

Exploring the Application Effect of Flipped Classroom Combined with Problem-Based Learning Teaching Method in Clinical Skills Teaching of Standardized Training for Resident Doctors of Traditional Chinese Medicine

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Abstract

Objective: To explore the application effect of flipped classroom combined with problem-based learning teaching method in clinical skills teaching of standardized training for resident doctors of traditional Chinese Medicine.

Methods: The study used the experimental control method. The study lasted from September to November 2022. The subjects of this study were 49 students of standardized training for resident doctors of traditional Chinese Medicine from grades 2020, 2021 and 2022 of Dazhou integrated TCM & Western Medicine Hospital. They were randomly divided into experiment group (25) and control group (24). The experiment group adopted flipped classroom combined with problem-based learning teaching method, and the control group adopted traditional teaching method. The teaching content was 4 basic clinical skill projects, including four diagnoses of traditional Chinese Medicine, cardiopulmonary resuscitation, dressing change procedure, acupuncture and massage. The evaluation method was carried out by comparing the students' performance and a self-designed questionnaire was used to investigate the students' evaluation of the teaching method. **Results:** The test scores of total scores in the experimental group (90.12 ± 5.89) were all higher than those in the control group (81.47 ± 7.96) ($t = 4.53$, $P < 0.01$). The experimental group believed that flipped classroom combined with problem-based learning teaching method was superior to the traditional teaching method in terms of improving classroom learning efficiency, enhancing self-learning ability, improving skill proficiency, and enhancing clinical operation confidence (all $P < 0.01$). **Conclusions:** The teaching process of the flipped classroom combined with prob-

lem-based learning teaching method is conducive to improving the efficiency of classroom teaching, cultivating students' self-learning ability, and enhancing students' willingness to learn.

Keywords

Standardized Training for Resident Doctors of Traditional Chinese Medicine, Clinical Skills Teaching, Flipped Classroom, Problem-Based Learning Teaching Method

1. Introduction

In September 2020, the General Office of the State Council issued *the Guiding Opinions on Accelerating the Innovative Development of Medical Education*, encouraging standardized training base for resident doctors of traditional Chinese medicine to innovatively develop post-graduation medical education based on the basic principles of new concepts, new positioning, new connotation and new Medicine, and exploring the application of innovative means of medical education in the standardized training of traditional Chinese medicine resident doctors and the reform of teaching methods [1]. The standardized training of traditional Chinese medicine resident doctors (hereinafter referred to as "STTCM") is an important part of post-graduation medical education of Chinese medicine graduate and a basic part in the construction of the team of Chinese medicine clinicians, which is aiming to cultivate qualified traditional Chinese medicine resident doctors with good professional ethics for various medical institutions at all levels, mastering solid basic theories, professional knowledge of Chinese medicine, and clinical skills, necessary modern medicine knowledge and technology, and be able to independently handle the diagnosis and treatment missions of common diseases, frequently occurring and difficult and critical diseases. Especially, cultivating general practitioners of traditional Chinese medicine who are competent for their posts in urban and rural grassroots medical and health institutions is important goal, too [2]. Flipped classroom is a teaching strategy that encourages students to learn knowledge by themselves outside the class and apply what they have learned to solve practical problems in the classroom [3]. PBL (problem-based learning) teaching method is a problem-based learning teaching method, which emphasizes guiding students to learn by themselves and improving students' ability to analyze and solve problems. In clinical medicine, it is a kind of group discussion form which is guided by cases, based on problems, takes student as the core, and is oriented by teacher, and a kind of teaching model that focuses on the diagnosis and treatment of a specific medical topic or specific case [4]. Flipped classroom and PBL teaching methods have realized student-centered pre-class learning, and teacher-leading in-class practice [5], both of which are considered to be effective teaching models, helping to cultivate medical students' clinical thinking and practical ability, and improving students' learning interest and

autonomous learning ability [6]. However, there are few researches on the combination of flipped classroom and PBL teaching method with the clinical skills teaching of “STTCM”. Therefore, this research attempts to use the flipped classroom combined PBL teaching method (hereinafter referred to as the “CTM”) in the clinical skills teaching of “STTCM”, analyzing and evaluating its teaching effect, and explore a new method of clinical skills teaching of “STTCM”.

2. Objects and Methods

2.1. Research Object

From September to November 2022, 49 students of “traditional Chinese medicine training” at 2020, 2021 and 2022 in Dazhou integrated TCM & Western Medicine Hospital were selected as research objects, including 19 boys and 30 girls. All subjects had informed consent to the content of this study.

2.2. Research Method

This study adopts the experimental control method. 49 students were randomly divided into experimental group and control group, 25 students in experimental group and 24 students in control group. The gender difference between the two groups was not statistically significant ($\chi^2 = 0.10$, $P = 0.910$). The scores of students in the experimental group in the early clinical skill examination were (85.53 ± 5.01) points, while those in the control group were (85.34 ± 3.36) points, with no statistically significant difference ($t = 0.18$, $P = 0.875$). The age of the experimental group was (26.20 ± 0.83) years old, and the age of the control group was (25.88 ± 0.86) years old, with no significant difference ($t = 0.89$, $P = 0.336$). The two groups of students are comparable.

2.3. Teaching Implementation

The two groups of students have the same syllabus, teaching materials, teaching hours, assessment methods and teaching teacher qualifications. This study relies on the flip training courses of TCM clinical skills required by the standardized training standards for Chinese medical residents, so four operation items are selected: “four diagnostic methods of Chinese medicine”, “cardiopulmonary resuscitation”, “drug exchange”, and “acupuncture and massage”. All the trainees have received training on other operation items (such as thoracic puncture) among more than 20 operation skills required by the National Examination for Traditional Chinese Medicine Practitioners, and the training items and contents are consistent, all of which adopt traditional teaching methods. The four operations are taught in turn. The learning time for each operation of the two groups of students is 90 minutes, and the four operations are 360 minutes in total.

1) Teaching of experimental group Adopt the joint teaching method. The learning arrangement of each operation is as follows: a) Study before class. Teachers will publish the operation-related guide and standard operation video to the students’ WeChat group 3 days in advance. The trainees learned the theo-

retical knowledge related to operation by consulting books, watching videos, etc., and completed at least one exercise with the help of the medical vision information examination system to get familiar with the operation process. The examination system generates feedback reports for students' reference, and also summarizes students' scores to form analysis reports and send them to teachers.

b) Classroom teaching. In the first 30 minutes, the teacher gives the medical records related to skill operation, guides the students to use the theoretical knowledge learned themselves before class, and discusses the medical records around the indications and contraindications of the operation. After that, according to the pre-class analysis report, the teacher summarized the common mistakes in the students' operation and conducted targeted teaching. In the last 60 minutes, students use the model to carry out operation exercises and give feedback guidance in teaching.

2) Control group teaching Traditional teaching methods are adopted. The learning arrangement of each operation is as follows: In the first 60 minutes, teachers focus on the theoretical knowledge and operation steps related to operation, and play standard operation videos or on-site teaching; After 30 minutes, students use the model to practice operation, and the teacher gives feedback and guidance.

2.4. Teaching Effect Evaluation

1) Operation assessment after the teaching of the four operations is completed; the two groups of students will be assessed for practical operation. The full score of each operation is 25, and the total score is 100.

2) Questionnaire survey after the completion of the questionnaire operation assessment, the students in the experimental group shall be investigated and the self-made questionnaire shall be distributed. The questionnaire is a rating scale. Students can only give an integer score if they agree with each item by 5 points and disagree with each item by 1 point. The main contents of the questionnaire include the students' acceptance of the teaching effect, as well as the grading of the flipped classroom combined PBL teaching method. The Cronbach coefficient of the questionnaire is 0.745, with high internal consistency and reliability.

2.5. Statistical Treatment

The EXCEL2016 software was used to establish the database, and SPSS18.0 software was used for data statistics. Measurement data were expressed by mean \pm standard deviation, and independent sample t-test was used for comparison between groups. $P < 0.05$ means the difference is statistically significant.

3. Results

3.1. Comparison of Assessment Results between the Two Groups of Students

The total scores of the students in the experimental group and the scores of the

four operations were better than those in the control group, and the differences were statistically significant. See **Table 1** for specific results.

3.2. Questionnaire Survey Results of Students in the Experimental Group

A total of 25 questionnaires were distributed to students in the experimental group, and 25 valid questionnaires were recovered, with a recovery rate of 100.0%. The survey results showed that 96.0% (24/25) of the students believed that flipped classroom combined with PBL teaching method was conducive to the learning of clinical skills of “traditional Chinese medicine training”. Students generally accept the joint teaching method. In comparison with traditional teaching methods, students believe that the former is superior in improving classroom learning efficiency, enhancing self-study ability, improving skill operation proficiency, enhancing clinical operation self-confidence and enhancing learning motivation. Compared with traditional teaching methods, the difference is statistically significant. See **Table 2** for specific results.

Table 1. Comparison of the clinical operation skills of the two groups of students in the standardized training of traditional Chinese medicine residents at 2020, 2021 and 2022 levels in Dazhou integrated TCM & Western Medicine Hospital (points, $\bar{x} \pm s$).

project	Experimental group (n = 25)	Control group (n = 24)	t-value	P-value
Four diagnostic methods of traditional Chinese medicine	23.15 ± 1.71	22.05 ± 2.21	4.58	<0.01
Cardiopulmonary resuscitation	22.75 ± 1.46	20.45 ± 1.84	5.02	<0.01
Dressing change	22.25 ± 1.61	20.55 ± 2.52	4.87	<0.01
Acupuncture and massage	21.35 ± 1.36	20.05 ± 2.68	3.79	<0.01
Total score	90.12 ± 5.89	81.47 ± 7.96	4.53	<0.01

Table 2. The evaluation of the two teaching methods by 49 students in the standardized training of Chinese medicine residents at 2020, 2021 and 2022 levels in Dazhou integrated TCM & Western Medicine Hospital Comparison (points, $\bar{x} \pm s$).

Scoring content	Combined teaching Methodology	Traditional teaching Methodology	t-value	P-value
Improve learning efficiency	4.67 ± 0.71	3.65 ± 0.21	6.06	<0.01
Enhance self-study ability	4.79 ± 0.46	3.45 ± 0.84	6.12	<0.01
Improve skill and operation proficiency	4.49 ± 0.61	3.55 ± 1.32	4.67	<0.01
Improve skill and operation proficiency	4.54 ± 0.36	3.70 ± 1.08	3.79	<0.01
Enhance learning motivation	4.59 ± 0.85	3.78 ± 0.69	4.36	<0.01

4. Discussion

4.1. Joint Teaching Method Is Helpful for Students to Master Operational Skills

The results of this study show that the total scores and four operation scores of the experimental group were better than those of the control group. The differences are statistically significant. The reason is that the students in the experimental group can consult the learning materials before class, observe the standard operation video, complete the “memory” and “understanding” of knowledge, and then use the “YISHIJIE” examination system to evaluate and practice before class, and get the information feedback provided by the system, so that the students can accurately evaluate the degree of mastery of their own knowledge and help them complete the internalization and transfer of their own knowledge. At the same time, the teaching process takes practice preparation and medical history analysis as the starting point, from clinical decision-making to skill operation, simulating the clinical practical operation process, which is helpful for the students to master the operation skills better.

4.2. Joint Teaching Method Is Helpful to Improve Classroom Learning Efficiency

The results of this study show, after comparing the two teaching methods, the students in the experimental group think that the Joint teaching method can improve the efficiency of classroom learning. The theoretical knowledge related to operation is relatively simple and easy to understand, but it can not be separated from hundreds of repeated exercises to complete the complex operation process skillfully and accurately. Therefore, in order to improve the teaching efficiency of operational skills, it is necessary to increase the practice time of students and strengthen the feedback and guidance in the process of practice. This is consistent with Bloom’s theory [7] of mastering learning and teaching. Compared with the traditional teaching methods, in the Joint teaching method, firstly, we provide students with learning materials before the class, put the relatively easy theoretical knowledge learning in front of the class, and use the most valuable classroom time for case-based teaching. Through case discussion, we review the students’ knowledge learning level before the class, complete the knowledge teaching in a way of missing and filling, shorten the classroom theoretical teaching time, and correspondingly extend the students’ practice time; Secondly, The medical vision examination system generates students’ performance analysis reports, which can intuitively reveal students’ weaknesses and common mistakes in practice to teachers. Classroom teaching starts directly from correcting mistakes, which not only helps teachers to save more time for students to practice, but also makes it easier for teachers to find common problems among students, and improve feedback efficiency through targeted guidance. At the same time, teachers can also query the practice report of each student separately, which is helpful to guide the students individually and teach

students according to their aptitude.

4.3. Joint Teaching Method Helps to Cultivate Students' Self-Study Ability and Improve Their Interest in Learning.

The results of this study show that the students in the experimental group think that the joint teaching method is helpful to cultivate self-study ability and improve their interest in learning. The flipped classroom teaching method fully mobilizes the students' initiative before class, and also gives the students the opportunity to grasp the learning progress flexibly according to their own conditions. This conclusion is consistent with the results of the relevant literature research [8]. At the same time, PBL teaching method requires classroom teaching to start with case discussion, requiring students to actively participate in the discussion, actively think about problems, and actively apply what they learned before class to actual cases. With the solution of clinical problems, students are more likely to experience a sense of achievement in learning, so as to establish self-confidence in clinical operation, establish positive feedback of self-motivation, and improve the initiative of learning.

5. Conclusion

The joint teaching method is helpful to the study of clinical skills of "STTCM training". Using this kind of teaching process with practice as the starting point in clinical skill teaching is helpful to improve classroom learning efficiency, cultivate students' self-study ability, enhance students' willingness to learn, and reduce the burden of teachers to a certain extent. The application of flip classroom combined PBL teaching method in the teaching of clinical skills of "traditional Chinese medicine" needs a larger research sample and a longer follow-up study to be verified.

Conflicts of Interest

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

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