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Research on Teaching Reform of Forest Tree Genetics and Breeding Course

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***Abstract*—Forest Tree Genetics and Breeding is a professional core course for forestry majors, and it is also knowledge that students of this major must master. In the process of teaching, it is found that students' learning objectives are not clear, the teaching content is backward and the key points are not prominent, which affects the students' learning effect. This paper aims to solve the existing problems by strengthening the students' learning initiative, updating the teaching content and highlighting the key points of learning, so as to improve the students' learning efficiency and enthusiasm and enable students to fully understand and master the knowledge points they have learned.**

Keywords—Forestry major; Forest Tree Genetics and Breeding; Teaching Reform

I. INTRODUCTION

Forest tree genetics and breeding is an applied science based on the achievements of modern biological science and other related natural sciences. It is guided by genetic theory and based on the characteristics of trees and the laws of genetic variation, and studies how to effectively control and use this genetic variation to serve human needs. It is a professional core course for forestry majors, and an important course after students learn and master basic courses and professional basic courses such as botany, plant physiology, soil, meteorology, dendrology, nursery science, forest pathology and entomology. It is the knowledge that students must have for genetic improvement of forest trees, breeding of new varieties and breeding of fine varieties.

II. EXISTING PROBLEMS IN TEACHING

A. Students' learning objectives are not clear

Forest Tree Genetics and Breeding is a very complex professional discipline. It combines the relevant knowledge of genetics and forest tree breeding. It is highly theoretical and practical, with a variety of knowledge concepts, and the knowledge points are difficult to understand. Many students feel relatively difficult during the learning process. At first, they can actively think, learn and interact with the teacher's thinking. However, with the deepening of the difficulty of knowledge points, their learning enthusiasm and interest are gradually affected. Then they don't listen carefully in class, answer the questions incorrectly and can't finish the assignment on time. The learning effect is not good. On the other hand, Forest Tree Genetics and Breeding is the core course for forestry majors. It needs to be based on courses such as botany, plant physiology and dendrology, so it usually starts in the third semester. However, during this period, many students are preparing for the job application or reviewing for the postgraduate examination. Students do not pay enough attention in the course of learning, so their learning efficiency and enthusiasm are low.

B. The teaching content is backward

With the rapid development of molecular biology and bioinformatics, and its increasing application in forest genetics and breeding, traditional forest tree genetics and breeding cannot comprehensively involve cutting-edge development content. Some knowledge points and research methods that have not been updated for a long time are no longer in line with the requirements of modern forest tree genetics and breeding development. They should not be taught to students, and students are not interested in them. They need to learn and master the most advanced theoretical knowledge and technical methods in this course, and apply what they have learned. This requires teachers to pay attention to and keep up with the development of the frontiers of forest tree genetics and breeding, enrich, adjust and update the specific teaching content in a targeted manner on the basis of following the syllabus, and apply the most advanced scientific research achievements in the academic frontier to the teaching process in a timely manner to improve the initiative and enthusiasm of students, thus further deepening their understanding and mastery of key knowledge points in forest tree genetics and breeding.

C. The key teaching points are not prominent

The Forest Tree Genetics and Breeding course consists of 54 credit hours of theoretical course and an 18 credit hours of experimental course with a total of 72 credit hours. However, there are many teaching contents in this course, including the teaching content of genetics and forest tree breeding, totaling 15 chapters, mainly including the basis of heredity cytology, basic law of heredity, molecular basis of heredity material, genetic variation, cytoplasmic inheritance, population genetics and quantitative genetics, forest tree breeding technology foundation, genetic breeding resources and tree introduction, provenance and plus tree selection, hybridization and ploidy breeding, clonal selecting and breeding, breeding and reforestation, seed orchard, genetic determination, application of biotechnology in forest tree breeding, breeding programs and multi-generation breeding, etc.. However, due to the

limitation of class hours of the course, it is impossible for the teacher to instill all the teaching contents into the students during the teaching process. Therefore, the teacher needs to carefully design the course content, carefully prepare the lesson, and continuously and systematically analyze and summarize the course content, to further optimize the teaching methods, highlight the key points of the course, carefully guide the students, activate the classroom atmosphere, and fully mobilize the students' enthusiasm for learning.

III. EXPLORATION OF NEW METHODS OF TEACHING

A. Strengthen students' learning initiative

In the traditional teaching process, the phenomenon of teachers' "one person alone has the say" is often seen. This teaching method will greatly discourage students' learning initiative and enthusiasm. Therefore, in the teaching process of Forest Tree Genetics and Breeding, traditional teaching methods and other teaching methods should be combined organically. In the course of theory teaching, teachers need to reasonably formulate teaching content, and enable students to clearly understand, familiarize and master the content of learning through reasonable allocation design; Classroom teaching must require close combination of theory and practice, focus on interactive heuristic teaching, adhere to the principle of sufficient theory, and mobilize students' initiative and creativity; In the teaching process, we should make full use of various teaching tools and use multimedia and other teaching methods to improve the teaching effect. In the course of experimental teaching, the teacher first needs to introduce the purpose, content, materials and specific experimental methods of the experiment in detail. The students do the experiment according to the experimental methods and experimental contents mentioned by the teacher, in order to verify the theoretical knowledge learned and deepen the study of theoretical knowledge; Teachers should pay full attention to experimental and practical classes, train students to master experimental techniques, and cultivate a rigorous scientific attitude and the ability to analyze and solve problems; Practical teaching plays a leading role in cultivating students' practical ability, and the quality of each link of practical teaching directly affects the students' mastery of experimental skills of forest tree genetics and breeding.

In the specific teaching process of this course, the key knowledge points can be taught first, and the important concepts, principles and other contents can be quickly explained according to the syllabus; Then, demonstrate according to the specific teaching content to deepen the students' understanding and mastery of the knowledge points learned [1]. The demonstration method can use the video of the corresponding knowledge points collected before class, for example, when teaching transcription and translation, the process of transcription and translation can be presented to the students in a three-dimensional way through a video; It can also provide demonstrative guidance for some knowledge points, for example, teaching the collection and storage of pollen enables students to acquire perceptual knowledge through practical observation of the teacher's demonstration, so as to verify the knowledge taught, and then master intuitive knowledge, combine theory with practice, and strengthen the understanding of knowledge. In addition, students need to arrange corresponding assignments based on the knowledge they have learned, so that students can collect materials at spare time, take the initiative to explore and learn, and report and discuss in the classroom to strengthen students' learning initiative and improve their learning interest in the course. Learning interest is one of the key points for students to learn this course. In the process of teaching, students should be the main body, and complicated knowledge points should not be completely instilled into students. The study of this course is not simple mechanical memory, but should combine knowledge points, timely ask questions, let students take the initiative to explore, fully think, improve their interest in learning, and guide the students carefully, so that they can fully understand and master the knowledge points learned and be able to apply them.

B. Update the teaching content

Bioinformatics is an interdisciplinary science that encompasses the acquisition, processing, storage, distribution, analysis, and interpretation of biological information. It combines the tools of mathematics, computer science and biology to clarify and explain the biological implications of large amounts of data [2]. In recent years, with the efforts of scientists from various countries, many important advances have been made in the research of plant genomes. Plants such as rice, corn and arabidopsis have all completed whole genome sequencing. On this basis, researchers can comprehensively study the gene expression, gene regulation, nucleic acid and protein localization, protein interaction and metabolic regulation networks of these plants through bioinformatics techniques, and then study the molecular control mechanism of plant growth and development at the level of molecular biology. As the core of biotechnology in the 21st century, bioinformatics has become an important part of modern life science research, and its research results also profoundly affect the development of forest tree genetics and breeding [3]. Woody plants have large biomass and long growth cycle [4]. It is very difficult to teach and study through traditional genetic breeding methods. It is necessary to introduce more advanced techniques and methods of molecular biology and bioinformatics on the basis of the original teaching contents, and teach students how to apply the technical methods they have learned to the course learning and scientific research of forest tree genetics and breeding. In the teaching process, it is necessary to increase histological sequencing and analysis of genomes, transcriptome and small RNA. For beginners, they can be taught only basic information analysis, rather than advanced information analysis and personalized analysis, so as to guide students to get started and understand the application of cutting-edge technologies in the courses they study, and improve their interest in learning. In the process of histological analysis, students should be mainly taught the screening of differentially expressed genes and differentially expressed genes as well as the analysis of key metabolic regulatory pathways, which should be taught in combination with the contents of forest-tree genetic engineering. In addition, with the improvement of the accuracy of plant genetic map and the clarification of the molecular basis of specific traits,

researchers have been able to use bioinformatics to look for relevant genes in model plants, and then screen out the genes and their loci from trees. The genetic and molecular biology study of forest trees has accumulated a large amount of data on gene sequence, map and function. It can integrate these data by establishing bioinformatics database to analyze and compare gene sequences, genetic maps and functions of different genomes [5]. Based on this, researchers can screen the desired phenotypes in a variety of allelic combinations, and then screen out the ideal combinations in genetic markers to further develop excellent varieties, which is of great significance. Therefore, in the teaching process of this course, it is necessary to supplement the basic knowledge of the database and its preliminary application, so that students can grasp the basic usage of the key comprehensive database, for example: GenBank, EMBL, DDBJ and other databases. Use demonstration methods to demonstrate to the students the steps of searching the database for homologous sequences of target genes, and describe the relevant information of the search results, compare and analyze DNA sequences. etc.. Enable students to use the resources of bioinformatics database to help them better understand and grasp the knowledge points in forest tree genetics and breeding. In addition, in the process of learning the Forest Tree Genetics and Breeding course, literature resources play a very important role in reviewing the relevant knowledge points and autonomous learning of students after class. Therefore, in the course of teaching, students should be taught how to carry out literature search for the relevant knowledge points of the course, so that students can learn to search and consult the literature to solve the difficult problems in the course of learning, and develop students' ability to explore and learn independently.

C. Highlight key points of study

It is necessary to clarify the key points of the Forest Tree Genetics and Breeding course to the students, so that the students can focus on the key points of this course in the learning process. Through the systematic study of the Forest Tree Genetics and Breeding course, students need to master the basic theoretical knowledge of heredity, such as the basis of heredity cytology, basic law of heredity, genetic variation, DNA replication and expression of genetic information; Master the basic theories of population genetics and quantitative genetics; It is also necessary to enable students to understand the forest tree genetic and breeding resources, understand the application of forest tree stress resistance breeding and biotechnology in tree breeding and the importance of tree breeding strategy and multi-generation breeding in forestry production and tree genetic improvement, master the basic theory and technology of forest tree breeding, master the methods of tree introduction, provenance and plus tree selection, hybridization and ploidy breeding, and clonal selecting and breeding, and recognize the importance of seed orchard, cutting orchard and genetic determination in forest tree breeding.

IV. SUMMARY

Forest Tree Genetics and Breeding is the core course for forestry majors. It has a very important guiding role in the students' practical application in work and postgraduate examination. It is a very comprehensive course. In the process of classroom teaching, it is necessary to update and supplement the cutting-edge teaching content and selects the teaching content, add specific pictures, video, operational exercises and other links to deepen students' understanding and grasping of key knowledge points, activate the classroom atmosphere, and fully mobilize students' learning enthusiasm. In addition, more practical teaching activities are needed to enable students to connect theory with practice and enhance students' perceptual knowledge of forest tree genetics and breeding. In addition, the focus of learning should also be highlighted in a large number of knowledge points so that students can focus on the key points of this course in the learning process. Through the course teaching reform of this course, students can fully understand and master the theoretical and technical knowledge of forest tree genetics and breeding.

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