Teaching Reform of Microbiology Practice in New Engineering

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Abstract: Engineering construction is a new direction for higher engineering education reform in China. The development of new projects is a response to the new round of science and technology revolution, industrial transformation, and new economic challenges to engineering education reform and development. The new project construction is a complex system project with extensive influence and Chinese characteristics. It has played a demonstration and leadership role in the reform and development of higher education in China. The construction of the "new project" points out the disadvantages of traditional teaching and puts forward new requirements for the practical teaching of microbiology inspection. The purpose of this article is to explore the reform of practical teaching in microbiology laboratories in the context of new engineering. Based on the review and analysis of relevant documents for new project construction and relevant documents for new project construction by the Ministry of Education, a new definition of the microbiology specialty was made from the current status and research directions of engineering education reform. The concept of new engineering, and clarify the new concept of new engineering construction. In terms of condensing the direction of new engineering construction, the construction of "dual-faculty" and "dual-energy" faculty, the construction of the new engineering curriculum system, the construction of teaching materials, the classroom teaching of new engineering, cooperative schooling, and experimental practical teaching, etc. The general idea of engineering construction, and put forward the idea of further development of new engineering specialty of microbiology. The revolution in the teaching of microbiology testing practice under the new engineering background has truly enabled students to master the most basic operations in "microbiology" experiments. It has also cultivated students' ability to use textbook knowledge, be able to do their own work, and be able to find many problems and raise doubts. Asking questions raises students' thinking in scientific research and helps to form innovative thinking.

1. Introduction

With the rapid development of new technologies such as big data, cloud computing, the Internet of Things, and artificial intelligence, driven by the innovation-driven Internet development strategy, China is moving towards 2025. The network is increasingly urgent, and China urgently needs to cultivate a large number of projects. New technical talents who will occupy strategic commanding heights in the global innovation ecosystem [1]. On February 20, 2017, the Ministry of Education issued a notice on new engineering research and practice by the Ministry of Education [2]. It is expected that through the implementation of new engineering education, well-trained engineering scientific and technical personnel will have higher scientific research capabilities, innovation capabilities and cross-border integration capabilities. Microbiology is a very practical tool course with unique experimental methods and techniques. The teaching effect of this course will directly affect students' learning of subsequent professional courses [3].

The criterion for measuring the effectiveness of microbiology teaching is to observe the ability of students to further utilize microbiological knowledge and experimental skills to solve practical problems in learning professional courses, subject research and actual production [4-5]. Therefore, it is necessary to provide experimental courses related to microbiology. Microbiology experiment

course is not only a learning process for students to master the basic methods and operating techniques of microbiology experiments, but also the basis for further in-depth study of professional courses [6-7]. In addition, experimental teaching also plays an important role in cultivating students' comprehensive quality, improving their practical ability and innovative consciousness. According to the university's own characteristics and existing problems, many university teachers have carried out reform attempts in microbiology teaching and achieved good results [8]. In recent years, according to the needs of professional training, in order to cultivate students' scientific research thinking ability and improve their comprehensive quality, we have borrowed the teaching experience of other universities to reform the teaching methods of microbiology courses [9].

In order to cultivate students' thinking ability in the course of microbiology, improve their comprehensive quality, and become a professional talent with the ability of scientific research and innovation in the motherland. The teaching reform was carried out by quantifying experimental results, intensifying process monitoring, and attaching importance to basic skills training. The methods of cultivating students' ability and evaluating methods in experimental teaching of microbiology were discussed [10-11]. The purpose of this article is to explore ways to carry out microbiology education reform in the context of new engineering, which can provide new help and suggestions for cultivating contemporary microbiology college students' scientific research ability, innovation ability, etc., so that the teaching method reform can Conducive to the cultivation of more talents [12].

2. Method

2.1 Adjust the Assessment Indicators and Quantify the Experimental Results.

Whether the performance assessment is reasonable is related to the enthusiasm of students for learning. There are many non-quantifiable factors in the assessment indicators, which will inevitably affect the fairness of the results and will dampen the enthusiasm of the students for learning; an objective and fair assessment method will promote the enthusiasm of the students for learning, and will help students to master the experimental operations more seriously. So as to consolidate and improve students' practical ability.

2.2 Introduce Mobile Phones to the Classroom and Strengthen Process Monitoring.

The era of intelligent mobile phones has arrived, and a mobile phone for students has been realized. It is no longer possible for teachers to talk about the discoloration of the phone and simply prevent students from bringing their phones into the classroom. Therefore, teachers should change their minds, introduce mobile phones into teaching, and serve the experimental classroom of "microbiology". To enrich classroom knowledge, the "Microbiology" experimental class is to enable students to master the corresponding methods through the teaching of some experiments, that is, not only to master these experiments, but also to understand the research methods involved in these experiments. In the two experiments such as Gram staining and morphological observation, what kind of microorganisms did students observe? What are the morphological characteristics of these broad categories? What is their specialization structure? These can be searched on the Internet and compared with what I have observed.

2.3 Comprehensively Improve the Comprehensive Ability of Students.

"Microbiology" experiment is a basic professional experiment. Its task should be to lay a good foundation for students and serve the next professional course. As the so-called high-rise buildings rise from the ground, if you increase the comprehensive experiments and research, you will definitely reduce the opportunities for students to exercise basic experiments. “The foundation is not strong, the ground is shaken”; only with a good foundation can it be possible to build a building of professional knowledge and better learn the subsequent professional courses. Therefore, in this process of teaching reform, a method that values the foundation and strengthens the operation is adopted to improve the comprehensive ability of students. All experiments set up by the college are

basic experiments, but corresponding adjustments have been proposed in the experimental requirements. For example, in a microbial separation and purification experiment, a student is required to be proficient in two common separation methods (stripe separation and coating separation), and inform the students of the grading rules of the experimental results before the experiment. To evaluate the performance of the experimental operation. For those students who fail the experimental operation, it is required to do it again until they pass. Each experiment has specific experimental operation requirements. To meet these requirements, students need to perform a lot of repeated exercises, paying attention to the details of each experiment.

2.4 Cultivate Scientific Thinking Ability

The ability of scientific research thinking can be roughly divided into 4 levels: the ability to learn quickly, the ability to design experiments, the basic hands-on ability, and the ability to find problems. To do research, you must stand on the research results of the predecessors and stand on the shoulders of giants. The study of experimental theory is to understand the foundation of the predecessors and the accumulation of giants. Thorough understanding of the theory is the basis for scientific experiment design. After designing the experiment, basic hands-on abilities are required to achieve it, and the ability to find problems is required throughout the process. Previewing the experimental report will help to cultivate students' scientific research ability. It mainly involves learning ability and experimental design ability. Require students to discover problems and explain the problems based on what they have learned, which will help students develop their scientific research ability. When students can't find problems, they should be good at guiding students to find problems. For example, in the experiment of bacterial colony observation, students should be guided to observe the dryness and wetness of E. coli and Bacillus subtilis colonies, and ask students to explain the cause of this phenomenon. The enhancement of hands-on ability will help the cultivation of students' scientific research ability. Conjectures formed during the scientific research process need to be verified by experiments. Even if there are good ideas, if the experimental ability cannot match the ideas, it can only be discussed on paper. The enhancement of hands-on ability will help to enhance students' self-confidence, and help to understand the experimental principle and experimental design.

2.5 Peer Teaching Method

The premise of this method is that after students have a certain understanding of the learning content, they will be taught to peers, and the goal of common learning will be achieved through peer-to-peer questioning, discussion, and inquiry. This is the same as the "online" stage of pre-class self-study in mixed teaching Design coincides. This article is aimed at the theoretical knowledge of experimental principles, using peer teaching method to carry out practical exploration in the course of "microbiology experiments", and achieved gratifying results.

3. Experiment

A questionnaire is a tool for collecting data that is used to measure people's behavior, attitudes and social characteristics. The content collected is various materials related to people's social phenomena and social activities. According to the questionnaire, user information is obtained based on how people use microbiology education. We have conducted a questionnaire survey on the application of "microbiology education" to people and the design of the case for microbiology education. The questionnaire was revised and improved repeatedly, and the questionnaire for this survey was finally developed. Subsequently, 650 different people were selected as survey objects at three different locations in Yantai. A total of 600 questionnaires were distributed, of which 546 questionnaires were recovered, with a recovery rate of 91%, and 521 valid questionnaires, with an efficiency of 95.4%. Although the number is limited, the research results have certain reference value. In addition, due to the subjective deviation of the surveyed participants' personal understanding of the survey items, it may cause errors in the results, but within the scope of the survey, the survey conclusions are not affected as a whole. Two weeks after the questionnaire was

collected, the relevant students were retested using the retest reliability method. After the test, the results of the two questionnaires were highly correlated, indicating that the questionnaires had high reliability.

4. Discussion

Table 1. Comparison of Implementation Effect of Peer Teaching Method

Teaching method	Operational Assessment Achievements 20%	Classroom performance 30%	Online Achievements 50%	Bonus points(1-5)	Final Grade	Network synthesis
PI class	78.5	86.4	85.5	2.3	86.7	85.8
No-PI class	73.7	84.3	84.4	0.9	83.2	78.7
Increased score	4.7	2.1	1.1	1.4	3.5	7.0

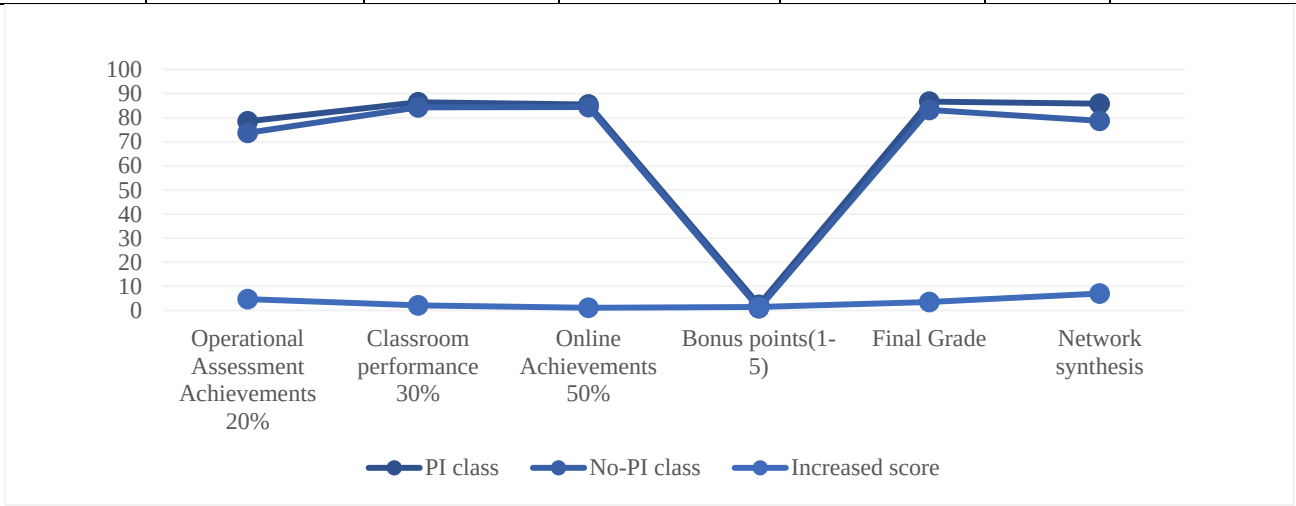

Figure 1. Comparison of Implementation Effect of Peer Teaching Method

Before the teaching reform, the experimental class scores were always evaluated as each experimental result multiplied by the weight coefficient, and then added up; each experimental score was divided into 4 parts: experimental theory, experimental attitude, operating skills, and experimental report. Each experimental result = 70% of the overall score of the experimental process + 30% of the experimental report score of which: the comprehensive score of the experimental process = experimental attitude + experimental theory + experimental skills.

There are a number of issues that arise. The overall score of the experimental process accounted for 70%. Among them, experimental attitude refers to classroom discipline, students' pre-reading situation and whether the experiment is serious; experimental theory, the mastery of experimental principles reflected by teachers' questions and preview of experimental reports; experimental skills to assess students' experimental process, and whether the operation is correct and standardized. However, the achievements in these three parts are not easy to quantify. Whether the attitude is serious is not convenient for judging the grade, and it is unscientific to use this item as one of the indicators for evaluating the experimental results. The teacher's questions in the experimental theory part cannot cover every student, nor can it be guaranteed that the questions answered by each student are of the same degree of difficulty; regarding the preview of the experimental report, students will more often use the experimental purpose, experimental requirements, The experimental principles, experimental content, and operation steps are copied over; it is not scientific to measure students' mastery of experimental theory. Although the operation skills are important, it is not easy to quantify the assessment, and the operation skills are from inexperienced to unfamiliar to proficient. You should evaluate the mastery of the experimental operation after

completing the experiment; but there are about 30 students in an experimental class. , It is necessary to evaluate the students' mastery of the experimental operation one by one, but it is impossible to achieve.

After the teaching reform, there have been corresponding changes. Adjust the weight coefficients occupied by each experiment to make it more reasonable. The results of each experiment are divided into three parts: experimental report, experimental theory, and experimental operation. Experimental results = 60% experimental report + 20% experimental theory + 20% experimental operation Put the preliminary experimental report into the experimental report, and change the copying time from 2 times to 1 time. Before completing the experiment, the student completes the experimental purpose, experimental principle, and experimental steps of the experimental report. The specific requirements of the experimental steps must be detailed and operable. Students must understand not only how to do each step, but also why. Before the start of each experiment, the student's preview is tested in 10-15 minutes, and the student's mastery of the experimental theory is tested. The test is performed in a classroom test. The questions are mainly filled in blanks or short answers. The reformed experimental operation examines the experimental results of the students, that is, after the students complete the experiments, the teacher checks the experimental results and gives the results after the experimental requirements are met. If they do not, the results are repeated until they pass.

5. Conclusion

The design of mixed experimental teaching has changed the problems of traditional classroom teachers' "one-word conversation", resulting in low learning initiative and insufficient cognitive participation. The peer teaching method masters the learning content more effectively through peer communication, cooperation, discussion and evaluation. The application of peer teaching method in the classroom of mixed experimental teaching can make it play the best effect. Peer-to-peer teaching helps to understand what is learned, keep learning activities at the efficient level of the learning pyramid, and effectively improve The experimental teaching effect was achieved, and the in-depth teaching goals of the two areas of cognition and skills were achieved. In the monitoring of various learning evaluation indicators, the performance of the peer teaching class is significantly better than the class without peer teaching method, which is an efficient teaching method worthy of experimental teaching research and promotion.

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