# *Application of Mixed Teaching Mode in Peripheral Blood Leukocyte Examination and Clinical Application of Medical Laboratory Specialty in Higher Vocational Colleges Application of Project Teaching*

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***Abstract:*** To explore the application of mixed teaching mode in the project teaching of peripheral blood leukocyte examination and clinical application. Methods: the mixed teaching mode was discussed from the principles and basis of the design of the mixed teaching mode, the practical research, result analysis and necessity of the mixed teaching mode of peripheral blood leukocyte examination and clinical application. 1817 medical laboratory specialty was selected as the mixed teaching of the experimental group and 1818 medical laboratory specialty as the traditional teaching of the control group. The teaching effects of the two groups were compared. Results: there was significant difference between the experimental group and the control group in the results and analysis of blood sample absorption and release, microscope use, white blood cell count and white blood cell sample count ($P < 0.05$). Students are satisfied with the learning interest, initiative of autonomous learning and teaching effect in the mixed teaching mode. Conclusion: compared with the traditional teaching mode, hybrid teaching promotes students' autonomous learning ability, strengthens teachers' information teaching application and improves teaching quality.

## 1. Introduction

The relationship between higher vocational medical laboratory and professional post is more direct [1]. Basic laboratory technology is an important professional course of medical laboratory specialty in higher health vocational education. The main contents of this course include blood test, urine test, other body fluid test, excreta test, clinical cytology test, etc. The teaching content of leukocyte examination and clinical application in blood test has strong logic of theoretical knowledge and high requirements of operation skills. In order to make the knowledge and skills learned by students systematic, organized and operable, explore the application of mixed teaching mode in teaching design and teaching effect. Hybrid teaching, that is, online and offline teaching

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mode, can combine the advantages of online teaching and traditional teaching, improve students' active participation, explore knowledge, and improve their ability to ask, analyze and solve problems; Promote the improvement of teachers' information-based teaching ability, innovate teaching design to realize the construction of new teaching mode, cultivate students' active learning and optimize teaching effect [2].

## 2. Principles and Basis of Mixed Teaching Mode Design

### 2.1 Teaching Content and Teaching Design of Peripheral Blood Leukocyte Examination and Clinical Application

The teaching content follows the principle of integrity and forms a practical application whole from blood sample collection to clinical application. Through the integration of teaching material resources, the teaching content tasks have a total of 8 tasks, ① blood sample collection and processing (Theory), ② venous blood collection experiment (operation), ③ blood smear preparation and staining (Theory) ④ Blood smear preparation and staining experiment (operation), ⑤ leukocyte count, ⑥ leukocyte count experiment (operation), ⑦ leukocyte morphological examination (Theory), ⑧ clinical case score

Analysis - leukocyte examination (operation), 2 class hours for each teaching task, a total of 16 class hours. This teaching content is in the form of a project teaching. Through theoretical study of the key points of blood collection methods, we can carry out operation practice; How to prepare and stain the collected blood samples requires students to master the key points of theory, combined with the correct operation of blood smear and staining; Review which cells and cells are in the blood

Morphology, leading to the counting and morphological examination points of leukocytes in blood, combined with the correct counting and classification of operation.

Specific process of Hybrid Teaching: release online materials through superstar learning link before class, including micro courses, Web links

Courseware, learning tasks, etc. task driven teaching method promotes students to study actively and cultivate students' ability to explore the unknown; Pass in class

According to the actual teaching requirements, the tasks arranged online can achieve the teaching process, strengthen the teaching content and differentiate the difficult and key points of teaching. After class, make operation videos for evaluation to mobilize students' enthusiasm. Scenario play makes learning not dry through sharing and cooperation

Dry and interesting. Therefore, the main teaching methods are: project teaching method, case teaching method, role-playing method, situational method and so on. The specific mixed teaching arrangement is shown in Figure 1 below:

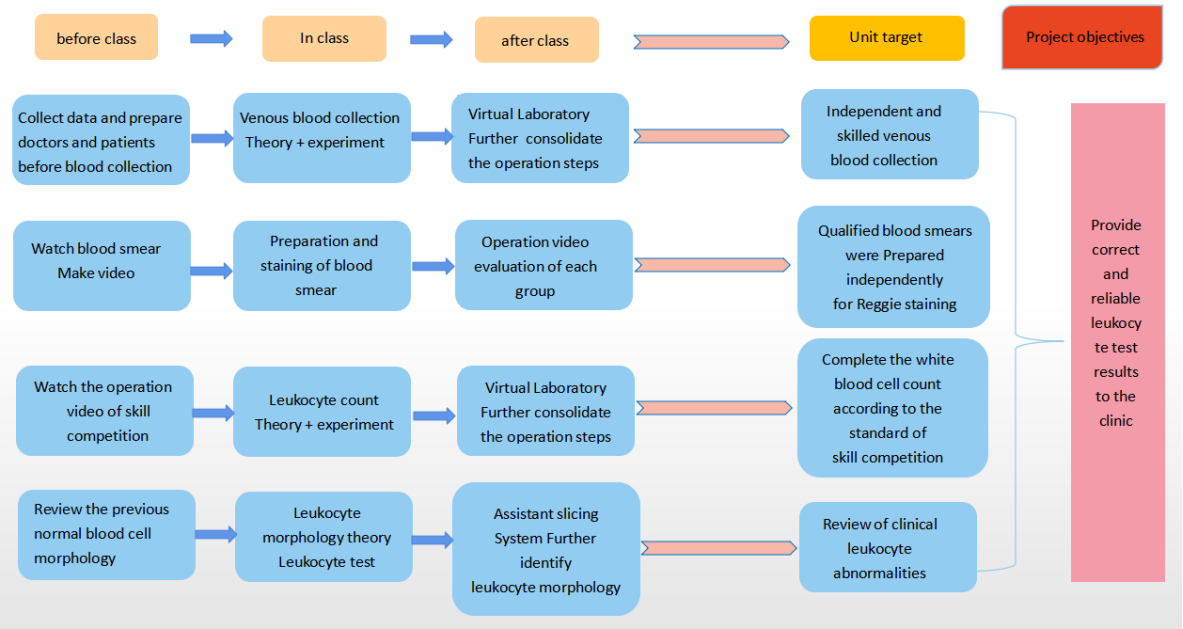


*Fig.1 Teaching Arrangement of Peripheral Blood Leukocyte Examination and Clinical Application*

## 2.2 Characteristics of the Application of Mixed Teaching Mode

The mixed teaching mode is “student-centered”, pays attention to the cultivation of ability, mobilizes subjective initiative, improves learning efficiency and stimulates learning potential by enhancing students' awareness of autonomous learning. Its teaching theoretical basis includes: constructivism learning theory, connectionism learning theory and inquiry community learning theory [3]. These teaching theories emphasize subjectivity, use information resources, practice and explore the sense of presence. Through online learning interaction, students master the knowledge itself, have wider ways to obtain knowledge, and have more contacts with other learners. In teaching, teachers use the mixed teaching mode, and teachers' informatization ability is continuously improved, which is in line with the Ministry of education's proposal of “building high-quality online open courses, encouraging online courses to explore the reform of teaching methods such as flipped classroom and mixed teaching”. Mixed teaching requires teachers, with the support of information technology and under the guidance of modern teaching theory, to break the traditional teaching mode through informatization, innovate teaching design in the teaching process, and implement informatization teaching in the links that may form good interaction with students [4].

# 3. Practical Research on the Mixed Teaching Mode of Peripheral Blood Leukocyte Examination and Clinical Application

## 3.1 Teaching Object

The students of 1817 and 1818 classes majoring in medical laboratory were selected as the research object, 46 students in 1817 class as the experimental group and 47 students in 1818 class as the control group. The teaching materials, teaching plans, curriculum standards, assessment schemes and class environment of the two groups of students are the same.

## 3.2 Evaluation Index

Take the theoretical examination results and skill operation norms as the evaluation indicators. The skill operation refers to the requirements of medical examination skill competition, including article preparation and recovery (3), use of sample adding graduated pipette (3 points), absorption and release of blood samples (6 points), disposable filling tank (3 points), use of microscope (2.5 points), leukocyte count (4 points), data and report (2.5 points), sample calculation results (30 points) Classified counting of electronic blood tablets (5 points), classified counting results and analysis of leukocytes (33 points), Biosafety (6 points), smooth operation (2 points), etc. The experimental group evaluated the effect of mixed teaching mode by questionnaire.

### 3.3 Statistical Method

The data were processed by spss23.0 statistical software. The measurement data were expressed as mean ± standard deviation (XS). T-test was used for comparison between groups; Count data are expressed in number of cases and percentage (%); The difference was statistically significant ($P < 0.05$).

## 4. Practical Results of Mixed Teaching of Peripheral Blood Leukocyte Examination and Clinical Application

### 4.1 Comparison of Theoretical Results between the Two Groups

The theoretical scores of the students in the experimental group were significantly higher than those in the observation group ($P < 0.05$). The scores in the control group were concentrated in 70-79 segments, while the scores in the experimental group were concentrated in 80-89 segments. See Table 1 and table 2.

*Table 1 Comparison of Theoretical Scores between the Two Groups( $\bar{X}\pm s$)*

| group | Theoretical achievements |
|---|---|
| experience group | 80.63±7.58 |
| control group | 76.76±7.49 |
| p | <0.05 |

*Table 2 Distribution of Students' Theoretical Scores in the Two Groups*

| class | Score / person | | | | |
|---|---|---|---|---|---|
| | 90∽100 | 80∽89 | 70∽79 | 60∽69 | 0∽59 |
| experience group | 3 | 26 | 12 | 5 | |
| control group | 1 | 7 | 19 | 16 | 1 |

### 4.2 Comparison of Skill Operation Scores between the Two Groups

There were significant differences in blood sample absorption and release, microscope use, leukocyte count, leukocyte sample count results and analysis, and total score between the two groups. The total score of the experimental group was 74.584.84 and that of the control group was 66.807.53. The experimental skill operation scores of the two groups were not very high. The highest score of the experimental group was 81.3 and the highest score of the control group was 77.2. According to the score deduction rules for competition skill operation, students should pay attention to each step of operation in their usual learning and training, standardize, strictly require themselves, strengthen training, and find out their own problems by watching operation videos and

asking teachers during repeated training. Higher vocational colleges pay attention to skill training. While training talents to strengthen theoretical knowledge, skill training should not be lax. From the mixed teaching mode, the operation of the experimental group is slightly better than that of the control group, which shows that this teaching mode is effective. Teachers have gradually changed from traditional “teaching” to “internalization guidance”. The application of mixed teaching has improved students' initiative and enthusiasm. The results are shown in tables 3 and 4.

*Table 3 Comparison of Skill Operation Scores between the Two Groups*

| index | experience group | control group |
|---|---|---|
| Article preparation and recycling | 2.18±0.36 | 2.12±0.21 |
| Sampling - use of graduated pipette | 2.0±0.38 | 1.91±0.35 |
| Absorption and release of blood samples* | 4.28±0.56 | 3.66±0.68 |
| Disposable tank filling | 1.92±0.26 | 1.82±0.35 |
| Use of microscope* | 1.815±0.27 | 1.68±0.34 |
| Leukocyte count* | 2.13±0.49 | 1.8±0.58 |
| Leukocyte count data and report | 2.13±0.27 | 2.13±0.37 |
| Calculation results of leukocyte samples* | 24.08±2.52 | 22.01±3.95 |
| Electronic blood slice classification count | 4.5±0.51 | 4.85±0.35 |
| Results and analysis of leukocyte count | 24.84±2.14 | 22.69±3.75 |
| Bio-Safety | 3.89±0.88 | 3.63±0.71 |
| Smooth operation | 1.07±0.25 | 1.02±0.15 |
| Total score* | 74.58±4.84 | 66.80±7.53 |
| | | |

*Table 4 Distribution of Skill Operation Scores in the Two Groups*

| class | Score / person | | | | |
|---|---|---|---|---|---|
| | 90∽100 | 80∽89 | 70∽79 | 60∽69 | 0∽59 |
| experience group | 0 | 2 | 40 | 2 | 2 |
| control group | 0 | 0 | 22 | 13 | 12 |

## 4.3 Evaluation of Mixed Teaching Mode by Students in the Experimental Group

Hybrid teaching has fully mobilized learning interest and initiative of autonomous learning, promoted the transfer from “teaching centered” to “learning oriented”, and strengthened students' understanding and memory of knowledge. Through interactive teaching, students have learned teamwork, and the use of information means has been strengthened. Through micro class video - Teamwork - teacher Q & A - repeated practice, their operation skills have also been improved. See 5 for the results

*Table 5 Students' Evaluation Of Mixed Teaching Mode (%)*

| Questionnaire content | Student evaluation | | |
|---|---|---|---|
| | satisfied | commonly | dissatisfied |
| Overall satisfaction of mixed teaching model | 40(86.95) | 6(13.05) | |
| Mobility of learning interest | 42(91.3) | 4(8.7) | |
| Initiative of autonomous learning | 38(82.61) | 8(17.39) | |
| Understanding and memory of knowledge | 40(86.95) | 3(6.52) | 3(6.53) |
| Participatory teamwork | 38(82.61) | 6(13.05) | 2(4.34) |
| Application of information resources | 35(76.09) | 6(13.05) | 5(10.86) |
| Proficiency in operating skills | 37(80.43) | 9(19.57) | |

## 5. Necessity of Mixed Teaching Mode of Peripheral Blood Leukocyte Examination and Clinical Application

### 5.1 Advantages of Mixed Teaching Mode

By comparing the traditional teaching of medical laboratory 1818 with the mixed teaching of medical laboratory 1817, the results show that most students are willing to accept the mixed teaching mode, which has obvious advantages in stimulating learning interest, learning enthusiasm and autonomous learning ability. Stimulating students' learning in the mixed teaching mode is the primary principle in the whole design. Only by making students realize the value and fun of the knowledge learned, and through the experience of situational teaching and open learning activities, learning motivation will be achieved [5]. The hybrid teaching of online learning and offline teaching uses the introduction of some teaching software and tools to select more appropriate and efficient learning methods for different learning activities. For example, in peripheral blood leukocyte examination and clinical application, theoretical knowledge and operation videos are published online, and students actively study independently according to the arrangement of tasks; Offline teaching reports and comments on the results of online learning.

### 5.2 Students Strengthen Their Skills and Theoretical Knowledge through Active Learning

The mixed teaching mode has consolidated theoretical knowledge and strengthened skilled operation skills. The content released by students through online teaching software: Micro class, teaching plan, homework, etc. after using their spare time to systematically review the learned knowledge of blood sample collection and processing, venous blood collection experimental operation, blood smear preparation and staining, blood smear preparation and staining experimental operation, etc, The next knowledge is to analyze leukocyte count and morphological examination in blood samples. Micro course released: leukocyte count, morphological examination and scoring standard of the national medical examination skills competition of vocational colleges. Through the correct operation of each step of the video, students have an intuitive impression and watch it repeatedly. At the same time, they compare it through hands-on operation to correct improper or wrong operation in time. The assessment and scoring standards refer to the skill competition. In the usual learning process, high standards and strict requirements are required to achieve the teaching objectives with high quality. The key content of the whole process adopts the methods of video playback, teacher demonstration, student operation and mutual error correction to deepen the impression and form the memory; Difficult knowledge is combined with repeated practice within the group, mutual evaluation between groups and teacher comments to turn difficulty into easy.

### 5.3 Teachers Constantly Improve Their Informatization Ability and Teaching Methods

Under the background of “Internet plus” education, teachers design teaching content through teaching software, and release teaching tasks according to the syllabus and occupation education characteristics, so as to train students to think actively and to participate actively. Teachers transition from the traditional “imparting” to “guiding” role, carry out collaborative learning and joint exploration, not only encourage students to cooperate effectively with each other, but also learn the knowledge points required by the outline [6]. This process reflects the “student-centered” and supplemented by teachers' supplementary questions, which is in line with the development needs of skilled talents of medical laboratory specialty in higher vocational colleges. In the process of designing mixed teaching mode, teachers have teaching cognitive ability, teaching resource sorting ability, curriculum design innovation ability, flexible application ability, supervision and

evaluation ability, etc. through the organic combination of these abilities, teachers' information-based teaching ability in vocational colleges is continuously improved [7].

The teaching method is realized from a single teaching method to a variety of teaching methods, such as: (1) project teaching method: project teaching runs through the whole process, guided by the classification and counting of peripheral blood leukocytes, improve various information collection in turn, make plans in group cooperation, and finally report, display and assess, combined with effective evaluation, so as to improve students' comprehensive professional ability(2) Case teaching method: improve students' ability and confidence to solve and analyze problems(3) Role play method: combined with students' cognitive characteristics, let students master operation skills in role play and consolidate relevant theoretical knowledge(4) Situational approach: promote the transfer of students' knowledge and the improvement of their ability by simulating work situations(5) Others: telling examples, heuristic teaching method, brainstorming method, etc. The comprehensive application of these teaching methods has improved teachers' teaching ability, strengthened students' learning effect and improved teaching quality.

## 6. Summary

The implementation of mixed teaching is mainly completed before, during and after class. Before class: teachers release teaching content - teaching micro class - teaching task - teaching effect through the learning platform, and students learn in time through the tasks of the learning platform; In class: teachers answer questions and solve problems through students' pre class learning, and students strengthen knowledge through teachers' teaching; After class: students check and fill vacancies through tasks, The application of the mixed teaching mode of peripheral blood leukocyte examination and clinical application has stimulated students' enthusiasm and initiative in learning, increased experience in skill operation training and clinical simulation, enriched teachers' application of multiple teaching methods and information ability, and promoted the improvement of teaching results.

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