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《Experiment of Soil Fertilizer》 First class course-- Research and practice on the construction of open-research teaching model

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----------ABSTRACT----------
This teaching research and reform project is based on the school level teaching research and reform project of Panzhihua University, and carries out research and practice on the construction of an open-research teaching model, which is a first-class course of soil and fertilizer science experiment. The main contents of research, construction and practice include:
1. Research and Practice on the Construction of the First class Course of Soil and Fertilizer Experiment Course.
2. Research and practice on the construction of open and research-oriented teaching model of soil and fertilizer experiment course.
3. Research and Practice on the Construction of Student Assessment System of Soil and Fertilizer Experiment Course.
4. Research and practice on the construction of student evaluation system for soil and fertilizer experiment course.
This paper studies and practices the experimental course teaching of soil and fertilizer science in order to achieve the goal of building a first-class course of soil and fertilizer science experiment -- an open research teaching model.
KEYWORDS: Soil and fertilizer science, experiment, first-class course, open and research-oriented, student assessment system, student evaluation system

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I. Research and practice on the construction of first-class courses of soil and fertilizer experiment course

The traditional teaching model of soil science experiment should be changed into an open and research-oriented teaching model, and the corresponding evaluation system should be established. This model can not only maximize the teaching effect and students' autonomy in learning, but also enhance students' professional innovation ability, exploration spirit and ability to solve practical problems, and ultimately achieve the training goal of application-oriented, innovative, high-quality and diversified talents[1].

The current development direction of higher education has changed into the connotation development with the improvement of teaching quality as the core. As an important professional practice course, the soil science experiment course is a major compulsory course for cultivating compound applied talents in horticulture, and plays an important role in cultivating and improving students' professional quality and skills[2-3].

With the rapid development of society and science and technology, the requirements of society and jobs for college graduates are becoming higher and higher. In addition to mastering basic knowledge and meeting the needs of the times, students also need to be innovative, forward-looking and international, and have a certain ability to independently solve practical problems. This requires that colleges and universities must give full play to the professional characteristics of the lecturers scientifically and effectively, and strive to find the most suitable teaching methods and models for the soil science experimental courses of horticulture majors for the students of horticulture majors. In the network era of high-quality educational resources sharing, the traditional teaching model of "teacher oriented, one mouth, one pen, one lesson" will be transformed into an open and research-based teaching model, and the corresponding evaluation system will be established. This model is of great significance for students to follow the international development frontier, improve teaching

level, quality and effect, expand students' knowledge and thinking ability, and enhance students' independent innovation and all-round development ability[4-7].

The multi-level meaning of open and research-oriented teaching

Open and research-based teaching refers to a teaching model based on research and exploration, which is based on curriculum content and students' knowledge accumulation. This model emphasizes students' self thinking, exploration and problem finding, encourages students' independent learning and personality development, rather than passively "accepting" knowledge[8-10].

The open teaching model, based on the self construction of individuals, is a fundamental change to the traditional teaching model in many aspects, such as the teaching concept, means, goals, teacher-student relationship, and evaluation system. The key lies in "openness", including the openness of teaching concept, content, process, space, and evaluation system. This model takes students as the main body of teaching activities, including multiple teaching objectives, open teaching environment and multi-dimensional teaching design, so as to mobilize the enthusiasm and initiative of students to learn, and cultivate compound talents who adapt to social needs and have innovative awareness and practical ability[11].

The research-oriented experimental teaching model is a practical teaching activity that combines students' experiments with teachers' scientific research activities. Constructivist learning theory emphasizes that students build their knowledge structure and system by finding and solving problems. In the problem-based research-based experimental teaching model, teachers' scientific research projects should be used as the support. Students no longer only carry out basic experimental operation training such as demonstration, imitation and operation exercises, but pay more attention to students' original experience and main body, guide students to think actively, form effective problem solving and reasoning strategies, and enable students to actively design experiments and implement them, That is, students will change from passive receivers to real active constructors, so as to improve their practical ability and flexible application of knowledge.

II. Research and practice on the construction of open and research-oriented teaching model of soil and fertilizer experiment course

Specific implementation measures for the reform of open and research-based teaching model:

The open teaching model of soil science has two important supporting points, which not only emphasizes the openness of curriculum and teaching content, but also emphasizes the openness of teaching process. For the experimental content, we should also pay attention to the research-based teaching model of experimental content. In such a teaching model, the role of teachers is not only to impart professional knowledge, but also to cultivate students' ability to learn independently and master new knowledge. At the same time, teachers should create a classroom atmosphere for students to spread their thinking and a space to publicize their personality, and encourage students to acquire knowledge independently.

1. Creating Situations and Introducing Teaching Content Reasonably in Open Teaching

Change the single indoctrination model dominated by teachers, comprehensively use interest guidance method, task driven method, layered teaching method, multimedia assisted method and other methods, create situations, encourage and stimulate students' independent thinking ability, and stimulate students' logical thinking and analytical ability through the interaction of students and teachers. Improve students' learning interest and professional knowledge and skills through example teaching.

For basic theoretical knowledge, homework and teaching can be combined. Before the lecture, the teacher lets the students learn by themselves in the form of homework; In the classroom, create an atmosphere of inquiry by means of research and discussion, stimulate students' innovative thinking, and learn knowledge points by asking students questions and teachers' summaries. In particular, teachers can create a situation first, and then propose or design some new questions to formally enter the teaching of the taught content. At the same time, they should pay attention to giving students time to explore, cooperate and practice knowledge, creating a harmonious and free learning atmosphere for students, so that students can consciously participate in the teaching to the greatest extent. You can also ask students preset questions, and students can answer the questions raised by teachers according to the preview before class or the accumulation of existing knowledge, so as to provide a good start for later teaching. This kind of scene introduction can also remind students of the learning content of the day, enable students to find the right direction and goal in learning, and effectively exercise students' independent thinking ability. In open teaching, students can not only make effective use of classroom time, but also improve their ability to learn independently after class, thereby improving the teaching effect and quality. In addition, special attention should be paid to the knowledge expansion and ability cultivation of students in the teaching process. Teachers can let students choose topics independently within a certain range in

the form of homework. They can learn relevant knowledge by consulting literature, and then complete the learning in the form of discussion or defense in class.

In terms of experiments, with the support of teachers' scientific research projects, set up experimental content related to teaching content, or students independently design experimental content related to teachers' scientific research projects according to the content they are interested in, look up data and design experimental programs by themselves, and complete them independently under the guidance of teachers, so that students can constantly tap their innovative potential.

2. Adopt the method of group learning and cooperation to integrate the teaching content with life

In the open teaching classroom, teachers should try to give the initiative of the classroom to students, and increase the communication between teachers and students, students and students. Group learning cooperation method is the most frequently used open teaching method at present. When using the group learning cooperation method, the team members should follow the principle of complementary advantages and voluntary combination, and define the corresponding division of labor for each member. Teachers can let students discuss the learning content in groups. Students can express their opinions and brainstorm. They can also learn from each other to improve and motivate themselves. After the discussion, each group will send representatives to explain. If conditions permit, more students can participate in the explanation. The teacher will then make a comprehensive evaluation of each group. Of course, students can prepare PPT after class in advance. This kind of learning method can not only improve the students' learning initiative, but also balance the differences among students, and improve the class's learning level and teaching quality as a whole.

In the open classroom teaching, it is necessary to integrate the teaching concept of life. Soil science itself is closely related to daily life. Teachers should pay attention to the integration of teaching content with life, break through time and space constraints, encourage students to think in multiple directions, let students connect abstract soil science knowledge with the reality of real life, creatively use the knowledge learned to adapt to new situations, let students truly appreciate the charm of soil science, so as to cultivate students' initiative, creativity, participation and cooperation, So that students' innovative spirit and practical ability can be brought into full play. In addition, teachers' teaching language can be appropriately adapted to life. In addition to professional terms, teachers can communicate with students in a more popular language to make the teaching content easier to understand and learn.

3 Provide more teaching resources to enable students to actively explore

In the open and research-based teaching model, textbooks and traditional reference materials are far from meeting the needs of contemporary students. Teachers should find and provide the most appropriate teaching materials or other diversified learning materials, such as video materials and relevant pictures, for students through multiple channels and means. The network resources are very rich. Teachers can find and download all kinds of materials they need. They can also outline the teaching objectives and key and difficult points, or design hierarchical problems, and then integrate them into teaching courseware suitable for their own classroom. In the classroom, teachers should make full use of the image and intuitive characteristics of multimedia teaching, adhere to the complementary advantages of traditional teaching and multimedia teaching, so as to attract students' attention. Students should think according to the outline or with problems, and actively seek solutions. The excavation of the intrinsic fun of the teaching content itself can also stimulate students to experience the joy of learning with their own thinking creativity. Teachers should also constantly explore new teaching methods and means in practice, such as making full use of the library's audio and video room, voice room, WeChat, QQ, Learning Pass, etc. to explore teaching. It can also interact with students on the network teaching platform, timely grasp students' classroom learning effects, and timely analyze and summarize common problems.

In terms of carrying out research-oriented experiments, teachers are required not only to circulate project books and other materials to students, but also to teach students how to obtain relevant research materials through various channels, such as CNKI China Knowledge Network, Wanfang Data, Elsevier Science Direct journal database, Springer LINK journal database, ProQuest biological agricultural journal database, etc., and to consult relevant Chinese and foreign documents, and guide students to complete the design and implementation of the experiment scheme.

4. Enlarge the opening degree of the laboratory and construct the research exploration model of experimental teaching

Experiment is also an important aspect of soil science teaching and learning, but at present, soil laboratories are only open to students during experimental classes. To successfully apply the open and research-oriented teaching model of soil science, based on the application of the group learning cooperation method and the provision of more teaching resources, the school should also formulate relevant regulations on the use of

laboratories to increase the openness of laboratories, open laboratories to students at ordinary times, so that students have free space and time to carry out experiments and innovations in soil science. Of course, we should also pay attention to laboratory safety and the safe use of pharmaceutical glass instruments. We should also enrich the instruments and equipment, introduce some new advanced equipment to the laboratory, and let students use them freely, so as to broaden students' knowledge and vision.

The research-oriented experimental teaching mainly includes the following contents: students understand and analyze the teacher's project content, and put forward relevant experimental questions; Teachers guide students to analyze problems, and students look up data to design experimental programs; Teachers comment on and guide the experimental plan to form a final feasible plan, which is implemented by students; Summarize the experimental results and make comprehensive analysis. In the above process, we should pay attention to guiding students' active thinking ability, and improve their practical ability and the ability to flexibly apply the knowledge learned to solve practical problems.

5. Educate students in accordance with their aptitude, and establish a good teaching evaluation system

Each student has its own characteristics, and different teaching methods should be adopted according to their own characteristics, different foundations and understanding abilities. Open and research-based teaching focuses on cultivating students' interest in soil science. According to the difficulty of professional knowledge and students' level and reality, we should teach students in accordance with their aptitude, design various forms of classroom teaching activities, mobilize the learning enthusiasm of poor students, improve the innovative and practical ability of better students, and let all students actively think and discuss, so as to achieve teaching interaction and common progress of students.

A reasonable evaluation system is the guarantee for the implementation of open and research-oriented teaching. For the evaluation of basic theoretical knowledge, it mainly inspects the students' mastery of theoretical knowledge, which can be comprehensively evaluated according to the students' speeches in class, whether they are well prepared after class and other aspects, and combined with various methods such as regular assessment and written examination. Special attention should be paid to the assessment and evaluation of students' learning process, effect, initiative, ability to analyze and solve practical problems. It can be carried out by combining stage assessment with final assessment. At each stage, students submit their study works to obtain stage scores, such as reports, assignments, micro PPT, etc., and then integrate the final scores for comprehensive evaluation. The evaluation of research-oriented experimental teaching focuses on assessing students' ability to actively learn, analyze and solve problems, and design and implement experiments, so that students can master the most basic experimental skills of the subject, and cultivate students' scientific thinking model and rigorous scientific attitude. Students' academic performance should be assessed from both groups and individuals. Students can choose a representative to report to the research group. The whole class will ask questions and the group members will jointly defend. The teacher will then give corresponding scores according to the purpose and significance of the students' research content, the results, the division of labor and participation of the group, the defense, etc., as well as the experimental design or papers of the group, and the enthusiasm for participating in the research. For individual assessment, students can be required to submit an experiment report or experience, focusing on the examination of students' sense of group cooperation and their achievements in the experiment.

III. Research and practice on the construction of student assessment system for soil and fertilizer experiment course

Assessment of 2018 Horticulture Major's Soil Fertilizer Experiment Scoring criteria

According to the requirements of the teaching syllabus and the actual teaching situation, the assessment and scoring criteria for the course of Soil and Fertilizer Experiment for the 2018 horticulture major are specially formulated as follows.

The score consists of three parts: experimental attendance, hands-on operation assessment of experimental process, and experimental report.

(1) Experiment attendance, including preview of experiment report (accounting for 10% of the total score): 2 points will be deducted for late attendance or early leave once. The preview before the experiment is scored according to the quality of the preview report. Those who are absent from work without reason and fail to complete the experiment in time fail to pass the final course examination.

(2) Examination of hands-on operation in the experimental process (accounting for 30% of the total score): Does the experimental instructor listen carefully to the experimental guidance and explanation? When the teacher conducts the experiment demonstration, do you observe carefully? Whether the experimental operation is carried out carefully according to the arrangement and requirements of the experimental project, and whether the experimental process is standardized? Whether the experimental phenomena and results are observed and recorded in a timely manner, whether the problems existing in the experimental process can be found in a timely manner and reasonable measures can be taken, and whether the teachers can actively ask for advice? What is the final completion quality of the test? At the end of each experiment, the instructor shall conduct a comprehensive evaluation on each student according to the above evaluation requirements, and score according to the hundred point system.

(3) Experiment report (accounting for 60% of the total score): the examination practice report is completely written, the handwriting is neatly arranged, the charts are standardized, the experimental data is recorded accurately, the data analysis and processing are appropriate, and the experiment conclusion is correct, and the problems in the experiment can be clearly analyzed. For each test report, the instructor shall correct it as required and give results. (The score composition of a single experiment is generally 10 points for the purpose and principle of the experiment, 10 points for the materials and instruments, 40 points for the content and steps of the experiment, and 40 points for the original record of the experiment.)

IV. Research and practice on student evaluation system construction of soil and fertilizer experiment course

According to the course assessment system, research and practice the construction of the evaluation system for students' learning courses. See the following table for the specific evaluation of students' learning courses:

Detailed Transcript of Soil Fertilizer Experiment

semester: 2020-2021-1 | Course: Experiment of Soil and Fertilizer | Summary Date: 2020.11.16 | teacher: Xiong Jian

Serial No.	Student No.	full na	Abbreviation of experiment	Roll call+hand work30%					experimental report					comprehensive
				roll call 8%	Preview 2%	skilled 10%	standard 10%	discipline 10%	Purpose and princi	Materials and appli	Experiment conten	Original record 40%	Single experiment	average
1	201810908014	Zhou Xue Yao	Collection and treatment of	100		70			71				74	73
			Determination of alkali	100		70			70				73	
			Morphological diagnosis of	100		70			71				74	
			Chemical Diagnosis of Crop	100		70			70				73	
			Determination of nitrogen in	100		70			71				74	
			Determination of available	100		70			70				73	
2	201810908049	Jiang Xia	Collection and treatment of	100		70			71				74	74
			Determination of alkali	100		70			71				74	
			Morphological diagnosis of	100		70			71				74	
			Chemical Diagnosis of Crop	100		70			71				74	
			Determination of nitrogen in	100		70			71				74	
			Determination of available	100		70			71				74	
3	201810908018	An Rong Jing	Collection and treatment of	100		85			83				85	86
			Determination of alkali	100		85			84				86	
			Morphological diagnosis of crop nutrient deficiency symptoms	100		85			85				87	
			Chemical Diagnosis of Crop Tissue Nutrition Determination of Phosphorus	100		85			84				86	
			Determination of nitrogen in ammonium nitrogen fertilizer	100		85			80				84	
			Determination of available phosphorus in superphosphate	100		85			84				86	
4	201810908047	Yao Hong Ying	Collection and treatment of soil samples and determination of texture	100		85			80				84	85
			Determination of alkali hydrolyzable nitrogen in soil	100		85			81				84	
			Morphological diagnosis of crop nutrient deficiency symptoms	100		85			85				87	
			Chemical Diagnosis of Crop Tissue Nutrition Determination of Phosphorus	100		85			83				85	
			Determination of nitrogen in ammonium nitrogen fertilizer	100		85			80				84	
			Determination of available phosphorus in superphosphate	100		85			84				86	
5	201810908024	Heng Li	Collection and treatment of soil samples and determination of texture	100		85			82				85	85
			Determination of alkali hydrolyzable nitrogen in soil	100		85			83				85	
			Morphological diagnosis of crop nutrient deficiency symptoms	100		85			82				85	
			Chemical Diagnosis of Crop Tissue Nutrition Determination of Phosphorus	100		85			84				86	
			Determination of nitrogen in ammonium nitrogen fertilizer	100		85			82				85	
			Determination of available phosphorus in superphosphate	100		85			80				84	
6	201810908007	Li Qing Qing	Collection and treatment of soil samples and determination of texture	100		70			71				74	73
			Determination of alkali hydrolyzable nitrogen in soil	100		70			70				73	
			Morphological diagnosis of crop nutrient deficiency symptoms	100		70			71				74	
			Chemical Diagnosis of Crop Tissue Nutrition Determination of Phosphorus	100		70			70				73	
			Determination of nitrogen in ammonium nitrogen fertilizer	100		70			71				74	
			Determination of available phosphorus in superphosphate	100		70			70				73	
7	201810908015	Li Ji Hong	Collection and treatment of soil samples and determination of texture	100		70			70				73	73
			Determination of alkali hydrolyzable nitrogen in soil	100		70			71				74	
			Morphological diagnosis of crop nutrient deficiency symptoms	100		70			70				73	
			Chemical Diagnosis of Crop Tissue Nutrition Determination of Phosphorus	100		70			71				74	
			Determination of nitrogen in ammonium nitrogen fertilizer	100		70			70				73	
			Determination of available phosphorus in superphosphate	100		70			71				74	
8	201810908020	Zhang Shi Min	Collection and treatment of soil samples and determination of texture	100		85			82				85	85
			Determination of alkali hydrolyzable nitrogen in soil	100		85			83				85	
			Morphological diagnosis of crop nutrient deficiency symptoms	100		85			80				84	
			Chemical Diagnosis of Crop Tissue Nutrition Determination of Phosphorus	100		85			83				85	
			Determination of nitrogen in ammonium nitrogen fertilizer	100		85			83				85	
			Determination of available phosphorus in superphosphate	100		85			80				84	

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