

Research on project-based teaching of "crop genetics and breeding" course in higher education

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Abstract: *Skills and talents are increasingly important in China's rapidly growing economy, so universities and colleges have been focusing on giving their students professional skills. Project-based teaching is used in Crop Genetics and Breeding classes in forestry and agricultural schools and universities. This paper discusses how the method is utilized in the class, as well as some ideas on how to improve the method.*

Keywords: *Crop genetics and breeding; Project-based teaching; Teaching reform*

1. Introduction

"Crop Genetics and Breeding" learning design is an important professional qualification in agriculture and forestry colleges. The first is to cultivate students' conventional crop genetics and breeding skills and improve their theoretical application ability. To improve the teaching effect of the course and increase the employability of students, we constantly research new teaching ideas. Project-based teaching is an important development direction of current college teaching, which combines practice and teaching to improve students' professional quality ^[1].

2. Current status of teaching crop genetic breeding courses

2.1. Heavy teaching loads

College students are not sensitive enough to the topic of crop genetics and breeding and have too little initiative in learning. There are other problems, mainly because of lacking solid basic knowledge, interest in this course, understanding of knowledge and initiative in learning, which lead to difficult teaching tasks. With the development of the times and the improvement of technology, many new breeding standards and ideas have emerged, but the existing teaching has been unable to adapt to the latest industry needs. Also, the teaching tasks of the course are gradually increasing.

2.2. Lack of a complete practice teaching system

The crop genetics and breeding course itself is difficult, the overall theory of the course is more, the knowledge is difficult to understand, and the students are difficult to learn. It is difficult to achieve theoretical practice, and classroom teaching cannot achieve the ideal teaching effect. The practical teaching of many colleges and universities is not perfect, and most of the practical courses have serious formalism problems, resulting in students not paying attention to improving their practical ability. In the teaching process, classroom teaching and practical courses are seriously separated, and theoretical learning cannot be combined with practice.

2.3. Single instrument for evaluation

The student's performance assessment consists of two parts: the usual grades and the final exam. The usual grades account for a small proportion of the final grades. As a result, students usually do not listen to lectures and study hard at the end of the semester, and concentrate on the exam semester ^[2]. The whole process is exam-oriented study. The current curriculum lacks an evaluation with final grades as the main evaluation standard, which means that many students cannot take daily theoretical study and practical

courses seriously. Many students just dramatically improved their test scores before the test, and their professional skills didn't improve.

3. Project-based teaching concepts and principles

3.1. Employment-oriented principles

The implementation of project-based teaching should be employment-oriented, in line with current industry standards and professional needs, and not for improving students' theoretical knowledge. The so-called career orientation is to improve the professional ability of students under the current standards and needs of the industry [3]. Project teaching of crop genetics and breeding courses should focus on improving students' data collection and testing ability. Schools should try to connect the students of this course with breeding units and seed production enterprises to engage students in production and consolidate the content of this course. Under the premise of ensuring integrity of the internship program, students are required to truthfully record the procedures and methods of seed production, and report and communicate at the end of the internship. During the internship, students gain practical experience, deepen their impression of course knowledge, and effectively improve their practical skills and ability to apply knowledge.

3.2. Clear educational objectives

The educational goal of project-based teaching in crop genetics and breeding courses is to improve students' technical and practical abilities through project-based teaching, and to increase the overall and systematic nature of the curriculum. This project-based teaching method can meet the current needs of colleges and universities for staff training and improve students' core professional skills [4]. Project-based teaching should follow the principle of clear educational goals to improve students' examination ability. Replace individual exams with a combination of theory and competency assessments. Teaching assessment should be process-oriented. The assessment is usually divided into each experimental class and practical class, and each practical class must be assessed. The assessment results and final exam results should be suitable. Each assessment result directly reflects the final grades included in the course. The teaching effect has changed the test-oriented learning.

3.3. Innovation in Course Teaching

Project-based teaching can adapt to the latest curriculum standards, and the flexibility of project-based teaching enables it to keep pace with the times. Schools and teachers should set wants for students according to the latest industry needs and advanced enterprise theories, and innovate teaching methods and teaching content according to the current advanced breeding technology and instruments. At the same time, teacher use multimedia demonstrations, micro-videos, flipped classrooms and other teaching methods to stimulate students' interest and initiative in learning. Through classroom teaching to mobilize students' enthusiasm for learning, it heightens their subjective understanding of the course [5].

4. Strategies for project-based teaching in the course “Crop Genetics and Breeding”

4.1. Teaching projects based on practical needs

The main goal of the crop genetics and breeding course is to improve the professional skills of students, so the employment needs in the project teaching should be used as the basis for the project teaching. First, it is necessary to clarify teaching crop genetics and breeding courses is mainly aimed at crop improvement, agricultural product sales, seed production departments, scientific research and testing institutes and other positions. It is also possible to send scientific research support personnel and laboratory leaders to laboratories in related industries. After the initial situation of the course is clarified, it is necessary to carry out project teaching aimed at improving the employability of students. In the project study, students should understand the basic principles of breeding and the use of common breeding instruments, and be able to use them skillfully. Second, project-based teaching should focus on important crop breeding projects of institutions at all levels as the main teaching content, and try to combine teaching with practical work needs to meet the current needs of the industry. Third, the project teaching can be designed according to instrument, and relevant industry standards, methods and skill training can be introduced into the project teaching. Then, students can understand the work needs in

classroom teaching and meet the employment needs of students. Finally, in the project teaching, the syllabus and basic needs can be integrated into the project teaching to improve the employability of students, and at the same time strengthen the practicality and professionalism of teaching crop genetics and breeding.

When settling the teaching project, the future professional needs and personal development of the students are taken as the basis and starting point of teaching. Taking the test items and types of test tools currently wanted by colleges and universities for dividing the project topics, divide teaching items according to these two needs, and combine the teaching hours to ensure the time can be allocated in the classroom. completed within. After entering project-based teaching, students have a deeper understanding of professional knowledge and industry needs. The teacher's class is not limited to teaching textbooks, but also guides students into the industry through project classes, so they can understand in advance the industry they will be engaged in. This new teaching is more systematic and easier to understand than the traditional teaching, and the method combining practice and theory is more acceptable ^[6]. Therefore, settling project-based teaching oriented to students' development needs can improve the quality of teaching, to achieve the teaching goals.

4.2. Teaching tasks with projects

When carrying out project-based teaching, the relevant teaching tasks should be designed with the project as the carrier to ensure the teaching tasks can be similar to the work needs. Creating teaching tasks can involve traditional breeding techniques, crossbreeding techniques, population improvement techniques, cell engineering, molecular markers and transgenic breeding techniques. Breeding techniques can be divided into project teaching. On this basis, multiple teaching tasks can be divided to ensure that each teaching task can meet the work needs of students. Through learning the teaching tasks in the project, the relevant professional knowledge and skills can be mastered. Take transgenic breeding technology as an example. The main purpose of this tool is to directly get transgenic breeding resources, so this project can be divided into three tasks: construction of transgenic cloning vector, laboratory breeding and identification of transgenic crops, and field safety evaluation of transgenic crops. By completing the first two tasks, students will be able to master the experimental procedures of GM molecular biology in the laboratory and understand the specific functions of GM breeding. After completing the first two tasks, the third task is to consolidate and secure the knowledge of transgenic technology. Designing such three step-by-step tasks develops students' professional skills and conforms to their cognitive rules.

When schools apply project-based teaching, they should be based on rich teaching resources and innovate teaching methods. Only by making full use of teaching can be truly implemented. Before innovating teaching methods, schools should fully integrate teaching materials, and teachers and schools should integrate relevant teaching materials and organize them into a knowledge system that is more acceptable to students. After the project teaching is established, teaching assignments will be designed according to the project design. Students can improve their professional ability and professional quality after receiving the project teaching, and independently understand the relevant knowledge and learning content of the course. Through deconstructing and rebuilding the teaching system, the school defines new teaching tasks, so teachers and students can improve their professional knowledge, professional skills and professional skills combining practice and theory ^[7].

4.3. Implementing project teaching by work process

Setting up project-based teaching, the work can be used as the carrier of the project division. The three parts of preparation before the start of the work, when the work starts and after the work is completed can be used as the carrier of the project. First, in the preparatory work before starting work, the whole work process must be divided into six steps, and organized into teaching according to different steps, namely: clarifying work tasks and getting task information, formulating relevant breeding plans, creating breeding, reviewing programs, predicting breeding results and providing feedback on predicted results. This is also the preparation for teachers to start project teaching. After each work step is refined, a teaching system is established. Second, when performing the task, teachers should first ask students to complete the task, collect test data and understand the standards that must be met for breeding. Also, student organize a project demonstration in class to show the breeding program to the students they designed. In this process, teachers should give sufficient guidance to students, but they should not interfere too much with students' work. To avoid problems that are difficult for students to solve, teachers can group students into groups and let them complete tasks together by cooperating to communicate and integrate relevant information. After entering the breeding process, teachers should give appropriate

guidance to students. If students meet problems in the implementation process, they can discuss and solve them in groups, or ask teachers for opinions to solve problems. After students complete the breeding design, teachers should review the students' completion to find out whether the students' grades meet the standards. After completing the breeding task, the teacher leads the students to clarify the whole process. The students conduct group evaluation or self-evaluation, thinking about the mistakes and shortages in the task process. Then, the teacher completes the graduation evaluation with an objective and professional attitude. All of students' work tasks can become the carrier of project-based teaching. In this work environment, organizing project-based teaching can dramatically improve students' professional skills and provide them with a well-rounded education.

Carrying out project-based teaching, colleges and universities should bring the work content into the classroom and buy many professional breeding equipment for students to use in practice. Before the project-based teaching of the crop genetics and breeding course, the teachers of the teaching and research group discussed to divide teaching projects according to the work tasks, and designed teaching plans according to different project settings. In the classroom, students have to apply the latest industry standards in a professional working environment, not only to learn how to use the farming equipment, but also to master the use of the equipment. To introduce project-based teaching, the work ability of school students will be recognized, and many testing institutions and related institutions will recognize crop genetics and breeding students.

4.4. Innovation of project-based teaching methods

When carrying out project-based teaching, we should innovate teaching methods and carry out project-based teaching in various teaching methods. One is the case teaching method. First, through case interpretation, in the classroom with the guiding questions, to stimulate students' thinking, through case analysis, let students think about professional issues. Second, according to the course content and project settings, the topic-based teaching method arranges relevant teaching topics, so students can find relevant information, and summarize and organize. After completion, students express their views and opinions on the data content and present it in class, and all students take part in discussion and evaluation. Students can then develop the ability to design their own breeding programs and share their plans with classmates in the classroom to develop their professional skills. Third, teachers can use modern information tools to enrich classroom and set up project lessons skillfully. In the information-based classroom, students should be the heads of their own affairs, and teachers should share relevant materials and excellent cases on the online platform in advance. Students can expand their knowledge of crop genetics and breeding through online resources. Because this course is a skilled course, especially transgenic breeding, various molecular experimental tools are used in the teaching at the same time, and the testing process takes a long time. Because of class time constraints, many teachers cannot guide students through the testing, and science equipment are limited, resulting in students having less practical experience. Therefore, teachers can use online teaching, proving a simulation test room. At the same time, students can repeatedly learn the breeding process, so each student has the opportunity to participate in the real test, and improve the teaching effect of the course. Fourth, the project teaching of crop genetics and breeding courses can also be carried out in the form of project competition. Breeding competitions are held regularly and students independently design and do testing procedures. Judges will evaluate students by analyzing their designs and test results, which will lead most students into breeding practice, adding a new resume to the resumes of skilled students and improving their competitiveness in the job market.

4.5. Establishment of a sound evaluation system

Setting up a sound evaluation system is an important part of the innovative teaching model, especially in project-based teaching. The traditional teaching evaluation takes the students' academic performance as the assessment standard, and conducts a onetime performance assessment for the students. This assessment method will only allow students to "stand up" and review for a period of time before the exam, but will not inspire students to learn and improve their professional skills through daily study. This evaluation method is obviously not suitable for project-based teaching. It is necessary to conduct a comprehensive inspection of students' theoretical knowledge and ability, and project-based evaluation is also an indispensable evaluation method in project-based teaching. It tests students' theoretical knowledge and ability. Students can collect materials independently, summarize and extract effective information from them, test students' hands-on ability and whether they can conduct experiments independently. It is also important to check whether students can conduct experiments independently. This assessment can be done by performing breeding tasks and completing a breeding report. Don't ask

students to write lab reports, let them focus on the work. In this evaluation mode, students can feel the work content in advance and shorten the distance from the workplace. Therefore, in project-based teaching, a solid evaluation system consisting of student self-evaluation, peer evaluation and teacher evaluation should be established to guide students to explore their own professional knowledge and improve professional skills.

5. Conclusions

Project-based teaching is a new teaching method, especially in the professional discipline of crop genetics and breeding, the advantages of project-based teaching are more obvious. To carry out project-based teaching, teachers should change the traditional form of education and adhere to the student-centered teaching. Mostly, teachers not only provide students with a wealth of theoretical knowledge, but also provide students with plenty practical skills.

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