

Teaching reforms of experiment in Environmental Microbiology

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Abstract

At present, there are still some questions in the experimental teaching of Environmental Microbiology, such as the lack of training of students' experimental skills, the disconnection between experiments and scientific research training, and the neglect of valuable student experiments. Therefore, the experiment in Environmental Microbiology need to be reformed. In order to improve the students' experimental skills and promote the cultivation of students' creative ability, based on the analysis of Environmental Microbiology experiment teaching, the scientific research innovation projects are put forward to design comprehensive experiments.

Keywords

Environmental Microbiology, Experimental teaching reforms, creative ability.

1. Environmental Microbiology description and goal

While environmental pollution is of increasing concerns worldwide, the rapidly-emerging field of Environmental Microbiology is just beginning to address how organisms and ecosystems will respond. This course will focus on the basis of microbiology by discussing the individual and group characteristics of microorganisms, physiological and biochemical characteristics, growth characteristics and genetic variation. The course will emphasize how applying microbial basic knowledge to analyze and solve problems found and emerged in engineering. The course will consist of some lectures and experiments, but will primarily be comprised of presentations and discussion of readings.

Environmental Microbiology is an important professional foundation course for environmental engineering and environmental science. The goal of this course is to enable students to meet the following requirements: 1) Have basic knowledge of microbiology; 2) Master the role of microbes in environmental pollution control and governance and its principles; 3) Understand the application of new microbiology technology in environmental engineering; 4) To lay the foundation for learning professional courses such as water treatment engineering, solid waste treatment and disposal and air pollution control engineering.

2. Main problems in experimental teaching of Environmental Microbiology

At present, Henan university environmental science major of "environmental microbiology experiment" courses is environmental science professional basic course of Environmental Microbiology experimental teaching courses, which is mainly composed of the five basic experiment and comprehensive experiment, a total of 18 classes. The experiments are "morphological observation by the optical microscopy", "simple and gram staining", "medium preparation and sterilization", "separation, culture, and bacterial counting", "determination of enzyme activity", and "Microbial degradation of microplastics and identification". It has formed a complete curriculum system, but it still exists many problems.

The questions are as follows. (1) The existing experiments only train students in experimental skills, but lack the ability to understand the basic theoretical knowledge of microbiology, as well

as the ability to analyze and solve problems. (2) The existing experimental teaching arrangement is short, the teaching time is hasty, the student does not have enough time to study and practice; Moreover, there are many students majoring in environmental science, and the teaching laboratory space is small, so it is difficult to have enough experimental space. (3) Each experiment content is relatively independent and does not conform to the general rules of microbiology experiments. It can be seen from the original curriculum setting that the experimental contents of environmental microbiology experiments are mostly isolated and not consistent, and there are many repetitions among the experiments, which makes it difficult for students to master the microbiology experiments systematically. (4) In the environmental microbiology experiments of each academic year, students were able to separate a large number of pure microbes from different environments, some of which were actually of great practical value. However, due to the limited experimental time, they failed to conduct further research on them, which led to the waste of these microbial resources.

3. Exploration of teaching reform in scientific research and practical training

In view of the problems, the following teaching reform objectives are set: through revising the experimental teaching syllabus of Environmental Microbiology, reforming the traditional experimental teaching methods, transforming the single experimental operation skill training into the scientific experimental training based on scientific research innovation projects. Around a single experiment operations training design is a comprehensive scientific research, relevant teaching experiment results can be converted to the early stage of the scientific research achievements, can not only realize students experiment skill training and improve, also can enhance students' understanding of the basic theory of environmental microbiology knowledge, cultivating students' ability to analyze and solve problems, but also provides undergraduate students with a practical innovation training. In addition, the teaching experiment results will be regarded as the basic work of scientific research to improve the efficiency of environmental microbiology research.

The solutions are as follows. (1) The existing experiments only train students in experimental skills, and lack the ability to understand the basic theoretical knowledge of microbiology, as well as the ability to analyze and solve problems, so as to improve the training level of students' ability through good experimental design. It is possible to solve this problem by combining teaching experiment with teachers' scientific research innovation. In fact, some basic scientific research in environmental microbiology, such as the development and utilization of environmental microbial resources, involves a number of basic experimental operations in microbiology. Therefore, it is highly feasible to combine scientific research training with teaching experiments. (2) In view of the existing problems such as short class hours, short teaching time, insufficient time for students to study and practice, and narrow teaching laboratory space, and so on, the scientific research experiment can break the time and space limit of experiments. Focusing on teaching experimental principles and operating skills, the experimental team can freely choose the time and place of the experiment to conduct the research according to their needs. (3) The content of each experiment is relatively independent and does not conform to the general rules of microbiology experiments. By integrating the original independent experimental content, a continuous experimental system can be formed. A scientific research project involving microbial research is often related to the isolation, screening and identification of microorganisms. Experimental operations contain all operating units of microorganisms. Therefore, setting all experimental contents as a comprehensive scientific research experiment can enable students to have a more comprehensive understanding of the operation of microorganisms and improve their experimental operation

skills. (4) In the environmental microbiology experiments of each academic year, students were able to separate a lot of pure microbes from different environments, some of which were actually of great practical value. However, due to the limited experimental time, they failed to conduct further research on them, which led to the waste of these microbial resources. If teachers' scientific research experiments are combined with teaching experiments, the results of teaching experiments can be fully utilized to serve teachers' scientific research. At the same time, the teaching experiment also has a clearer goal, students can get the actual experimental training, the results are more remarkable.

4. Conclusion

Environmental science major courses in Henan university since in environmental microbiology experiment teaching, the reform innovation unceasingly, from the initial training students' practical operation ability, to train the students' comprehensive experimental ability, now in order to exercise the students' scientific research ability as the goal, comprehensive improve the students' experiment operation, experiment design, the ability to analyze and solve problems. Guided by scientific research practice, it not only transforms the closed teaching reform into the open teaching mode, but also combines the experimental teaching closely with teachers' scientific research projects and college students' innovative training projects, organically combines the students' practical teaching, teachers' scientific research projects and the construction of environmental engineering disciplines for common development.

Acknowledgments

This work was supported by Research and Practice project of higher Education teaching Reform in Henan Province (2019SJGLX202) and Teaching Reform project of Henan University (HDXJJG2018-12 and HDXJJG2018-68).

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