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Article

Exploration and Practice of WeChat Platform-Assisted Teaching in the "*Pharmacology*" Experimental Course

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Abstract: With the continuous progress of information technology, the field of medical education is also actively seeking innovative teaching models. WeChat, as a convenient and efficient learning and communication platform, has been increasingly applied in medical education. This article takes the experimental course of "*Pharmacology*" as the research object and adopts the WeChat platform for the organization and implementation of teaching activities, aiming to effectively address numerous issues such as insufficient ability in independent learning of students and unsatisfactory teaching effects in the process of medical experimental teaching. By comparing the teaching effects of the experimental group and the control group, the results indicate that the teaching method based on the WeChat platform can significantly enhance students' independent learning ability and learning efficiency, optimize the learning process, and promote the effective connection between theoretical knowledge and experimental teaching. Additionally, this article delves deeply into the unique advantages that the WeChat platform possesses in medical education, as well as the methods of effectively maintaining students' learning enthusiasm through appropriate adjustments to the teaching content. Overall, the research results demonstrate that this teaching model not only benefits the cultivation of students' good learning habits but also significantly improves the teaching effectiveness.

Keywords: WeChat platform; *Pharmacology*; experimental teaching; teaching evaluation

1. Introduction

The practice-oriented nature of medical education necessitates that students not only acquire theoretical knowledge but also develop proficient practical skills. However, due to the abstraction and complexity of medical education, there are also some pain points, like constrained class hours, complex course content, and diverse student proficiency levels, in medical experiment teaching that urgently need our consideration and solution.

Firstly, given the limited number of class hours, the content of experimental teaching is relatively complex. Medical experimental teaching and theoretical teaching often interpenetrate each other. In experimental teaching, the understanding of basic medical concepts and theories is frequently involved. This not only supplements and assists theoretical teaching but also provides an opportunity to deepen and consolidate theoretical knowledge. However, due to the duration limit of the course, this part of the content has been somewhat compressed, and a large amount of potential teaching information cannot be fully reflected in the course. How to make use of the limited course time to broaden students' knowledge base, enhance their experimental skills and increase their enthusiasm for independent experiments is an important proposition

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worthy of deep consideration. Secondly, the content of experimental teaching covers a wide range. Medical experiment courses often require students to master certain basic medical theories and holistic medical experiment thinking. How to help students build a systematic concept of medical experiments is also the difficulty of the course. Finally, students' levels vary greatly and there are significant differences in their majors. Since the students of medical experiment courses often come from multiple different majors, and the prerequisite courses set up by each major are not the same, the experimental operation training and experimental skills that students receive in their respective departments are also different. Combining with the characteristics of the above, to maximize the effect of experiment teaching, students are required to have similar experiment operation skills and knowledge quality, and in addition to the courses of ductility. To promote the teaching reform of medical experiment courses, implement the student-centered teaching reform concept, and improve teaching quality, this paper explores the application of task-driven teaching in medical experiment courses based on the WeChat platform. In-depth discussion and practice on this issue will help establish a brand-new experimental course teaching system that is more suitable for medical students.

A task refers to various purposeful activities that people undertake in their daily life, work, and entertainment. In the 1980s, a teaching method emphasizing "learning by doing" emerged, which was the predecessor of the task-driven teaching method. Traditionally, the task-driven teaching method refers to a teaching approach in which teachers guide students to master the learning content through practical problem-solving activities [1]. It is a teaching method based on constructivist teaching theory, and learners achieve learning outcomes of quantitative change leading to qualitative change by accepting learning tasks and completing them step by step. This method helps to cultivate students' comprehension abilities and divergent thinking, stimulates their learning enthusiasm, and enables them to truly become the main body of learning.

The WeChat platform teaching method is a novel approach nowadays. One study found that WeChat's enhanced social features foster peer interaction and discussion, thereby enhancing single or collaborative learning skills [2]. Additionally, WeChat's social functionalities provide a flexible and accessible teaching and learning environment. Within this framework, teachers guide students via a series of commands on this platform, aiming to stimulate learning motivation and cultivate comprehension abilities alongside divergent thinking [3]. This study investigated the WeChat platform teaching method within a *Pharmacology* experimental course, using its user-friendliness, extensive user base, and low cost to enhance students' learning ability.

2. Methods

2.1. Participants and Group Assignment

A total of 78 undergraduate students from Guizhou Medical University participated in this study. Participants were comprised of 39 students from the 5th-year Nursing program and 39 students from the 5th-year Pharmacy Management program. They were randomly assigned to two independent classes for parallel instruction: Control Group (n = 39): Received instruction using traditional experimental teaching methods. Experimental Group (n = 39): Received instruction utilizing the WeChat platform-based teaching method.

2.2. Curriculum Design for the WeChat Platform Teaching Method

This study structured and delivered the content for the "*Pharmacology*" experimental course via the WeChat platform [4]. The instructional design encompassed three phases. (1) Pre-class: Instructors distributed preparatory materials and diagnostic quizzes via WeChat to guide student self-study. (2) In-class: Specific experimental procedures and instructional videos were pushed to guide students through hands-on operations and the step-by-step completion of experimental reports. (3) Post-class: Instructors conducted course summaries and assessments through the platform, while students provided feedback to consolidate learning outcomes.

2.3. Statistical Analysis

Data analysis was performed using SPSS software (version 23.0). Independent samples *t*-tests (or appropriate parametric/non-parametric tests) were conducted to compare the performance of the two groups across three key assessment metrics: preview materials, test records, after-class quiz.

3. Implementation of the WeChat Platform-Based Experimental Teaching Method: A Case Study in *Pharmacology*

Pharmacology is a core discipline for medical and related health professions, characterized by its strong experimental component. This section details the specific application of the WeChat platform-based teaching method within the *Pharmacology* experimental course, serving as a representative case study. The teaching content was systematically organized and delivered via the WeChat platform, encompassing the entire instructional cycle: pre-class, in-class, and post-class phases (Figure 1).

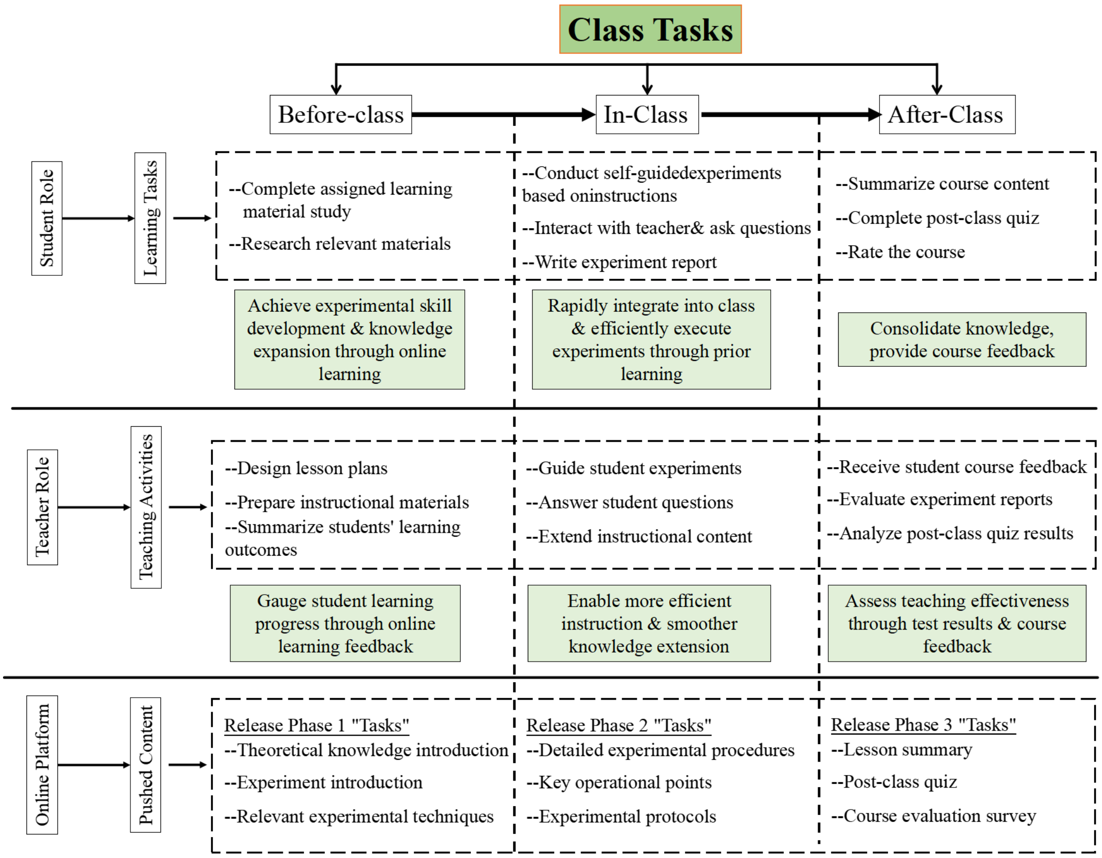

Figure 1. Application of the network platform push Function in Medical Experiment Teaching.

3.1. Pre-Class Phase: Guided Preparation via the WeChat Platform

One week prior to the scheduled laboratory session, the instructor disseminated relevant pre-class materials through the dedicated Pharmacology WeChat public account. These materials included: A review and extension of theoretical knowledge pertinent to the upcoming experiment. An introduction to the experiment's fundamental principles and explanations of key procedural skills. Instructors integrated relevant Pharmacology MOOC resources and employed diverse instructional formats. Students were guided to: Watch procedural demonstration videos. Complete pre-class quizzes. Submit experimental pre-reading reports. Engage in asynchronous interaction via the WeChat public account messaging feature.

This structured pre-class phase enabled students to conduct self-directed learning based on the pushed content, complete online self-assessments, deepen their understanding of the experiment's objectives and critical points, and formulate preliminary thoughts. Concurrently, instructors utilized the platform's analytics functions to monitor student engagement (e.g., access logs), analyze pre-assessment scores and feedback, gain insights into student preparedness, and provide timely oversight.

3.2. In-Class Phase: WeChat-Guided Experimental Instruction

After the course officially began, due to the study of the introductory content of the previous courses, students already had a certain understanding of the knowledge of this course. After the teacher quickly introduced the relevant theoretical knowledge and basic operation principles of the course, specific experimental operation steps and operation videos were pushed through the WeChat platform, such as: how to anesthetize rabbits, how to dissect the common carotid artery of rabbits, how to perform arterial ligation, how to perform arterial cannulation, etc. The entire experimental course content was divided into several specific “TASKS”. Students completed the tasks one by one according to the prompts, exploring and experimenting independently. Teachers acted as a coach and guide, guiding students to complete the specific experimental steps, and promptly answering students’ questions when encountering problems during the experiment.

When setting up the push content, the first step was to split and reorganize the specific “TASKS” based on the experimental content and key nodes, and divide the experiment into several parts for hierarchical push. Secondly, the “push” content should be written according to the importance of the experimental content, rather than simply copying the experimental manual. For the content that needed to be focused on, additional relevant information can be added to assist teaching, such as principle videos and operation videos; for the content that needs to be familiarized with or understood, the length can be shortened. Moreover, this form also facilitates teachers to flexibly add elements such as humanities and ideological and political content during the learning process. Under the stimulation of the WeChat push and the guidance of the teacher, students completed the textbook experimental content step by step and in a hierarchical manner.

Taking “Experimental Teaching in Pharmacology—Effects of Drugs Acting on the Peripheral Nervous System on Rabbit Arterial Blood Pressure” as an example, the main teaching content of the course is first divided into the following 3 parts (Figure 2). Students performed experimental operations according to the pushed instructions for each phase. Progression to the next phase occurred only upon instructor verification of satisfactory completion of the current phase and provision of necessary guidance, thereby ensuring experimental rigor. The final phase culminated in instructor confirmation of overall experiment completion and provision of summative feedback.

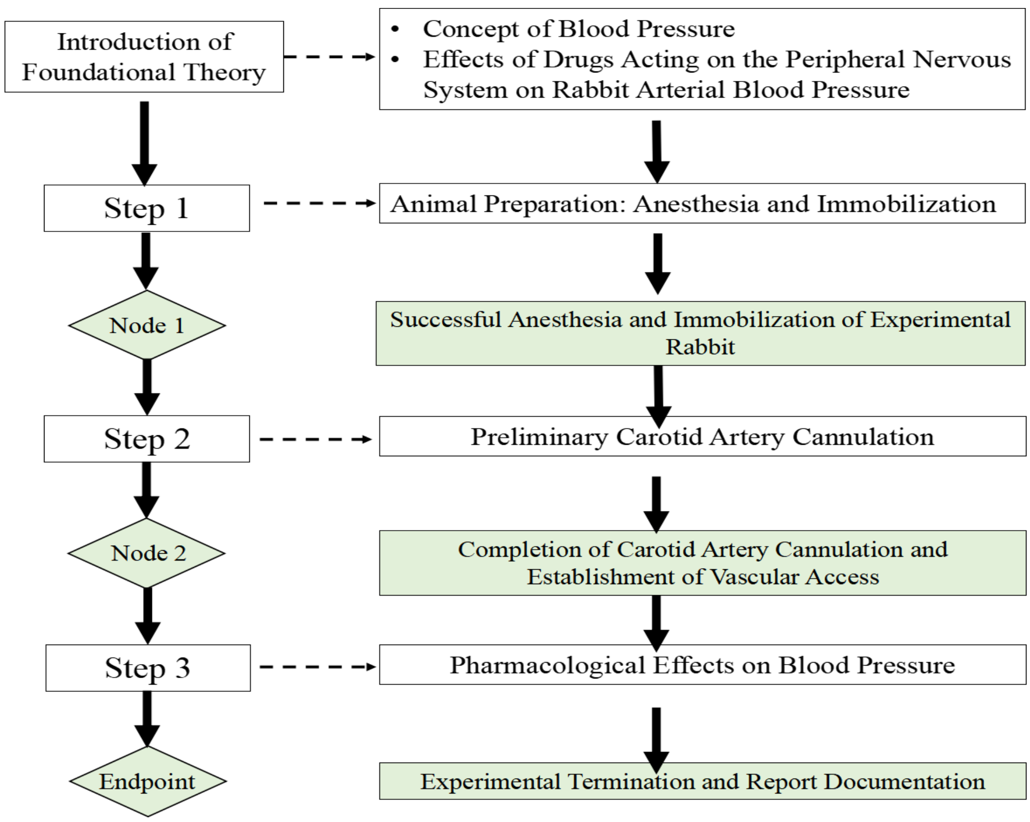

Figure 2. Task-Driven Procedure for the Experimental Teaching of “Effects of Autonomic Drugs on Arterial Blood Pressure in Rabbits”.

3.3. Post-Class Phase: Consolidation and Assessment via the WeChat Platform

Learning continued beyond the laboratory session through targeted post-class activities delivered via WeChat push notifications, focusing on three key aspects: Course Summary: A concise synthesis of the experimental content was provided to aid student review and consolidation of learning. Formative Assessment: Short quizzes focusing on 2–3 critical knowledge points related to the experiment were administered. These quizzes, designed to minimize time burden, reinforced core concepts and evaluated students' understanding of the experiment's underlying principles, procedures, and theoretical foundations. Performance Feedback: Constructive feedback on student performance during the laboratory session was provided to deepen skill acquisition. Collectively, these three components established a closed-loop learning cycle for the entire course module.

3.4. Integrated Assessment System

This approach fostered the development of a novel, multi-faceted assessment system distinct from traditional models. Evaluation incorporated: Completion and quality of pre-class learning activities. Level of participation and successful execution of tasks during the in-class experimental phase. Engagement with and completion of post-class consolidation activities and feedback. By integrating the entire learning process into the assessment framework, the system achieved greater objectivity and comprehensiveness, while simultaneously enhancing student motivation and fostering proactive learning engagement.

3.5. Practical Effect

Both groups underwent the "*Pharmacology*" experimental course following a comparative teaching approach. The mean age of the control group was 21.2 ± 0.8 years, and that of the experimental group was 20.9 ± 0.9 years. No statistically significant difference in mean age was observed between the groups ($p > 0.05$).

Pre-class Self-Assessment Test Scores: Evaluated baseline understanding before the experimental session.

In-class Experimental Record Scores: Assessed by the instructor upon completion of the in-class activities, reflecting procedural execution and understanding during the experiment.

Post-class Assessment Scores: Measured knowledge retention and consolidation after the session.

The results of these analyses are presented in Table 1. Statistically significant differences were found between the control and experimental groups across all three assessment measures (preview materials, test records, after-class quiz; $p < 0.05$). Students in the experimental group demonstrated significantly higher mean scores on all three evaluations compared to the control group.

Table 1. Analysis of the Differences in teaching Evaluation Results between the Experimental Group and the Control Group.

Category	Learning Content	Groups	Scores	*t*	*p Value*
Pre-class	Preview materials	Control group	19.90 ± 4.1	2.035	<0.05
		Experimental group	21.46 ± 2.5		
In-class	Test records	Control group	85.69 ± 1.49	3.35	<0.001
		Experimental group	86.94 ± 1.81		
Post-class	After-class quiz	Control group	17.56 ± 8.34	2.703	<0.01
		Experimental group	22.57 ± 8.55		

The observed superior performance of the experimental group can be attributed to the distinctive features of the WeChat platform-based instructional method, which encompasses a structured three-phase approach: pre-class self-assessment facilitated the effective delivery of preparatory content, leading to enhanced student preparedness as evidenced by higher pre-test scores; systematic in-class guidance through the platform enabled structured execution of learning procedures, resulting in improved quality of experimental records; and post-class assessment, supported by the delivery of summaries and key knowledge points, effectively reinforced knowledge consolidation and retention, contributing significantly to higher post-test scores.

4. Discussion and Conclusions

The traditional experimental teaching model focuses on the imparting of knowledge and mainly relies on the direct narration by the teacher. It has the following shortcomings: (1) The teaching content is extensive and dull; (2) It is mainly based on the one-way transmission of knowledge by the teacher; (3) It fails to motivate the enthusiasm for independent learning. Medical experimental teaching places more emphasis on students' independent thinking ability, practical skills, and teamwork spirit. Therefore, it is urgent to develop innovative education models and teaching methods that can stimulate students' enthusiasm for learning. In task-driven teaching, teachers can stimulate students' interest in learning and their strong desire for knowledge by creating actual scenarios and introducing specific “TASKS” [5]. This helps students gradually overcome difficulties, progress step by step, and unravel the threads through the process of independent exploration, ultimately becoming the true learning subjects.

With the continuous advancement of smart phones and internet technologies, the WeChat public platform, as a teaching and learning aid, has received increasing attention and application in medical education. Firstly, the unique push function of the public platform can be perfectly applied to the assignment of “TASKS” in experimental teaching. At the same time, teachers can view and check the learning data through the backend, and can also effectively supervise students' completion of the learning “TASKS”. Secondly, the public platform can perfectly connect with online learning resources. Through the platform, teachers can easily incorporate MOOCs, gold courses content, and other free learning websites' content into students' reference materials, such as experimental principle videos, experimental operation videos, and related knowledge quizzes for experiments, etc., fully leveraging the advantages of network resources. Moreover, the WeChat public platform makes it more convenient for teachers to prepare lessons and for students to study. The public platform has low requirements for hardware facilities, has a clear internet framework, and is easy to edit and operate, enabling teachers to create teaching content and operate the platform independently; from the students' perspective, they only need to follow the relevant course public accounts to achieve mobile learning.

This study innovates the assessment system by establishing a novel multi-dimensional framework leveraging the WeChat platform, characterized by a student-centered focus that shifts evaluation paradigms towards active participation and autonomous learning through integrated self-, peer-, and instructor-assessment; process-oriented evaluation prioritizing continuous learning progression over solely final outcomes, enabling instructors to track performance dynamically during activities, promptly identify challenges, and provide timely guidance for continuous improvement; and diversified assessment content reflecting varied activity requirements via experimental procedures, case analyses and group discussions to evaluate multifaceted learning outcomes including knowledge mastery, skill application, teamwork, and innovative thinking.

Overall, the learning mode based on the WeChat platform has also enhanced the convenience of learning, increased the diversity of learning methods, and better has aligned with the current concept of fragmented learning and learning anytime and anywhere. It is believed that with the continuous refinement of this teaching method and the continuous accumulation of teaching experience in the future, its teaching effect in medical experiments will be further improved, and more well-rounded medical talents will be provided for the society.

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Conflicts of Interest

The authors declare no conflict of interest.

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