Design, Effect and Evaluation of Practice Reform of Environmental Microbiology—Take Yanbian University as an Example

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\textbf{Abstract.} Environmental microbiology is a very practical science. In order to make students have a more specific cognition of the law of biological activity changes in the micro world, according to the theory of cognitive psychology, combined with many years of teaching experience accumulation, the practical teaching links of the course are designed and summarized one by one, forming a relatively fixed sample of practice mode in school, so as to change it. In the past, the effect of practice in Environmental Microbiology schools was not good. Through the macro control of the teacher side, the subjective initiative of students was fully stimulated. Then, the details (including the time of practice, the design of practice report, the writing of practice report, etc.) were designed and monitored completely by the teacher, and the expected effect was achieved. This case provides a new idea and reference for the reform of similar curriculum practice in colleges and universities, and has practical guiding significance.

\textbf{Introduction}  
Microbiology is a young field. In this sense, only a few microbial species have been studied by human beings. In addition, concepts such as "microbiome" and "community function" are relatively new to the world. With the deepening of research methods, some results of previous studies will be questioned, which will bring the future of environmental microbiology. It has great attraction. Because of its richness, it is difficult to see the development direction of this field accurately. However, in the future of environmental microbiology, some development seems to be very likely to be outstanding [1]. At present, many domestic scholars [2, 3, 4] have mentioned that the task of our country's ordinary colleges and universities is no longer theoretical teaching, but the judgment of practical teaching, which can be seen from the increasing proportion of practical teaching required by the Ministry of education in the compilation of teaching syllabus in Colleges and universities in recent years. Practical teaching is of great significance in higher education. Strengthening practical teaching of college students is a powerful measure to achieve the goal of professional training [3]. Foreign scholars, especially in the field of Medicine [5, 6, 7, 8, 9, 10, 11, 12], pay more attention to practical teaching because of the particularity of the research object. In fact, no matter which field you apply microorganism to, mastering the real ability will be what a college student should have after entering the production practice. However, the theoretical significance of the current general higher education in our country is no longer the topic we pay attention to, and how to effectively carry out practical teaching is the key issue at present? This problem involves the countermeasures, measures and evaluation of practical teaching [13]. At present, most of the general colleges and universities in our country have many subjects, which leads to the complexity of the major composition. Therefore, there are many differences in thinking about this problem at a certain level. Due to the characteristics of Microbiology (such as easy cultivation, economy, space saving and large amount of acquisition), it has become the intermediate test material of many interdisciplinary subjects in recent years. More and more researchers are working on it. In the actual operation, many people are not standardized in the use of microorganisms, which directly leads to the unreliable or even wrong experimental results. In the process of higher education, practice Link is the best way to make up for this mistake. In order to improve the past collective practice is the place, a lot of students "walk the horse and watch the
flowers" phenomenon, we will change the centralized practice to a separate form of practice to carry out, so as to change the past difficult to receive the expected effect of the status quo. This paper expounds the content design, time design and process design of the practice so as to provide solutions and references for similar practice links in Colleges and universities.

**Practice Design**

**Topic Content Design**

Within the framework specified in the professional training program, students' topics are collected in the form of first solicitation and then induction. Before selecting a topic, the instructor will first give the scope of the topic prepared by the students, guide the students to prohibit the phenomenon of "Deviation" when selecting a topic, at the same time, it can expand the students' thinking and find the topic clues (it is recommended to complete the topic within 1-2 days, otherwise many students will commit "procrastination" and delay in submitting). Identify the feasibility of the collected topics, and according to the topics submitted by the students, type back the topics that do not meet the requirements or the existing experimental conditions. Finally, the selected topics are classified according to the content relevance degree. For example, the related topics of "isolation of microbial species and quantity in the environment" can be classified into one category, and the topics of "Research on biological pollution and evaluation in different water quality" can be classified into one category. After the completion of the classification, the students will be grouped into "categories" and concentrated on the writing guidance of the internship program, such as literature retrieval, the writing process of the internship program and precautions (it is recommended to complete the writing of the internship program within 7 days). For the submitted scheme, it is necessary to review and guide the students to revise one by one (Group) until it is finalized (the scheme writing process is required to be completed within 2 weeks).

**Practice Time Design**

In order to not only achieve the expected effect of practice, but also alleviate the fact that teachers cannot effectively guide and supervise due to too much practice time, the practice time of one week in the original outline is changed to a phased and irregular practice mode, which also solves the problems such as the quality of practice cannot be guaranteed, the experimental space and the lack of equipment.

**Establishment of Practice Group and Definition of Topics**

According to the actual situation of the course schedule, the practice of environmental microbiology course can be scheduled for the 8th week after the course starts. At this time, the students have certain knowledge and understanding of Microbiology, and the selection process is easy to carry out. The number of group members should not exceed 3. It is encouraged to establish a single group. The scope of practice should be determined by the teachers. The specific topics of each group should be submitted after discussion by individuals or groups. The process should be completed within 2 days. The instructor corrects and feeds back the topics handed in by students in groups. If the scope of the questions proposed by the students does not meet the requirements of the practice or the questions proposed cannot be completed under the conditions of this experiment, timely feedback to the students and give guidance. After the topic is determined, the teacher can summarize and sort out all the topics for the smooth progress of the follow-up work.

**Writing of Practice Report**

The teachers should guide the students in the centralized literature retrieval and the writing of the practice plan, and cultivate the students' ability of using literature retrieval tools and the scientific research literacy of experimental design. This link is limited to 5 days (including the process of students' checking, writing and teachers' feedback and finalization).
Practice Training

Let students carefully read the laboratory rules and regulations, instrument and equipment operation process and precautions, and emphasize that a series of links, such as the experimental operation process and maintaining laboratory health, will be taken as the important assessment points of practice results. Complete the change of students' concept from "result theory" to "process theory," emphasize process supervision, and improve the score of process assessment. As a result, students' practice attitude can be corrected. So as to achieve the expected effect of practice.

Guidance and Supervision of Practice Process

The students or groups that are classified into one category shall be guided in a unified way, and the guidance shall be detailed, mainly on-site guidance and supervision. For students who are divided into one group due to similar internship contents, they should be appropriately divided into multiple groups or arranged in different internship time to ensure the internship quality. In the process of practice, the teacher can check the key steps according to the characteristics of the instrument and equipment to determine whether the students fully master the use methods and precautions. In order to make the experiment accurate, the teacher must carefully supervise every link of the students' experiment, so as to avoid the students' mistakes in the "small problems" that the teacher thinks, which happens frequently. In the process of detailed guidance, the teacher is better to explain or demonstrate to the students with guidance and heuristic, so as to avoid the students' knowing and not knowing the reason, and let the students give one example instead of three in practice, so as to truly understand and be impressed.

Practice Effect and Evaluation

Improve Students' Practical Ability and Personal Sense of Gain

Because the practice is designed by individuals or groups (less than 3 people), it completely avoids the phenomenon of some students' taking the car, and greatly mobilizes the students to participate in the whole process of practice independently (i.e. consulting literature, designing experiments and practical operation). In the process of literature search, students not only understand and learn the use of literature management software, but also grasp the skills of retrieval. In the process of experiment design, they exercise and cultivate students' logical thinking ability, so that students can learn to design a small experiment. In the process of practice, students not only consolidate the knowledge learned in the classroom, but also the theory knowledge has been sublimated, so that students can master the knowledge more solid and firm, greatly enhancing the sense of acquisition of students.

Seeking Common Ground while Reserving Differences and Narrowing the Gap between Individuals

From the actual results, the number of students who practice in individual units accounts for about 1/10 of the total number of students in the class, and the rest of the students practice in 2-3 people units. From the submitted practice questions, we can see that some students are very thoughtful, and the topics they choose are not involved in the course experiment and practice, which is very novel; although most students choose similar topics, such as "the separation and purification of microorganisms in a certain environment" and other topics are the most, but there are differences in the experimental methods, which shows that the same The scholars have made great efforts to consult the literature. Through this kind of exercise, the gap between students in the mastery of relevant knowledge and practical ability will gradually narrow, and in this process, it also greatly expands the vision and scope mentioned by teachers in the internship outline, making the content of internship rich and meaningful.
Team Awareness Improved

Because the vast majority of students will practice in the form of groups, in the process of practice, the group members can work together. Zhang Chi has a degree, and complete the tasks in an orderly manner, and the team awareness of the group members has been significantly improved in the process of practice.

Problems and Solutions

In the design of this practice reform, the biggest problems are the time of teachers and the lack of teachers. There is no doubt that this kind of practice design will have a very obvious effect, but because it lengthens the practice time and improves the participation of teachers and students, from the perspective of teachers, the biggest pressure is the lack of manpower (1 teacher, 1 postgraduate), which leads to the teacher's guidance time cannot fully meet the needs of students. There is no such problem in the writing stage of students' topic selection and experimental design, but in the practical stage, teachers feel inadequate. Because most students choose to do experiments on weekends, there are inevitable conflicts, resulting in the unsatisfactory effect of these students. This problem can be solved by adding assistant graduate students. After the reform of environmental microbiology practice, some students' practice time is inconsistent with the outline, which is not conducive to teaching management and supervision. In order to solve this problem, we require all groups (including individuals) to take photos of the whole process of the internship and submit them to the teacher for filing for review. This reform of practice in school increases the workload of teachers, because the students who enter the practice stage ahead of time can account for about 1/4 of the total number of students. Although most students write the practice report in advance, the actual time of practice is the same as the time marked on the outline, which increases the workload of teachers. Only in this way can teachers be encouraged to actively carry out the reform of practice teaching.

Summary

To improve the participation of students as the starting point, encourage students to choose their own topics, make the internship content close to their own life, stimulate students' enthusiasm for exploration, so as to mobilize their initiative, make the internship process interesting, be full of expectations, through the careful guidance of teachers, grasp knowledge and skills, learn to design and think about solutions to problems. Through strengthening the change of process assignment, students pay more attention to details, and combine theory with practice, and get the expected effect of practice.

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