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Exploration of Plant Physiology Research-based Experimental Teaching Model

Yunmei Lu
College of Food and Biology, Jingchu University of Technology, Jingmen, 448000, Hubei, China

* Corresponding Author: **Yunmei Lu**

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Abstract
The traditional experimental teaching model is no longer suitable for the development trend of this discipline and the social demand for personnel training. In order to change the teaching model of experimental courses, this paper takes the plant physiology experimental course of Jingchu University of Technology as an example, studies and analyzes the drawbacks of traditional plant physiology experimental teaching from multiple levels and perspectives, and carries out the exploration and practice of the research experimental teaching model.

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Keywords: Plant physiology experiment, Teaching mode, Assessment method, Traditional teaching

1. Introduction

1.1. The teaching model is old

The traditional experimental teaching of plant physiology mainly adopts the experimental teaching method based on a single small experiment. Each experiment (4 class hours) and an experimental class generally includes five parts: teacher teaching, experiment preparation, experiment operation, data recording and sorting, and experiment report writing. The teacher completes the teaching task step by step in accordance with the teaching syllabus, and prepares the drugs and instruments needed for the experiment. The experiment steps and schemes are shown in the PPT, and the students can complete them according to the requirements. This kind of teaching method makes students have a kind of dependence on teachers, can not stimulate students' enthusiasm and initiative in learning, let alone cultivate students' research ability and innovation ability.

1.2. Single teaching content

The experimental content is the determination of a physiological index, most of which are "basic" and "confirmatory" experiments, such as the plasmolysis and restoration of plant cells, the determination of water potential of plant tissue (small fluid flow method), the determination of plant root vitality, the determination of chlorophyll content, the determination of plant respiration rate small basket method, the determination of plant seed viability. For the determination of malondialdehyde content and superoxide dismutase (SOD) activity in plant tissues, due to the limitation of class hours, each experimental project is carried out separately, which lacks cohesion and is not systematic, which will lead to the lack of overall understanding and understanding of this course and the lack of training of research ability.

1.3. Simple assessment method

The traditional test assessment method is relatively simple, including only the usual results and the results of the experiment report two parts, this form of assessment has some drawbacks. The lack of preliminary work of experimental scheme design and preparation before experiment, which can best reflect students' learning attitude. Normal grades are determined by classroom performance. However, some students in class are not careful in operation and cannot obtain real experimental data. In order to complete the experimental report, they copy the experimental results of others, which leads to the deviation of teachers' experimental teaching evaluation, thus affecting students' enthusiasm for learning.

2. Research on experimental teaching of plant physiology

2.1. Preparation before class

The traditional teaching preview before class is superficial and students only finish it perfunctorily. The research-based teaching mode is that the teacher gives an experiment scope and lets the students design the experiment. By consulting the data, determining the experiment project and integrating the experiment plan, the students must do their homework fully to complete this series of work. This part of the teaching content included in the course assessment can truly reflect the learning situation of students, and can well mobilize the enthusiasm and initiative of students, from the traditional passive learning to independent learning, can stimulate students' interest in learning, and improve the cultivation of students' scientific research and exploration ability and innovative spirit.

2.2. Experimental Preparation

The traditional preparation of materials, reagents, instruments and utensils before teaching experiments is completed by the experiment teacher. After the teacher teaches in class, students directly enter the operation process according to the experiment steps, and do not know the preparation work before the experiment. As a result, students have incomplete grasp of the experiment, but also make students dependent, passive learning effect is not good. The experimental preparation work of research-based teaching mode is completed with students as the main body and teachers' guidance as the assistance. From the preparation of experimental materials to the preparation of reagents, let students complete it alone, which can better cultivate students' hands-on ability and independent experiment ability, and lay a solid foundation for future graduation experimental research.

2.3. Experimental Operation

The ability of experimental operation includes whether the experimental operation is standardized, whether the observation of experimental phenomena is careful and serious, and whether the accuracy of experimental results can form good experimental habits. Because plant physiology experiment is the basic experiment of biology, most of the experiments are relatively simple (such as the determination of plant respiration rate, the determination of malondialdehyde content in plant tissue, etc.), traditional teaching experiment students often do not operate standard, prone to various problems. The training and examination of students' standardized operation should be strengthened. In addition, research-based plant physiology experiment teaching can guide students to actively solve problems in the experiment, assess whether students have independent operation and independent problem solving ability, actively affirm students with greater progress, and demonstrate in the whole class. Students should operate independently when doing experiments, and teachers should go back and forth during the experiment, timely correct students' wrong operations, answer the questions raised by students, and record the students' situation. After each experiment, each student should be scored in time. In this way, students can do a good job in each experiment, which is conducive to the improvement of experimental skills, prevent students from only focusing on experimental exams, and do not pay attention to the usual experiments, but also allow students to make accidental mistakes in the experiment, so that the evaluation results are more scientific, reasonable and comprehensive.

2.4. Assessment

The traditional teaching experiment assessment method is relatively simple, mainly written examination method, lack of effective evaluation system of experimental design and operation ability. The final examination of research-based plant physiology experiment teaching includes experimental theory examination and operation examination. Due to the strong operability of plant physiology experiment, the actual operation examination accounts for a slightly larger proportion, and the score distribution ratio is 40% and 60% respectively. Among them, the theoretical examination is mainly to test the experimental principle, the theoretical basis of the experiment, the experimental data processing and the basic laws and basic concepts of the experiment. The test of experimental operation is a test of students' practical ability, and the test method is to carry out a separate operation test for each student. The test focuses on students' mastery and use of commonly used instruments, such as the operation process of biological microscope and the operation process of type microscope. In form, the experimental content learned can be independently operated by drawing lots as a link in the grade evaluation of the course.

3. Conclusion and discussion on experimental teaching effect of research-based plant physiology

Plant physiology experiment is a basic experimental course, studying this course systematically and effectively helps students to consolidate the theories and techniques of botany and plant physiology, and lays a solid foundation for learning other related courses. The reform of experimental teaching of plant physiology can strengthen the systematization of experimental courses through the modular teaching of experimental projects, cultivate students' hands-on ability by tracking the process of plant physiological activities, and tap students' innovation potential through independent learning, so as to improve students' innovation ability. Although the basic program of research-based plant physiology experiment teaching has greatly increased the workload of teachers, it has indeed changed the practice of emphasizing theoretical teaching and neglecting experimental teaching in the past. While giving full play to the role of the laboratory, students have comprehensively mastered the basic knowledge, basic operation and basic skills of plant physiology experiment. This kind of teaching program objectively reflects the actual ability and level of students, and lays a certain foundation for cultivating a new generation of college students with innovative consciousness. Through the teaching reform of plant physiology experiment course of biological science major, students have been greatly improved in all aspects.

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