

# Teaching Reform and Practice of Functional Experiment Course based on Core Literacy Improvement

Xiulan Yang<sup>1, \*</sup>, Xia Dong<sup>1</sup>, Guangzhi Zhong<sup>2, \*</sup>

<sup>1</sup> Department of Pharmacology, Basic Medical School of Yangtze University, Jingzhou, Hubei, China

<sup>2</sup> Department of Nephrology, Jingzhou Hospital Affiliated to Yangtze University, Hubei, China

\* Corresponding author: Xiulan Yang (Email: 406490115@qq.com), Guangzhi Zhong (Email: 812007491@qq.com)

**Abstract:** Medical experiment teaching is the basic link of medical education and an important way to train medical students' practical ability and innovative spirit. In recent years, with the continuous development of medical education reform, the teaching reform of functional experiment has become the focus of attention. Based on the basic framework of the 5-year experimental teaching content of functional experiment for students majoring in clinical medicine, this paper carries out the teaching reform of "three integration, three connection and three evaluation" of the experimental course of kinesiology based on the core literacy training of medical students of different majors and levels, and probes into the implementation process and effect of the teaching reform. The practice shows that teaching reform has played a good role in promoting the cultivation of medical students' practical ability, innovative ability and core quality.

**Keywords:** Functional Experiment; Teaching Reform; Core Literacy; Curriculum Ideological and Political; Personnel Training.

## 1. Introduction

Education is of great importance to the state and the Party. Medical experiment teaching is an important part of medical education, which plays an irreplaceable role in cultivating the core quality, practical ability and innovative spirit of medical students. With the continuous development of medical education, medical experiment teaching also needs constant reform and innovation to meet the needs of socialist modern medical personnel training.

Functional experiment is a basic course for clinical medicine. It is a multi-domain integrated experimental course based on the theories of physiology, pathophysiology and pharmacology, which takes whole animals and isolated organ tissues as experimental objects to study various physiological activities and laws, pathophysiological changes, and the interaction between drugs and the body. As an important part of medical education, the functional experiment plays an important role in cultivating the core quality of medical students. In this paper, the teaching reform and practice of "three integration, three connection and three evaluation" are carried out in the experimental teaching of kinesiology, aiming to improve the quality and effect of medical experimental teaching, enhance the core quality and job skills of medical students, and help the construction of healthy China.

## 2. Reform of Experimental Teaching

### 2.1. Following the Characteristics of the Course, the Ideological and Political Education of the Course is Implemented Throughout the Course.

**Table 1.** Ideological and Political

Methods	Curriculum ideological and political integration point	Specific content
Dependent curriculum, Solidified resource	Functional science development	History of international and domestic medical functional discipline development
	Advanced pharmaceutical technology	Major innovative scientific and technological achievements in biopharmaceutical technology
	Typical clinical case	Can cooperate, partially cooperate, do not cooperate, new drug application patients
	Student assessment	Preview before class, experiment in class, homework, final exam
Flexible application related resources	Spirit of important speech	An important speech on teachers' ethics and medical ethics
	National policy document	Healthy China construction, disciplines, professions, industries, etc
	Deeds of advanced characters	Tu Youyou, Jiang Hualiang, Liu Changxiao, Xu Guojun and other advanced deeds of pharmacists
	Great spirit in fighting the epidemic	Life is supreme, the whole country is united, risking life and death, respecting science and sharing the destiny
	Examples of doctor-patient disputes	Doctor-patient disputes related to irrational drug use

With the ideological and political education concept of "stealthy knowledge points, smoothing things silently", based

on the industry and job requirements and the current situation of the development of Chinese medicine, combined with the actual teaching practice of functional experiment in our school, according to the professional characteristics, on the basis of investigation, literature review and collective discussion, the ideological and political elements of basic medicine, clinical medicine and other professional knowledge are deeply excavated from the aspects of medical ethics, professional quality, socialist core values and excellent traditional Chinese culture education. By relying on the curriculum solidification resources and flexible application of relevant resources, the ideological and political elements are silently integrated into all aspects of functional experiment teaching. The methods and contents of ideological and political education of the course are shown in Table 1.

## 2.2. Integration and Optimization of Teaching Content

Conscientiously implement the Opinions of The General Office of the State Council on Deepening the Coordination between Medical Education and Further Promoting the Reform and Development of Medical Education, taking the principle of "Strengthening the foundation, focusing on quality, cultivating ability and encouraging innovation" as the principle, focusing on improving students' learning interest, emphasizing the cultivation of students' practical ability, analytical problem-solving ability and innovative ability, and realizing the "three integration" of teaching content: That is, basic medical knowledge, clinical medical knowledge, curriculum ideological and political content organic integration.

A total of 72 class hours are divided into two semesters, and 24 class hours are started in the second semester, which mainly includes basic experiments and human physiology experiments, including basic knowledge of kinesiology, basic

operation of commonly used experimental animals, common surgical apparatus and surgical methods, virtual simulation experiments and some validation tests. 48 hours begins in the third semester, which mainly offers case discussion, comprehensive experiment and design experiment, focusing on cultivating students' comprehensive ability and innovation ability. The selection of the experimental teaching content of kinesiology follows the appropriate reduction of basic experiments, the increase of comprehensive experiments and design experiments, and the increase of case discussion. In the design of experimental teaching content, the relationship between real experiment and virtual experiment should be properly handled, and the principle of "combining virtual experiment with virtual experiment, complementing each other and being able to be real is not false" should be adhered to. Virtual experiment is mainly used as a necessary tool for pre-class preview and after-class review and consolidation. The virtual simulation experiment is used to supplement the real experiment in a few cases where the operation is difficult, the instrument is complex and time-consuming, and the large-scale student experiment cannot be set up, such as the pharmacodynamic evaluation of anti-senile dementia drugs.

## 2.3. Reform and Innovation of Teaching Methods

In close combination with all kinds of national health professional technical qualification examination modes, and with reference to the scoring standards of the national Clinical Skills Competition for medical college students, the specific post competency requirements are standardized, virtual simulation resources, videos, micro-lessons and other teaching methods are used to implement teaching methods such as online resources and offline classroom mixed teaching, case discussion and so on.

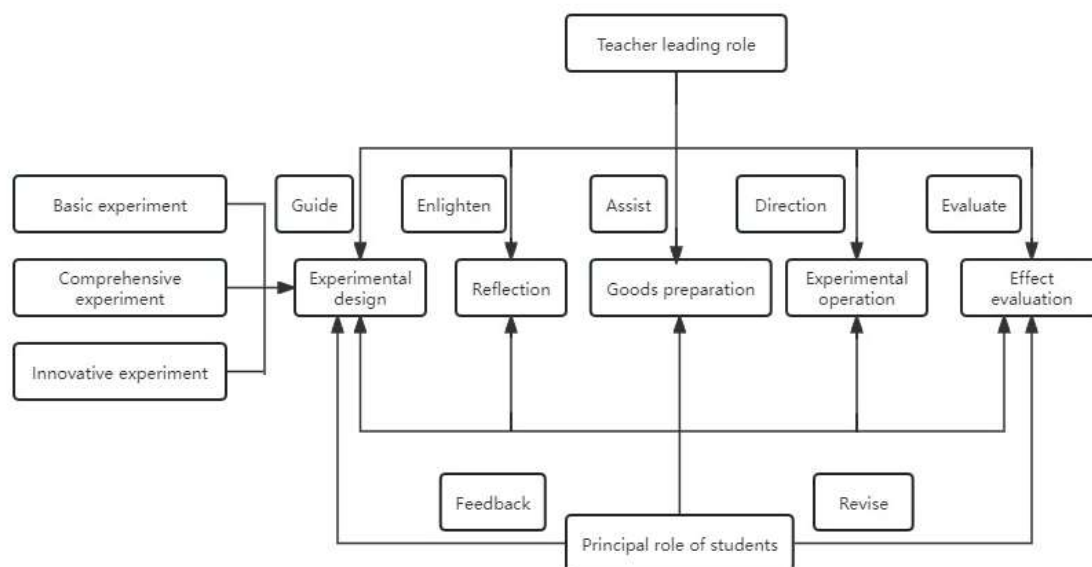


Fig. 1 "student-oriented" experimental teaching method

In the course of experimental teaching reform, the paper explores the "three connections" in the course of experimental teaching of kinesiology: before class, during class and after class. Before class, teachers arrange virtual experiments online as the main preview content, and send micro-videos, expansion materials and PPT courseware related to the

experiments to the online learning platform. Students use mobile phones or computer terminals to enter the virtual simulation experiment teaching platform to learn, and teachers answer questions online. In the class, the teacher elaborated the experimental content, the students completed the experiment independently in groups, the teacher guided

the tour, the field test, the individual counseling and answering questions, and the summary. After class, students write experimental reports, use the virtual simulation experiment teaching platform to consolidate knowledge again, reflect and summarize, and design innovative experimental projects. Excellent innovative experimental projects will be selected as scripts for virtual simulation experimental teaching projects, and will be actively incubated into virtual simulation experimental teaching projects with certain promotion and application value through discussion and co-construction with cooperative companies.

The whole teaching process is student-oriented and teacher-oriented (see Fig. 1). Teachers pay attention to "speech" and "example" in teaching, and students pay attention to "listening, watching, doing, remembering and thinking" in learning. Based on the above activities, the teaching practice record form is designed to make students truly "learn to think, think to understand, understand to do", and constantly stimulate students' learning enthusiasm, initiative and creativity.

#### **2.4. Reform and Improvement of Evaluation Methods**

In order to evaluate students' learning effect more comprehensively and promote students' all-round development, the paper constructs "three evaluations" of experimental teaching of functional science: network intelligence evaluation, student mutual evaluation and teacher comprehensive evaluation. Using the network intelligence assessment and the online classroom as the carrier, the students' online learning situation and learning quality are evaluated timely through the learning platform. Mobilize students to evaluate each other, and students form groups to communicate with each other and evaluate each other; To carry out the final evaluation of teachers, teachers will comprehensively evaluate the depth and breadth of students' learning, the ability and level of linking theory with practice, and the learning situation of students in online extra-curricular classes, offline practical classes and homework completion.

In the evaluation system, students' learning attitude, participation and comprehensive ability in the learning process are fully considered. The total score of the experimental course is 100 points, which is composed of two parts: process evaluation (i.e. normal grade 50%) and final grade (50%). Peacetime performance includes two parts: virtual evaluation and practical evaluation. The concrete implementation is divided into pre-class evaluation, in-class evaluation and after-class evaluation. Pre-class evaluation accounted for 20%, which was mainly calculated by the score of the background of the virtual experiment platform; Evaluation accounted for 50% of the class, which mainly consisted of classroom performance (10%), experimental operation (30%) and experimental results (10%). The after-class evaluation accounted for 30%, which mainly consisted of experimental report (10%) and innovative experimental project design scheme (20%).

### **3. Teaching Reform Results**

The reform of experimental teaching content and method has been carried out in the 2021 grade of clinical medicine major in the experimental teaching of kinesiology, and has achieved good expectations: (1) The reform of experimental

teaching of kinesiology has integrated the scattered knowledge in the theory class, deepened students' understanding of some concepts in the textbooks, and applied the knowledge and concepts in the books to the design of comprehensive experimental schemes. (2) Let students personally participate in the design of experimental scheme, which significantly improves students' learning interest and practical ability. After the whole experimental process, students not only master the experimental principle, improve the success rate of the experiment, but also learn the basic method of practical design, so as to combine theory with practice. (3) It has greatly improved students' understanding and mastery of the content of the experimental course, and the pre-class preview has increased from 20% to 95%, and the students' concentration on the experiment has been improved. (4) According to the evaluation content and questionnaire survey results of the educational administration evaluation system provided by the school, students like this interest-oriented experiment very much. The evaluation content is rich, and the form similar to real scientific research practice allows students to have scientific research experience. Through this complete process from experiment design to implementation to harvest results, students' sense of accomplishment arises naturally.

### **4. Summarize and Reflect**

The teaching reform and practice of the experimental course "three integration, three connection and three evaluation" has strongly supported the training goal of innovative medical talents, promoted the overall improvement of students' knowledge and ability, and generally satisfied with the feedback of students, and significantly improved the teaching quality. In the later stage, we will continue to follow up the latest national requirements for new medical talents, learn from the latest teaching and scientific research achievements in the biomedical field, combine our own characteristics, continue to deepen reform, explore methods, optimize and improve the curriculum training system, and cultivate compound talents with solid professional knowledge, adapt to future development, innovative thinking and all-round development.

### **Conflicts of Interest**

The authors declare that they have no conflict of interest.

### **Acknowledgements**

The present study was supported by Ministry of Education industry-university cooperative education project (NO.230906291250446).

### **References**

- [1] Kayal Lakshmanan, Fabrizio Tessicini, Antonio J. Gil, Ferdinando Auricchio. "A fault prognosis strategy for an external gear pump using Machine Learning algorithms and synthetic data generation methods", *Applied Mathematical Modelling*, Vol. 123, pp. 348-372, 2023. <https://doi.org/10.1016/j.apm.2023.07.001>.
- [2] Hao Guangping, Ren Yunqing, Che Changyan, et al. SWOT analysis on Ideological and political teaching reform of Medical Immunology "1233" course [J]. *Chinese Journal of Immunology*, 2024,40(06):1265-1270.
- [3] Miao Jinxin, Cao Lihua, Miao Mingsan. Teaching reform of animal experiment course for medical graduate students:

- Cultivating students' ability of active learning and innovative thinking [J]. Chinese Journal of Comparative Medicine, 2024,34(06):100-105.
- [4] Li Xiaohong, Chen Tengxin, Wang Kezhi, et al. Teacher subjectivity in the Context of Literacy Oriented Teaching reform: Necessity, essence and confirmation path [J]. Journal of hunan normal university education science, 2024, 23 (3) : 46 to 52. DOI: 10.19503 / j.carol carroll nki. 1671-6124.2024.03.006.
- [5] Chen Aidong, Wang Juejin, Xingxin Ya. A Preliminary study on the construction of a new system of "Trinity" Functional Experimental teaching [J]. Journal of physiology, 2020 regulation (6) : 724-729. The DOI: 10.13294 / j.a ps. 2020.0074.
- [6] Li Ning, Li Hongfang, Lin Meiling, et al. Reform and exploration of experimental teaching model in medical mechanics laboratory [J]. Laboratory Research and Exploration,2020,39(10):159-163. (in Chinese).
- [7] Xu Jing, Sun Yiping, Gong Dezheng, et al. Based on diversity function to teaching reform and practice of experimental platform construction [J]. Journal of experimental technology and management, 2018, 35 (12) : 191-194 + 201. DOI: 10.16791 / j.carol carroll nki SJG. 2018.12.048.