

Application of Flipped Classroom Teaching Model Based on Micro-Course in Practical Training Teaching of Contact Lens Fitting Technology

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Abstract: *Objective:* This paper aims to study the application of flipped classroom teaching model based on micro-course in the practical training teaching of contact lens fitting technology. *Methods:* From September 2021 to July 2023, 120 students majoring in ophthalmology and optometry were selected and randomly divided into groups. The control group adopted the traditional teaching mode, and the study group adopted the flipped classroom teaching mode based on micro-course. Teaching scores and the skills, observation and judgment, adaptability, and communication skills were compared between the groups. *Results:* Statistical comparison of teaching scores under different management methods showed that the clinical thinking score and practice work quality in the study group were higher than those of the control group, and the effect of the study group was better ($P < 0.05$). The overall scores of skills, observation and judgment, adaptability, and communication skills of the study group were better than those in the control group, and the comprehensive ability scores in the two groups were significantly different ($P < 0.05$). *Conclusion:* In practical training teaching of contact lens fitting technology, the application of flipped classroom teaching based on micro-course can improve the skill scores of personnel, and the overall effect is good. This can lay the foundation for advanced ophthalmology and optometry talents with profound theoretical knowledge and professional skills.

Keywords: Contact lens fitting technology practical training and teaching; Micro-course based; Flipped classroom teaching; Application

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1. Introduction

With China's continuous development in economy and society, the visual quality requirements of the public continue to increase. Optometry technical talents should master solid operational skills and communication skills to meet the social needs of the new situation. As a compulsory course, the course of Contact Lens Fitting Technology is highly technical, application-oriented, and practical. The practical training of this course includes three parts, which are pre-contact lens fitting inspection, soft lens wearing, and fitting. Experimental operations should use slit lamps, keratometers, and other instruments for suitability assessment. Micro-course teaching is

an organic combination of short teaching videos and teaching resources produced for a particular segment and knowledge point^[1]. As a new organizational model, flipped classrooms can break through the limitations of traditional teaching, embody the teaching concept of students as the main body and teachers as the leaders, and cultivate students' learning ability. In order to solve the problems of contact lens fitting technology in practical training and teaching, this study is carried out as follows.

2. Materials and methods

2.1. General information

A total of 120 students majoring in ophthalmology and optometry from September 2021 to July 2023 were randomly selected and divided into control group and study group, with 60 cases in each group. The composition ratios of gender (male:female) in the control group and the study group are 25:5 and 24:6, respectively. The age ranges of the control group and the study group are 20–23 and 21–23, respectively. There is not much difference in data between the groups' ages.

2.2. Methods

The contact lens fitting technical teaching theoretical materials and practical training courses in the two groups were the same.

The control group adopted the traditional teaching mode, which includes the teacher's explanation and guidance, and students' group practice. The study group adopted the flipped classroom teaching mode based on micro-course.

Firstly, preparation before the class should be done by the teachers and students. Three days before class, the micro-course video, practical training operation assessment and scoring standards are uploaded by the teacher, and students are asked to prepare according to the questions assigned by the micro-course in groups. Secondly, the experimental operations are carried out as follows.

2.2.1. Apprenticeship stage

The first stage of skills training is the apprenticeship stage.

(1) Teaching objectives

Teaching content: basic concepts of contact lenses. Knowledge requirements: the development history and material evolution of contact lenses are described. Skills required: ability to describe contact lens material design. Ideological and political integration point of the course: through the course study, students will be taught to care for the instruments and equipment used, cultivate the spirit of excellence, and implement national standards and industry norms. Teaching method: online and offline hybrid teaching method.

(2) Teaching design

Online before class: according to the requirements of the teaching syllabus, clinical skills teaching materials are published by the teachers on the Xuetong learning platform for students to learn independently. Students can try simulation operations to stimulate their interest and enthusiasm in learning.

Offline classroom interaction: this follows the teaching design and teaching content arrangement of the "online preview" part and adopts an "interactive" offline teaching mode.

Online after class: operation videos are recorded and uploaded to the online platform by the students. The teacher watches the videos, and provides guidance on the difficulties in operation according to the

different levels of each student's mastery.

(3) Teaching evaluation

Final examination: After the first training phase, students majoring in optometry technology will be assessed in a final examination. The assessment is divided into two parts, regular assessment (20 points) and final assessment (80 points). The regular assessment is based on the student's attendance, classroom performance, and skill operation, with a full score of 20 points. The final assessment is divided into skills assessment and theoretical test. The skills assessment is 50 points. The theoretical test includes assessment of the indications, complications, contraindications, and operation procedures of each item, with a full score of 30 points. Scores are expressed in percentiles.

Evaluation feedback: a skill training survey form is designed and formulated, which includes students' evaluations of training teachers and teachers' evaluations of students' learning conditions.

2.2.2. Pre-internship skills training stage

The second stage is the pre-internship skills training stage.

(1) Teaching objectives

Teaching content: eye examination content. Knowledge requirements: the slit lamp examination, tear examination methods, and result analysis are described. Skills required: ability to use a slit lamp and observe the cornea using the diffuse light teaching method. Ideological and political integration point of the course: through the course study, students can cultivate a serious and careful work attitude and have a deep understanding of the core socialist values including patriotism, dedication, integrity, and friendliness.

(2) Teaching design

Pre-class guidance: The question cards for the operations are left by the teacher. According to the question cards, the operations that should be applied and the items and equipment that should be prepared were judged by the students. Relevant operations are previewed to guide students to learn and think independently.

Classroom assessment and inspiration: An assessment based on the question cards assigned is conducted before class, and the operations are performed by the students. After the operation, heuristic teaching is used to ask questions, thus inspiring students to conduct self-reflection and summary, and the final summary guidance is provided by the teacher. Grades are given based on students' performance.

After-class reinforcement: Students conduct self-reflection and summary based on the classroom situation after class. Teacher guides and re-strengthens their learning and operations.

(3) Teaching evaluation

In-class assessment: teachers conduct in-class assessments based on students' operations and self-reflection. Those with unsatisfactory results will retake the test until they pass.

Evaluation feedback: the skills training questionnaire is filled, including students' evaluation of training teachers, teachers' evaluation of students' learning status, and students' self-evaluation.

2.2.3. Skills training stage during internship

The third stage is the skills training stage during the internship.

(1) Teaching objectives

Teaching content: guidance on lens wearing. Knowledge requirements: the process of taking off

and putting on orthokeratology lenses and the fitting of orthokeratology lenses are described. Skill requirements: ability to guide patients in wearing orthokeratology lenses. Ideological and political integration point of the course: humanistic care should be given to patients wearing contact lenses, and students should be cultivated to have a patient working attitude and dedication.

(2) Teaching design

Case selection: teachers select clinical cases for explanation and training. After training, students discuss and learn about the cases.

Case design and discussion: students write their cases, and group members actively participate and conduct full discussions and exercises.

Scenario simulation: simulated consulting rooms are used to put students close to the natural environment. Patients, doctors, fitting technician, and family members are all played by the students. Students use the communication methods and skills they have learned to conduct on-site drills and operations. The teacher makes comments, and puts forward any existing problems and improvement methods.

(3) Teaching evaluation

On-site simulation operation assessment: after the students perform the operation treatment in the simulated fitting site, the teacher will conduct an assessment based on the overall performance of the students' operation, doctor-patient communication, humanistic care, and professional ethics.

Examination: The skills assessment in the examination includes practical operations, analysis of laboratory tests.

Evaluation feedback: the questionnaire is completed after leaving the department, including students' evaluation of the internship teachers, teachers' evaluation of students, and mutual evaluation of students in the group.

2.3. Observation indicators

The observation indicators include instructor scoring and training comparison, as well as the training effect score (skills, observation and judgment, adaptability, and communication skills).

2.4. Statistical analysis

SPSS20.0 was used for statistical analysis, and $P < 0.05$ represented a statistical difference.

3. Results

Statistical comparison of teaching scores under different methods of management was performed. After comparison, the clinical thinking score and practice work quality of the study group were higher than those of the control group, and the effect of the study group was better ($P < 0.05$), as shown in **Table 1**.

Table 1. Teaching score and training comparison (mean \pm standard deviation)

Group	Clinical thinking score	Internship work quality (points)
Study group	91.01 \pm 0.31	90.42 \pm 3.54
Control group	82.99 \pm 0.41	80.33 \pm 5.31
χ^2 value	17.451	11.5265
P value	0.000	0.000

The overall scores of skills, observation and judgment, adaptability, and communication skills in the study group were better than those in the control group, as presented in **Table 2**. There was a statistical difference in the comprehensive ability scores in the two groups ($P < 0.05$).

Table 2. Training effect scores of the control group and study group

Group	Observation and judgment	Adaptability	Communication skills
Study group	84.63±2.14	88.23±1.60	90.04±0.75
Control group	75.64±2.13	73.50±1.07	80.40±1.03
χ^2 value	8.064	11.090	7.086
<i>P</i> value	0.000	0.000	0.000

4. Discussion

The flipped classroom is a new teaching mode that combines knowledge teaching and internalization. The traditional teaching content includes basic concepts, teaching content, class summary, and after-class guide [2]. A flipped classroom allows students to use extracurricular practice to explain basic knowledge while using video lectures and practical problems as the basis to cultivate primary cognitive ability. Students can refer to and think about problems in class, and integrate them while conducting preliminary study and discussion. With the progressive rise of micro-course, the flipped classroom has gradually developed. Using video as the primary carrier while carrying out teaching activities around knowledge points and teaching segments aim to improve the interactivity of learning and provide a new learning experience.

Flipped classroom combined with micro-course teaching has certain advantages, which can be done anytime. Establishing a relevant evaluation mechanism while actively exploring a scientific and practical professionalism evaluation system are required. In the current research process on the interns, practical adjustments have been made by conducting a result-oriented evaluation and combining China's economic level and scientific theory [3]. It provides scientific guideline for the cultivation of high-level compound talents. Flipped classroom is a scientific and primary management method that has changed the shortcomings of "no plan, no goal, and randomization," making the teaching goals clear, simple, standardized, easy to review and evaluate, and standardizing, institutionalizing, and systematizing the teaching of optometry technology.

Generally, teaching of optometry technology requires the cooperation of personnel, and the disadvantages of using traditional teaching methods are apparent. The absence of fixed teacher makes interns nervous. At the same time, different teachers need to understand the situation of interns, and there is a lack of targeted education. The lack of educational goals in continuous guidance leads to the blindness and randomness of teaching work, which affects the teaching effect. This method can effectively enhance the quality of nursing care in micro-course teaching. After formulating a reasonable teaching plan, the overall purpose will be more precise, and quality supervision can be strengthened. While learning the basic knowledge, we can discover the shortcomings of interns in time to better train the talents.

In clinical teaching and the application of clinical operation skills to patients, micro-course teaching is used to train teaching skills and operation skills while seeking to apply clinical interns and operation skills to ensure the improvement of management quality and work efficiency. Through micro-class teaching, students' behavior and patients can be standardized, institutionalized, and scientific, thereby promoting medical quality improvement. [4].

Teachers make short videos of teaching-related content in advance, including micro-course videos. Micro-courses focus on teaching a key content or theme. The duration is about 10 minutes, including presenting main and difficult points in the outline and explaining fundamental theories. In the practical operation demonstration, including case analysis and other related content, the micro-course content will be released one week before the formal class, and students will be divided into study groups. Through micro-course learning, the Internet are used to collect and search materials and group discussions are conducted to find corresponding problems. When entering the classroom, the teacher no longer explains and repeats fundamental theories but provides personalized guidance, summarization, review, and analysis ^[3].

Contact lens fitting technology is a core course in the optometry major. The main contents of this course include the fitting of spherical soft contact lenses, the fitting of astigmatic soft contact lenses ^[5], the fitting of rigid gas permeable (RGP) contact lenses, and the fitting of orthokeratology lenses to cultivate students' independent skills. Learning skill, innovation skill, and comprehensive quality can better prepare students for internship and employment, and lay a good foundation for sustainable development. It is an important supporting course for students majoring in optometry to obtain professional qualification certificates such as "optician" ^[6]. This course focuses on the talent training goals of this major. The content arrangement focuses on the integrity of the teaching project and the systematicness of the overall curriculum, as well as the correlation of knowledge and skills. According to the career needs, a teaching method combining theory with practice is adopted. With multimedia courseware, teaching methods such as pictures and videos are combined with clinical and actual cases, focusing on cultivating students' ability to apply the knowledge and skills they have learned to solve practical problems. With "craftsman spirit" as the main body of ideological and political education in this course, the ideological and political courses are implemented to cultivate students with more remarkable abilities, thus laying the foundation for advanced optometry talents with profound theoretical knowledge and professional skills.

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