
Traditional methods	Reform methods
According to the time and place specified in the syllabus	Make full use of in abundant teaching resources online and virtual simulation technology open Courses
Textbooks are uniformly customized by the whole school	After mastering basic skills, practice teaching in medical colleges and universities in different stages
The teaching methods were traditional demonstration and simple repeated experiment	For the problems with more questions online, group discussion teaching was carried out to guide students to participate in the teaching class independently
The assessment method adopts a single final examination for evaluation	Make full use of the interactive assessment in the classroom and carry out the assessment of “formative assessment” in the network resource system

3. Results

The new method has been implemented for one year in the School of Pharmacy of Jiangxi Normal University. For the first group of students, the effect of the reform was assessed by examining their grades and feedback, while a network questionnaire was used to give feedback on the effect of the new teaching method. Compared with the traditional teaching mode, it has certain advantages.

In the course grade examination section of the pharmacology laboratory course, as shown in Fig. 1, the second group had far more students in the score range of 80-100 than the first group. And the number of students who scored less than 60 was only 2% in the second group, while it was as high as 10% in the first group. The number of students in the first group is higher than the second group in the score band of 80-60. This shows that the overall learning level of the first group is lower than that of the second group. The study shows that the reformed teaching mode has a great impact on improving students' performance in laboratory classes.

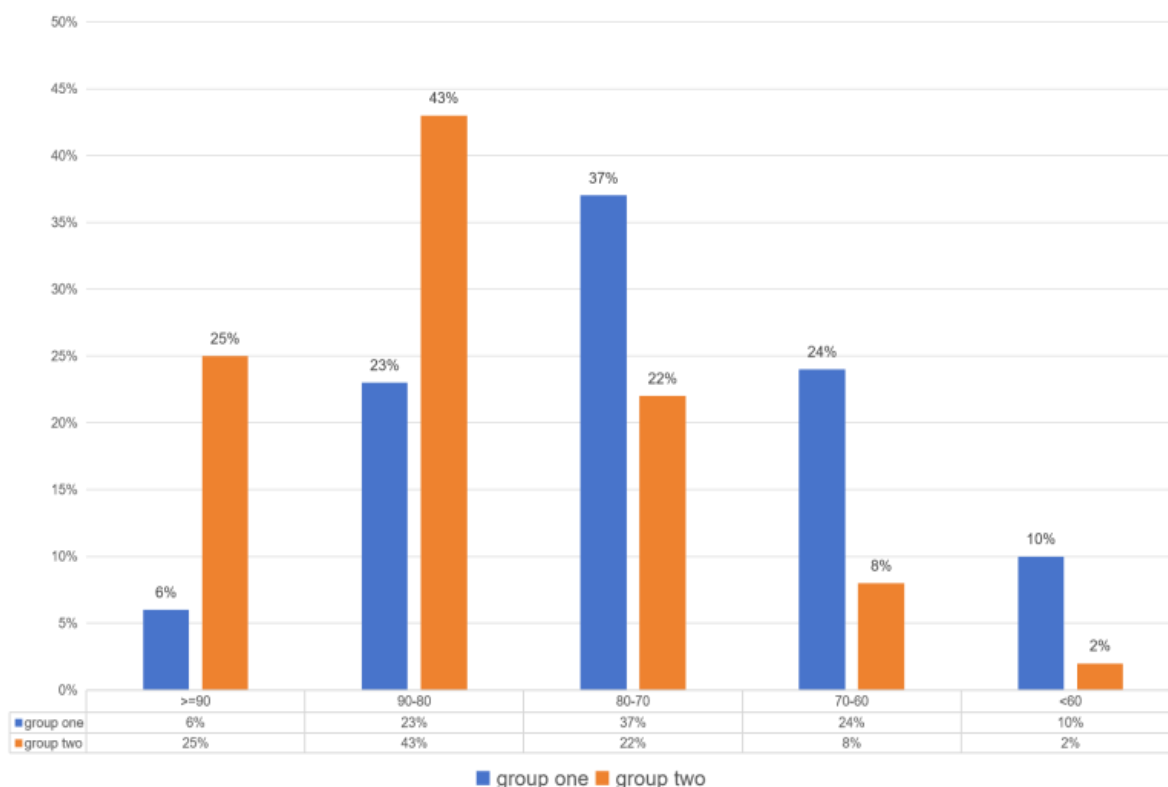


Figure 1. Examination results score statistics

Figure 2 shows the students' classroom response, and we see that the second group of students is much more motivated than the first group, up to 59%. The number of students in the first group is

only 37%. And the number of students in the first group with average classroom response is 24%. The second group is 9%. The number of students in the first group was twice as many as in the second group. The results of the experiment show that the new teaching mode is more conducive to improving students' motivation to learn.

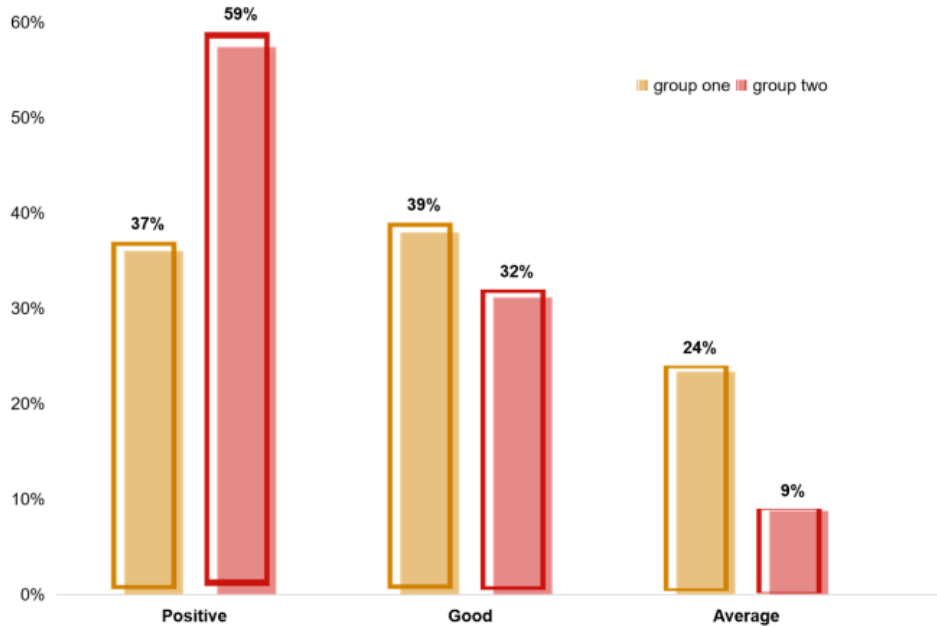


Figure 2. Student classroom responses

At last, we conduct a survey on students' satisfaction with the teaching model. The first set of data is the satisfaction survey about the traditional teaching method and the second set of data is the satisfaction survey about the reformed teaching method. In Figure 3, we observe from the data of the first group that although 59% of the students are satisfied with the traditional teaching model, 41% are still dissatisfied. In the second group, the percentage of students who were dissatisfied with the teaching method after the reform was only 8%, and most of them were satisfied or very satisfied. The survey shows that the reformed teaching mode of pharmacology is favored by most students, while many students are dissatisfied with the traditional teaching mode, which is a great supportive force for our teaching reform.

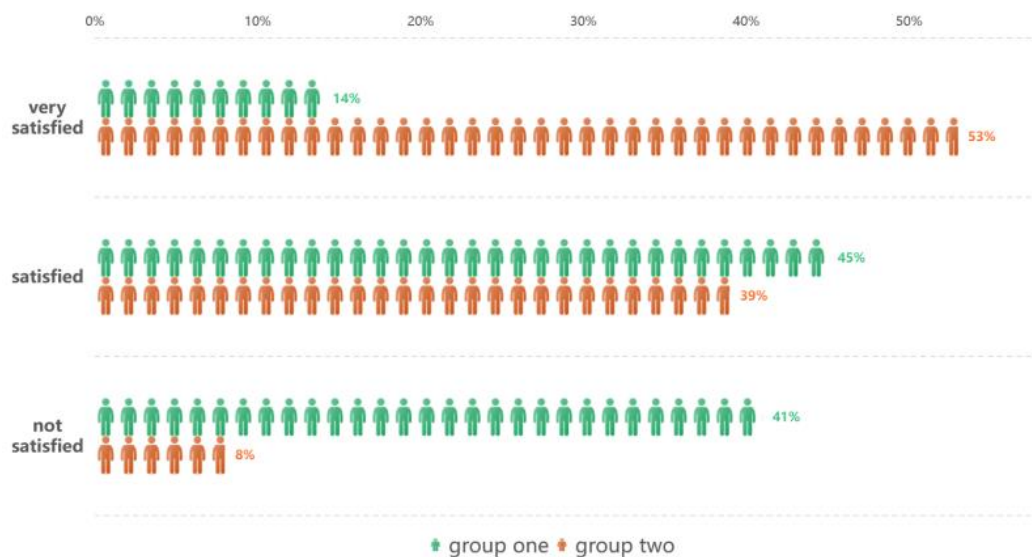


Figure 3. Statistics of satisfaction degree of the two group toward the different teaching methods

4. Summary

This work discusses two different teaching modes for the pharmacology experimental course in undergraduate teaching. The results show that, in contrast to the traditional teaching mode, a new mode of teaching based on the combination of online and offline through VR technology is then applied to the Pharmacology Laboratory course. This not only improves the comprehensive quality of students in an effective way to improve the quality of education. At the same time, the establishment of an effective teaching evaluation mechanism from the students' point of view, on the gradual improvement of the quality of teaching, expanding the scope of teaching. Further improve students' comprehensive skills and expand their understanding of cutting-edge knowledge. These have an important role to play.

Through the continuous construction of classroom teaching, it breaks the original more conservative, closed and single mode of teaching operation and achieves better learning effect. This brand-new teaching mode can not only be gradually applied to classroom teaching, but also be further promoted to the study of drug preparation and pharmaceutical engineering and other specialties. It can even be expanded to similar majors and colleges inside and outside the province. Overall, this experimental teaching mode, if successfully carried out, improves the efficiency of experimental teaching, meets the needs of students to obtain multifaceted knowledge and cultivate comprehensive pharmacy talents, and becomes a new mode of teaching reform in the field of pharmacology experiments, accelerating the reform of pharmacy professional teaching.

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