

Exploration on Teaching Reform of Medical Functional Experimental Science for International Students

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Abstract

Medical Functional Experiment Science, a bridge between basic medicine and clinical medicine, integrates classical experimental teaching contents of three courses including physiology, pathophysiology and pharmacology. This course not only helps students to verify and reinforce theoretical knowledge, but also cultivates their capability of scientific thinking to discover and solve problems. Based on the characteristics of international students and current situation of the teaching platform in the laboratory at Yangtze University, this paper discusses a series of problems in the Medical Functional Experiment Science teaching for international students and puts forward some measures for teaching reform including optimizing experimental content, innovating experimental teaching methods and establishing effective experimental evaluation mode, in order to cultivate more international medical students with innovative ability.

Keywords

Medical Functional Experiment Science, Teaching Reform, International Students

1. Introduction

Innovative talents are the key to a successful implementation of the Belt and Road Initiative, and colleges and universities clearly play a key role in this context [1]. It is an important mission entrusted to our higher education in the new era to train outstanding international talents with international vision. With the rapid pace of globalization, health problems are no longer issues for a single nation. The Belt and Road Initiative provides a common platform to improve the

capability of handling regional public health emergencies and cultivate the medical talents [2]. The medical education of international students in China not only bears the responsibility of cultivating international medical talents with high personality, high responsibility and noble medical ethics, but also serves the construction of the “Belt and Road” and the promotion of the international influence of Chinese Medicine.

As a bridge between basic medicine and clinical medicine, Medical Functional Experiment Science with strong practicability and application is an indispensable part of medicine. It closely combines experimental research with the theories of physiology, pathophysiology and pharmacology. Medical Functional Experiment Science utilizes human body and laboratory animals to reflect the phenomena of functional, metabolic activities and underlying mechanisms under normal, diseased or medicated states in human body, and cultivates the ability of medical students to operate, think and innovate independently while learning.

In order to promote the continuous optimization of the teaching mode of Medical Functional Experiment Science and enhance the effectiveness of experimental teaching for international students, this paper discusses a series of problems in the Medical Functional Experiment Science teaching for international students at Yangtze University and puts forward some measures for teaching reform through optimizing experimental content, innovating experimental teaching methods and establishing effective experimental evaluation mode, aiming to cultivate innovative medical talents.

2. Characteristics of International Students

The majority of international students at Yangtze University come from underdeveloped countries, and most of them are undergraduates. All the subjects for international students at Yangtze University are required to be taught in English and Chinese. Therefore, all these international students are required to learn Chinese before entering the university. However, their Chinese proficiency is limited to daily communication. Most international students are fluent in English, but their pronunciation is nonstandard or with local characteristics. Due to the language barrier, they are not able to understand all the experiments with bilingual teaching in Chinese and English and have difficulties in communication with teachers, which has a negative impact on the teaching progress and efficacy.

Moreover, international students are too free to obey class discipline. The phenomenon of late arrival and early leave is serious, and the classroom atmosphere is casual. Some students with religious belief usually refuse to operate experimental animals. The others either do it randomly or totally rely on teachers to help them complete experimental operations. There is a lack of teamwork during experimental operation, and they have no sense of cleaning laboratory after finishing the experiment. These characteristics of the students themselves seriously affect the effect of Medical Functional Experiment Science teaching, which is urgent to be reformed in order to improve the effect of experimental teaching.

Consideration of cultural differences and learning preferences among international students would enhance the effectiveness of the teaching reforms.

3. Teaching Reform Measures

3.1. Optimizing Experimental Content

The “Belt and Road” community of common destiny needs a large number of professionals with cross-cultural communication ability, so the textbooks used by international students should be bilingual textbooks with wide promotion and application, which can help international students to strengthen Chinese language as well as medical terminology in Chinese. Combined with the specific situation of Medical Functional Experiment Science teaching in China and the characteristics of the international students, it is important to select and optimize teaching content in the textbook of Medical Functional Experiment Science.

Medical Functional Experiment Science focus on theory-verified and skills-based experiments in the past, while in the future it will emphasis on research and comprehensive experiments. The experimental content for international students should contain both aspects of these experiments. Firstly, the international students should master the basic techniques of animal experiments such as holding, anesthetizing and fixing animals. Secondly, some classic basis confirmatory experiments should be chosen to help students deepen and consolidate the relevant theoretical knowledge. Thirdly, comprehensive experiments should be selected, which are important to help students develop a systematic understanding of Medical Functional Experiment Science and improve their ability to analyze and solve problems.

Of course, the use of laboratory animals is essential in the process of Medical Functional Experiment Science. The welfare of laboratory animals has become one of the frontier directions of medical ethics research [3] [4]. To maintain the ethical use of laboratory animals, the use of laboratory animals should be optimized and reduced as much as possible in teaching and scientific research. In the future course arrangement, animal experiments should be considered in a centralized arrangement to reduce animal use without affecting teaching quality and students’ practical operation. For example, the ridge toad is first prepared for analysis of reflex arc, and then for preparation of sciatic nerve gastrocnemius muscle specimen and contraction of skeletal muscle in turn. According to experimental types, the combination of operational experiments can be another option. For example, the influencing factors of rabbit urine formation (physiological experiment) and diuretic effect of drugs (pharmacological experiment) can be arranged in one experiment.

For comprehensive designed experiments with long cycle, difficult operation and large number of experimental animals, virtual simulation experiment platform [5] can be adopted for virtual operation and learning, such as the pharmacodynamic evaluation of anti-Alzheimer’s drugs, the determination of the maximum tolerated dose of drugs and median lethal dose of drugs. In terms of expe-

rimental form, the current virtual simulation experiments have specific steps. Students are guided to do experiments step by step just like in the real environment, and the learning or training effect obtained is equivalent to or even better than the effect obtained in the real environment. These virtual laboratory simulations could not only supplement traditional laboratory-based experiments, particularly in situations where access to physical laboratories is limited, but also encourage international students with religious belief to take part in the experiments.

Through Medical Functional Experiment Science, international students can not only grasp basic methods of experiment and the use of common instrument, but also understand the basic rules of normal function metabolism, disease model replication and drug action of human body and develop the ability to analyze and solve problems. Thus, it is necessary to gather the teachers in charge of Medical Functional Experiment Science from various colleges and universities to compile the textbook with optimized experiments for these international students.

3.2. Innovating Experimental Teaching Methods

In the traditional teaching of Medical Functional Experiment Science, teachers give priority to teaching and students passively accept knowledge. This teaching method is lack of cultivating autonomous learning ability, speculative ability, and innovative ability for international students. During the experimental operation process, these students have low learning enthusiasm and initiative, lack independent thinking, and even some team members do not operate manually. Therefore, it is very urgent to innovate experimental teaching methods to attract their attention and increase their interest.

Inquiry-based teaching is a kind of active learning for students. Teachers start the lesson by providing various questions, guide students to research the topic with a group to find an answer. For example, some questions can be set for the diuretic effect of drugs such as how to classify the diuretics, what the mechanism of action of the diuretic drug is used in the experiment and when this diuretic should be used in clinical. Through these questions, students are encouraged to review reference books, search in the network and library resources, and find answers with cooperation in groups before lab class.

CBL (case-based learning) teaching designs a typical case for teaching content. Students review the information reflected in the case by reviewing the textbook and consulting the relevant knowledge to further deepen the understanding of concepts and theories. For example, the teacher can provide a case about the acute organophosphate pesticide poisoning. The case [6] is shown as following: In mid-afternoon, a coworker brings 43-year-old JM to the emergency department because he has difficulty speaking and swallowing, his vision is blurred, and his eyes are filled with tears. His coworker notes that JM was working in a field that had been sprayed early in the morning with a material that had the odor of sulfur. Within 3 hours after starting his work, JM complained of tightness in his

chest that made breathing difficult, and he called for help before becoming disoriented. How would you proceed to evaluate and treat JM?

With the description of poisoning symptoms, students can clear the mechanism of action of organophosphates and symptoms after poisoning, thereby knowing how to observe experimental phenomenon and detoxify the experimental animal by themselves before experimental operation.

Flipped classroom teaching mode is appropriately adopted in teaching. Some international students can be encouraged to observe the experimental operation of domestic undergraduates in the process of Medical Functional Experiment Science. Then, they will be asked to make a presentation about the experiment in their own lab class. Observing the experimental course can not only promote international students to accurately cultivate their correct, standardized operation and professional experimental skills, but also strengthen the exchange of language and culture between Chinese and foreign students, so as to mobilize the enthusiasm and initiative of international students.

The implementation of these new teaching methods enables students to learn to use reference books, network and library resources. Moreover, these teaching methods increase the interaction between students and teachers, active classroom atmosphere, and increase their interest in learning.

3.3. Establishing Effective Experimental Evaluation Mode

Based on the characteristics of international students pursuing high scores in course assessment, it is very necessary to develop a new experimental assessment system. The new assessment system can not only comprehensively test the performance and practical ability of students in the experiment course, but also fully mobilize the enthusiasm of international students. The new assessment system should include the following five aspects: attendance, pre-class review and questioning, experiment operation, experiment report writing, and the safety and hygiene. The proportion of each part can be flexibly adjusted according to the actual implementation of international students. It is hoped that the reform of this assessment system can achieve the purpose of restricting international students to attend class on time, preview experiment content before class, active hands-on operations during class, carefully write experimental reports, timely return experimental equipment and clean the lab after class.

4. Conclusion and Perspective

Medical Functional Experiment Science is considered as a new independent experimental course to improve the quality of medical education. This course not only enables students to verify and consolidate theoretical knowledge through experimental practice, but also cultivates students' ability to discover, analyze and solve problems. Under the new international situation, carrying out the teaching reform of Medical Functional Experiment Science is to adapt to the changing patterns of modern medical education. The appropriate application of the reform

in the experimental teaching can not only increase the communication between teachers and international students, guide them to effectively learn, help cultivate self-learning ability, improve their comprehensive literacy, but also expand our international influence of medical education to a certain extent.

However, there are still many challenges and limitations to ensure the efficacy of bilingual medical education in Chinese and English for international students. The faculty members and teachers must be fluent in both the languages and patient at the same time, demanding responsive and integrative practices from them which address all international students. As not all professors, teachers and faculties are capable enough to teach medical course in bilingual languages, there is a significant gap noticed in the teaching methods. Moreover, effective bilingual education programs and implementation guidelines around the world emphasize teacher qualification/training as important prerequisite for a program's success [7]. Thus, it is also very important to conduct extended teacher training courses.

In the future, we will continue to improve the content of experimental teaching, constantly explore new and effective experimental teaching methods, sum up the experience of teaching practice, push forward the reform of experimental teaching, and continuously strengthen the cultivation of young teachers in bilingual medical education, thereby improving teaching quality and cultivating "complex" medical talents adapted to the new era.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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