



## Research and thinking of “Curriculum Ideology and Politics” education in advanced plant physiology course for graduate students

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### Abstract

Advanced Plant Physiology is a core course of graduate students majoring in horticulture. This paper summarizes the ideological and political elements in Advanced Plant Physiology, and introduces examples of integrating ideological and political teaching into the professional course teaching in order to accomplish the educational goal of “building morality and cultivating talents”, realizing the integration of professional education and ideological and political education.

**Keywords:** Advanced plant physiology, collaborative education, curriculum ideology and politics

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### 1. Introduction

In 2018, General Secretary Xi Jinping of China stressed again at the China Education Conference that we must take as our fundamental task the training of socialist builders and successors, and train generation after generation of useful talents who support the leadership of the Communist Party of China, uphold China's socialist system, and commit themselves to a lifelong struggle for socialism with Chinese characteristics <sup>[1]</sup>. In 2019, Xi once again pointed out at a symposium for teachers of ideological and political theory that ideological and political theory courses insist on reform and innovation to adhere to the "eight phases of unity", including "to adhere to the unity of explicit education and implicit education, excavate the ideological and political education resources contained in other courses and teaching methods, realize the full range of education <sup>[1]</sup>. These remarks show that to guide the value of college students, it is not only to rely on ideological and political courses, but also to vigorously promote the construction of "ideological and political courses" in the teaching process of specialized courses in colleges and universities.

At present, under the background of the construction of new agricultural sciences, agricultural colleges and universities are trying their best to promote the cultivation of outstanding agricultural and forestry talents, which puts forward higher requirements for the education, teaching and personnel training of basic disciplines in agricultural colleges and universities. Advanced Plant Physiology is a science that studies the life activities and laws of plants. It is a basic professional course for master students of crop science, plant protection science, biology, horticulture and other first-level disciplines <sup>[2]</sup>. Compared with other specialized courses, Advanced Plant Physiology mainly has the following characteristics. First, it is basic, which is involved in this course. It can provide basic theories and research methods for other disciplines, such as crop science, horticulture, forestry and so on. Second, it covers a wide range of subjects, ranging from lower plants to higher plants, and ranging from macroscopic physiological ecology to microscopic molecular biology. Third, it is widely used. The course content is closely related to industrial and agricultural production practices, such as high-yield and high-quality cultivation in agriculture and

horticulture, plant secondary metabolism in medicine, bioenergy in energy field, biological fermentation in biotechnology field, etc., all of which involve relevant basic theories of Advanced Plant Physiology. Fourth, rapid development. Due to the development of related disciplines, the research of plant physiology theory and technology has been rapidly developed in depth, and some breakthrough theories and technologies have emerged continuously (such as the recently popular gene editing technology). Meanwhile, the rapid development of plant physiology has in turn promoted the development of other disciplines. Therefore, in the course of teaching the theoretical knowledge of Advanced Plant Physiology, we should fully explore the ideological and political elements in the course, timely and naturally infiltrate moral education to students, so as to achieve a seamless connection between moral education and intellectual education, and its effect will be far more than the ideological and political effect of other courses<sup>[2]</sup>. In the teaching practice of Advanced Plant Physiology for many years, combined with the actual teaching materials, we mainly carried out ideological and political practice in the course from the following aspects.

## **2. Cultivate patriotism and Party love and a sense of social responsibility**

Qian Chongshu, the originator of plant physiology in China, published the article "Special Effects of barium, strontium and cerium on spirogyra" in 1917. This is the first time for Chinese scholars to publish a paper in the field of plant physiology in an international journal. Subsequently, the three founders of plant physiology -- Li Ji-dong, Luo Zong-luo and Tang Peisong began to teach plant physiology and set up plant physiology laboratory successively in the 1920s. It can be seen that at the beginning of our country, plant physiology immediately followed social unrest and wars. Although the social and environmental conditions are extremely difficult, even life-threatening, but the older generation of plant physiologists still insist on the teaching and research of plant physiology. For example, Mr. Tang Peisong gave up the favorable experiment and living environment in the United States in 1933, and after returning to China, he set up a laboratory in Wuhan University, engaged in teaching and scientific research, and completed 1 academic paper on photosynthesis and 7 academic papers on cellular respiration dynamics. As the war of Resistance against Japan continued, Mr. Tompersson had to move to Southwestern Associated University (1938-1946). At Southwestern Associated University's Agricultural Research Institute, he rebuilt the laboratory, which had been bombed three times, relocated four times and rebuilt, and finally moved to a small village on the outskirts of Kunming. In the course of teaching, the appropriate insertion of these contents, let the older generation of plant physiologists love the country and the party spirit, as well as lofty national and social responsibility deeply infected students, guide students to firmly establish the belief of reading for the rise of China<sup>[3]</sup>.

## **3. Strengthen confidence in socialist culture and the nation**

As mentioned earlier, the plant physiology of our country is occurring, growing and developing in the war, the start is late, the development is slow. But after reform and opening up, the research level of Chinese plant physiology has developed

rapidly, especially in recent years, the process from quantity accumulation to a qualitative leap, some breakthrough achievements have emerged, and the power of international discourse has been strengthened. In the teaching process of theoretical knowledge, we should combine the current situation of domestic and foreign research, especially the outstanding scientific research achievements in our country, enhance the students' socialist culture confidence and national confidence, and eliminate the kitsch thinking of foreign culture.

The story of Tu Youyou, the Chinese scientist who discovered artemisinin, an anti-malaria drug, and won the 2015 Nobel Prize in Physiology or Medicine; In the chapter "Photosynthesis", Mr. Tang and his graduate student Yan Longfei discovered that carbonic anhydrase also exists in *Chlorella* (previously thought to exist only in animal blood), and then successfully isolated and extracted from spinach leaves. Its separation and extraction methods have been widely used in the world and have been applied in space navigation. In the chapter of "Genomics and Proteomics", this paper introduces the first synthetic synthesis of biologically active crystalline bovine insulin, the first synthetic synthesis of yeast alanine tRNA, and the first revelation of the three-dimensional structure of the splice body and its molecular mechanism. Through the introduction of all these outstanding scientists and their outstanding scientific research achievements in the classroom teaching, students truly and profoundly understand the superiority of the socialist system in culture, education, scientific research and other aspects of the embodiment. While consciously enhancing their confidence in socialist culture and the national confidence, it will be more conducive to their firm determination to love the Party and patriotism and the enhancement of their sense of social responsibility<sup>[3]</sup>.

## **4. Cultivate students' consciousness of innovation**

One of the most important programs of postgraduate training is to cultivate innovative talents. At the same time, innovation is also the most important soul in future scientific research. Therefore, in teaching Advanced Plant Physiology to graduate students, some knowledge points can be introduced from different aspects such as "innovation of research ideas", "innovation of research techniques and methods" and "innovation of research results". The discovery process of Calvin cycle can be introduced in the presentation of "Photosynthesis of plants", so as to inspire students to think positively and solve problems with innovative technical methods<sup>[4]</sup>. In 1946, Calvin and his colleagues in the United States studied how *Chlorella* fixed CO<sub>2</sub> during photosynthesis. By this time both bidirectional paper chromatography and isotope tracers had matured, and Calvin creatively combined the two techniques during his experiments. Finally, the pathway through which CO<sub>2</sub> is fixed and assimilated in photosynthesis was identified, in what is now known as the Calvin cycle. His work greatly improved human understanding of the process of photosynthesis, and he deservedly won the 1961 Nobel Prize in Chemistry. Another example is the introduction of CRISPR/Cas9 technology when talking about how to study plant gene function. CRISPR/Cas9 was originally developed as an immune tool by bacteria as they evolved to fight viruses. In the process of invading bacteria, viruses can integrate some of their genes into the bacterial genome. When the virus re-invades, the bacteria can recognize, shut off and silence

the expression of the virus gene according to the stored foreign virus gene sequence. The researchers adapted CRISPR/Cas9 from the way it works in bacteria and have now developed a mature gene-editing technique that can be used to trim, cut, replace or add DNA sequences in plants and animals. Through the introduction of the above examples, students can be inspired to think about problems from an innovative perspective, use innovative methods to solve problems, and finally get innovative results.

### 5. Shaping the scientific spirit of seeking truth from facts

Science must not be false. Scientific conclusions must be drawn from rigorous scientific research, and cannot be changed by any political, economic or other artificial factors. In the teaching of Advanced Plant Physiology, examples can be listed from both positive and negative aspects to strengthen the moral quality of postgraduate research. For example, when narrating the chapter of photosynthesis, we can enumerate the contributions made by Mr. Yin Hongzhang, one of the founders of plant physiology in our country. During the "Great Leap Forward", he insisted on carrying out research on "plant population photosynthesis", which theoretically proved the absurdity of "10,000 jin per mu". Other examples include the 2005 Science paper by Hwang Woo-suk, the father of Korean cloning, which allegedly falsified experimental data; Japanese scientist Haruko Obokata's paper on STAP cells, published in Nature, was found to have falsified data; The NgAgo-gDNA gene editing technology published in Nature Biotechnology by Han Chunyu, associate professor of Hebei University of Science and Technology, once caused a shock in academic circles around the world, and was widely questioned at last. The experiment process could not be repeated, and the paper was withdrawn at last <sup>[4]</sup>. In the actual teaching process, through the above positive example guidance, negative example warning, cultivate students to firmly establish the "reasonable test design, scientific technical route, real test data, credible test results" spirit of truth.

### 6. Cultivate students' team spirit and cooperative spirit

Team spirit and spirit of assistance are essential qualities for a graduate student. Many of the most important discoveries in the history of science were not the result of a single scientist acting alone, but the result of collective intelligence. The DNA double helix model, as it is known, is the result of the joint efforts of scientists from many countries and many disciplines. Wilkins, a British molecular biologist, improved the X-ray diffraction technique, on which Franklin, a British physicist and chemist, obtained a clear diffraction photograph of DNA in May 1952. It was this diffraction image that inspired Watson and Crick to propose the DNA double helix structure in 1953, which won the 1962 Nobel Prize in Physiology or Medicine. Sixty-one years after Watson and Crick published their double-helix model of DNA, the journal Science published the results of a high-resolution three-dimensional study of the left-handed double-helix of 30nm chromatin as a long-form research paper. The work is a collaboration between Ping Zhu, Guohong Li and Ruiming Xu at the Institute of Biophysics, Chinese Academy of Sciences. In this study, they analyzed the three-dimensional structure of the left hand double helix of 30nm chromatin by using cryo-electron microscopy 3D reconstruction technology. The research results make our country in the field of three-dimensional structure of chromatin in the

international leading position. During the course of the course, students should be inspired by these examples and also create opportunities for students to experience the importance of working together. For example, in the process of carrying out experimental teaching, different members of the same experimental group can share different experimental tasks, and each member can give play to their own strengths. There is division of labor, cooperation and cooperation, and they can deeply realize that one plus one is greater than two <sup>[4]</sup>.

### 7. Conclusion

Through the teaching of Advanced Plant Physiology, students can understand the law and mechanism of plant life activities under various environmental conditions, master the main research methods of plant physiology, cultivate students' cognition ability of complex and changeable plant life activities and application ability to solve production practice problems, and have a comprehensive and systematic understanding of the basic law of plant life activities. At the same time, through the above methods, the ideological and political elements contained in the course content of Advanced Plant Physiology are fully explored, and the whole teaching process of "teaching" and "solving doubts" is integrated into the link of "teaching" in a comprehensive and seamless way. The ideological and political courses will be closely related to students' professional learning, career development and personality improvement. In the teaching of professional knowledge to students at the same time, guide students to scientific thinking, cultivate healthy professional quality, establish a correct outlook on life, values and world view. In the process of learning professional knowledge, students should realize all-round improvement in learning ability, scientific research quality, team consciousness, value orientation and social responsibility, and cultivate high-level scientific research talents in line with socialist core values.

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