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Application of Flipped Classroom Teaching Model in Case Teaching for Professional Degree Postgraduates of Stomatology

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Abstract

Objective: To explore the application effect of the flipped classroom teaching model in case teaching for professional degree postgraduates majoring in stomatology. **Methods:** A total of 68 first-year professional degree postgraduates of stomatology in a medical college were selected and randomly divided into two groups. The traditional teaching mode was used in the control group, and the test group selected the mixed teaching mode of case teaching + flipped classroom. After the course, two groups of students were evaluated for teaching effect. **Results:** Compared with the traditional teaching mode, the students in the experimental group scored higher in the theoretical assessment of clinical thinking ability ($P < 0.001$), and the evaluation of each teaching effect was also higher ($P < 0.05$). **Conclusions:** The flipped classroom teaching model has been tried in the case teaching of professional degree postgraduates of stomatology, which has achieved a good teaching effect and can be widely used.

Keywords

Stomatology, Professional Degree Postgraduate, Case Teaching, Flipped Classroom, Clinical Thinking Ability

1. Introduction

The Ministry of Education clearly put forward in the *Opinions on Deeply Promoting the Reform of the Training Mode of Postgraduates with Professional Degrees* that the training of professional degree postgraduates is "Guided by professional needs and focused on the cultivation of practical ability". Improving

the clinical thinking ability of professional degree postgraduates is the internal regulation and root of their training objectives. With the rapid development of stomatology education, the education of professional degree postgraduates of stomatology has become an important link in the training of stomatology talents in China (Wu et al., 2009). How to strengthen the cultivation of their clinical thinking ability, improve the students' post-competence and meet their professional needs has become an urgent task of postgraduate education in stomatology colleges.

From the perspective of teaching and learning, the teaching team has constructed an online and offline case teaching mode of "student-centered—case-based—problem-oriented—clinical thinking as the main line—multiple teaching methods combined", explored a case teaching mode suitable for the professional needs of graduate students of stomatology, and made it meet the requirements of the goal of cultivating high-quality applied medical talents.

2. Research Objects and Methods

2.1. General Information and Grouping

From September 2019 to July 2022, 68 first-year professional degree postgraduates majoring in stomatology in a medical college were selected as the subjects, including 31 males and 37 females, with an average age of (23 ± 1) years. They were randomly divided into two groups, with 34 students in each group. Control group: traditional teaching mode was used. Test group: selected the mixed teaching mode of case teaching + flipped classroom.

2.2. Teaching Method—Taking the Case Teaching Reform of Prosthodontics as an Example

2.2.1. Control Group

The traditional teaching mode based on the teacher's explanation is selected, and the case is integrated into the teaching process.

2.2.2. Test Group

Select the mixed teaching mode of case teaching + flipped classroom. It is divided into three stages: before class, during class and after class: 1) Before class: According to the characteristics of the teaching content and teaching needs, the teachers release theoretical knowledge learning tasks, and propose 2 - 3 typical cases and related problems. The students complete theoretical learning and case analysis before class, and propose solutions to problems in the way of mind mapping. 2) During class: a) Teaching link: With the help of smart classroom and rain classroom smart teaching tools, test questions are sent to check the students' learning effect before class, and key supplementary explanations are given to the knowledge points that students are confused about. b) Discussion link: Students are divided into 2 - 3 groups by using the random grouping function of Rain Classroom, and each group is allocated with medical records by

drawing lots. Group discussions are conducted to form unified opinions within the group, and the mind map is uploaded to the Rain Classroom platform in the form of a contribution. c) Case report: The team leader reports the case with the help of the mind map, and the team members need to reply to the questions or different opinions raised by the other group of students. d) Conclusion: The lecturer analyzes, revises and summarizes the deficiencies and problems in the discussion. e) Evaluation: Release the QR code and complete the mutual evaluation between students, teachers and students. 3) After class: The teacher releases the homework in combination with the research hotspots or new problems related to the case.

2.2.3. Evaluating Indicator

The teaching effect is evaluated after the implementation of the two teaching methods.

1) Theoretical assessment of clinical thinking ability: It is composed of single choice questions (A3, A4 type questions) and subjective questions (case analysis), with 50 points each and 100 points in total.

2) Teaching effect evaluation: At the end of the semester, a self-designed questionnaire is used to evaluate the teaching effect of the students participating in the study. The survey content includes the following three items: clinical thinking ability, autonomous learning ability, communication, and teamwork ability. Students give scores to each item, with a maximum of 10 points and a minimum of 0 points (Attached questionnaire, see Table 1).

2.3. Statistical Method

SPSS13.0 software is used for statistical analysis, the measurement data is expressed in ($\overline{x}$ ± s), the group t-test is used, and the inspection level is $\alpha = 0.05$.

Table 1. Questionnaire on teaching effect.

Evaluating indicator	10 - 8 points	8 - 6 points	<6 points	score
clinical thinking ability	It can significantly improve clinical thinking ability.	It is helpful to improve clinical thinking ability.	It is not helpful for the cultivation of clinical thinking ability.	
autonomous learning ability	It can significantly improve the willingness and ability of self-learning.	It is helpful to improve the ability of self-learning, but the willingness of self-learning is not strong.	It is not helpful for the cultivation of self-learning willingness and ability.	
communication and teamwork ability	It can significantly improve communication and teamwork ability.	It is helpful to improve communication and teamwork ability.	It is not helpful for communication and teamwork ability.	

Table 2. Comparison of the theoretical examination results of clinical thinking ability between two groups of students ($\bar{x}$ ± s, score).

Teaching method	Theoretical examination result	*T value*	*P valve*
Control group	73.10 ± 3.55	15.40	<0.001
Test group	86.10 ± 3.40		

Table 3. Comparison of teaching effect evaluation between two groups of students ($\bar{x}$ ± s, score).

Teaching method	Clinical thinking ability	Self-learning ability	Communication and teamwork ability
Control group	6.09 ± 0.71	5.71 ± 0.68	5.59 ± 0.56
Test group	8.77 ± 0.86	8.94 ± 0.85	8.65 ± 0.85
U value	10	2	2
P value	<0.001	<0.001	<0.001

3. Result

3.1. Comparison of the Theoretical Examination Results of Clinical Thinking Ability between Two Groups of Students

Compared with the traditional teaching mode, the theoretical assessment of students' clinical thinking ability under the mixed teaching mode of case teaching + flipped classroom is higher ($P < 0.001$, see Table 2).

3.2. Scores of the Questionnaire on Teaching Effectiveness of the Two Groups of Students

The students in the mixed teaching mode group of case teaching + flipped classroom have a higher evaluation on various teaching effects than those in the traditional teaching mode group ($P < 0.05$, see Table 3).

4. Discussion

Stomatology, as a first-class medical discipline, has a strong operational characteristic. However, in the actual training process of professional and master degree education in stomatology at this stage, more attention has been paid to the academic nature of professional degree talents, and their clinical thinking ability has been ignored, especially the link from theoretical learning to practical training is relatively weak (Dai & Song, 2018; Nghia, 2017). How to form a "student-centered" teaching atmosphere in the postgraduate stage, stimulate students' enthusiasm for learning, strengthen the cultivation of clinical thinking ability, and shorten the distance between the classroom and society, theory and practice, is worth our further thinking and research.

Case teaching is an exploratory teaching mode based on practical experience. Based on real cases, it provides situational access close to clinical practice. Through situational experience, task setting and completion, and role-playing, it enables

professional graduate students to promote clinical thinking ability from the perspective of the practicality of knowledge transfer and the situational transformation of knowledge in realistic application situations (Nghia, 2017). However, the traditional case teaching mode still takes teachers as the main body, which is still difficult to promote students' personalized learning and team cooperation. The improvement of clinical thinking ability also has certain limitations. It is of great theoretical and practical value to explore and improve the effective methods and quality assurance of case teaching.

In order to give a more effective play to the role of knowledge transformation of case teaching for professional degree postgraduates majoring in stomatology, the research team took the reform of case teaching of prosthodontics as an example. Under the background of digital and intelligent education reform, the research team made full use of various teaching tools and means such as smart classroom, Rain classroom, and mind map, to build a mixed teaching mode of "student-centered—case-based—problem-oriented—clinical thinking as the main line—multiple teaching methods combined" of case teaching + flipped classroom. The real cases in case teaching help to introduce learners to real situations and events. Through the online and offline mixed teaching mode, students were organized to conduct case analysis, discussion, and role simulation. The interaction between students, teachers and students, can be fully reflected. While improving students' clinical thinking ability and their ability to find and solve practical problems, they also improve their ability to apply and transform theoretical knowledge to achieve close integration of theory and practice. Satisfactory teaching results were obtained. In the final theoretical assessment, the scores of students' clinical thinking ability in the mixed teaching mode of case teaching + flipped classroom were higher than those in the traditional teaching group ($P < 0.05$), which effectively solved the two "pain points" of not forming "student-centered" and lacking clinical thinking ability.

With the rapid development of digital technology and the deepening of national medical teaching reform, the concept of stomatology education must keep pace with the times. The flipped classroom teaching model is a new student-centered teaching model, which reverses the traditional classroom teaching structure, highlights the dominant position of students in teaching, and forms a "student-centered" teaching form. In recent years, flipped classroom teaching model has been more and more widely applied in the field of medical education (Lu et al., 2019; Bonnes et al., 2017; Yang et al., 2021). The results of this study show that there are outstanding advantages in integrating the flipped classroom into case teaching. By presenting cases and creating problem situations before class, interactive discussion of cases, role-playing and simulated practice during class, providing solutions to problems, expanding knowledge after class, ability transfer and other series of teaching designs, the distance between theory and practice can be effectively shortened. The mixed teaching mode of case teaching + flipped classroom enables students to stimulate their independent critical thinking ability and clinical thinking ability, and cultivate their communication and team-

work ability in the process of active learning. The results of the questionnaire survey in this study showed that in terms of clinical thinking ability, autonomous learning ability, communication, and teamwork ability, students in the mixed teaching mode of case teaching + flipped classroom group had higher evaluation on the teaching effect than those in the traditional teaching mode group ($P < 0.05$), indicating that this teaching mode was more recognized by students.

In this study, case teaching + flipped classroom can be carried out scientifically and efficiently, and also benefits from the organic integration of mind mapping. Mind mapping is a simple and efficient practical thinking tool for clarifying ideas. Drawing a structure map fully demonstrates the organic integration of imaginal thinking and logical thinking, and orderly expresses knowledge, problem solutions, and innovative ideas, to achieve the purpose of optimizing learning (Chen & Zhao, 2006; Zheng et al., 2017). Before class, in the process of drawing mind maps, students can mark difficult knowledge points and relevant knowledge contexts. The use of mind maps not only combs knowledge points but also improves students' self-learning ability. During class, each group further optimized the mind map through discussion and sorting, the knowledge structure network was expanding, the thinking was more comprehensive, the team cooperation was fully reflected, and the idea of solving problems was clearer.

Guided by the cultivation of clinical thinking ability, the teaching team made full use of the advantages of flipped classroom teaching and tried flipped classroom teaching mode in the case teaching of master's degree students in stomatology, presenting unique teaching effects, effectively shortening the distance between theory and practice, and improving students' clinical thinking ability. Case teaching, as a key link to enhance the clinical practice ability of professional degree postgraduates, can be promoted by organically combining mind mapping and online offline hybrid teaching methods.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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