# Exploration of Student-centered Curriculum Ideological and Political Teaching under the Background of Rural Revitalization Strategy: A Case Study of *Crop Breeding*

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**Abstract** *Crop Breeding* is a compulsory course for agriculture-related majors and serves as an important platform for cultivating talents in agriculture, rural areas and farmers. Curriculum ideological and political education in the course of *Crop Breeding* can not only impart professional knowledge to students, but also shape their correct outlook on life, world and values. Based on elaborating the necessity of integrating curriculum ideological and political education into the *Crop Breeding* course, this paper deeply explored ideological and political elements and achieved their organic integration with professional knowledge. Throughout the teaching process, the educational effect of combining professional knowledge instruction with ideological and political education has been achieved, thereby creating new pathways for ideological and political development in the *Crop Breeding* course. While enabling students to learn and master basic theories, developmental trends, and cutting-edge knowledge of the discipline, this approach enhances students' sense of identity and belonging to the profession, cultivates their dedication to agriculture, rural areas, and farmers, and strengthens their sense of responsibility and historical mission in revitalizing agriculture. Therefore, it can foster high-quality agricultural talents for China's rural revitalization strategy.

**Key words** *Crop Breeding*; Curriculum ideological and political education; Rural revitalization; Teaching reform

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The current international landscape is complex and ever-changing, with the convergence and clash of diverse ideologies and cultures, a multiplicity of ideas, and accelerated social transformations. In this context, higher education institutions in China must strengthen ideological and political education to address the fundamental questions of "what kind of people to cultivate, how to cultivate them, and for whom". In the report to the 19th National Congress of the Communist Party of China, the General Secretary Xi Jinping proposed the Rural Revitalization Strategy, positioning it as the overarching approach for addressing issues related to agriculture, rural areas, and farmers in the new era. This strategy aims to promote the comprehensive upgrading of agriculture, the all-round progress of rural areas, and the holistic development of farmers. Meanwhile, *Action Plan for Scientific and Technological Innovation in Rural Revitalization by Higher Education Institutions (2018 – 2022)* explicitly states that universities should leverage their advantages in implementing the Rural Revitalization Strategy to cultivate a team of professionals working on agriculture, rural areas, and farmers who "understand agriculture, care about rural areas, and love farmers". On September 6, 2019, in a letter addressed to the leaders and experts of agricultural universities nationwide, the General Secretary Xi Jinping encouraged teachers and students to "continue to take fostering virtue through education as their core mission and strengthening agriculture and revitalizing rural areas as their responsibility". As key bases for cultivating professionals in agriculture, rural areas, and farmers, agricultural universities should consistently adhere to the goal of fostering virtue through education, integrate the Rural Revitalization Strategy into the "curriculum ideological and political education" for college students, cultivate their awareness of serving agriculture, rural areas, and farmers, and encourage them to actively pursue entrepreneurship and employment in rural areas after graduation. Against the backdrop of rural revitalization, many agricultural universities have conducted extensive research on curriculum ideological and political education of agricultural majors. Taking College of Agriculture of Ludong University (a provincial university in Shandong Province) as the research object, Liu *et al.* [1] carried out teaching reforms in curriculum ideological and political education based on disciplinary characteristics and professional background of agronomy, and actively explored pathways for cultivating new-type agricultural talents in the new era. Taking "Agroecology" as an example, Shu *et al.* [2] focused on the educational and training objectives of agronomy majors to develop curriculum ideological and political education. They established an assessment and evaluation system that incorporates curriculum ideological and political education by deeply exploring curriculum ideological and political elements and adopting diverse teaching methods to precisely integrate these elements. Wang *et al.* [3], taking Gansu Agricultural University as an example, explored and summarized the ideological and political education in the curriculum of plant science and technology under the context of the national rural revitalization strategy. They focused on extracting ideological and political

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elements from the curriculum, innovating teaching methods for ideological education, improving the curriculum evaluation system, and enhancing teachers' competence in ideological and political education.

*Crop Breeding*, as a core compulsory course in agronomy, is not only a means to impart professional knowledge to students but also an important platform for ideological and political education. Through the integration of ideological and political elements into *Crop Breeding*, the course aims to cultivate students' correct outlook on life, values, and world, as well as firm political beliefs. It guides students to learn and love agriculture, enhances their awareness of serving agriculture, rural areas, and farmers, and encourages them to actively contribute to the national rural revitalization strategy.

In this study, with the *Crop Breeding* course for undergraduates of agronomy majors in Hunan University of Arts and Science, an application-oriented institution, as the specific research subject, the importance of cultivating the awareness of serving agriculture, rural areas, and farmers among students in agricultural colleges and universities was explored, as well as how to foster such awareness. The study provides insights for the development of ideological and political construction of agricultural courses in agricultural colleges and universities.

## Importance of Integrating Curriculum Ideological and Political Education in *Crop Breeding*

Local universities bear the historical mission of cultivating talent for the Party, the country, and the people. They play a crucial role in nurturing agricultural professionals who love the nation and agriculture and cultivating contributors to rural revitalization while fostering virtue through education. Curriculum ideological and political education in agricultural colleges and universities is one of the key approaches to achieving this goal. In the context of the rural revitalization strategy, local universities bear the contemporary mission of cultivating high-quality applied talents who "can endure hardship, take root in rural areas, and accomplish meaningful work". Agricultural courses are rich in ideological and political elements. Thoroughly exploring and fully utilizing these elements and integrating values such as loving the country, agriculture, rural areas, and farmers into the teaching process is essential for nurturing talents dedicated to agriculture, rural areas, and farmers[4].

*Crop Breeding* is an applied science that studies the theories and methods of selecting and propagating superior crop varieties. It is one of the core compulsory courses in agronomy. The discipline has evolved through continuous exploration and practical experience by breeders, who have summarized general principles and refined them into breeding theories. The theories of *Crop Breeding* originate from production practice and, in turn, guide production practice, making it a discipline that closely integrates theory and application. The course of *Crop Breeding* embodies rich ideological and political elements, such as China's outstanding agricultural civilization and ecological culture, making it a high-quality teaching resource for integrating ideological and political education. Against the backdrop of the rural revitalization strategy, and with a student-centered approach, the course content is optimized around the tripartite objective of knowledge impartation, ability cultivation, and values shaping. Through incorporation of the hardworking spirit and innovative scientific ethos of breeders as ideological and political elements, students not only acquire theoretical knowledge but also develop moral integrity, humanistic qualities, and scientific values. This approach guides students in strengthening their ideological and ethical standards and shapes their values[5].

## Exploration of "Ideological and Political Elements" in the *Crop Breeding* Course

### Telling the stories of breeders to cultivate students' passion for "understanding agriculture, loving rural areas, and caring for farmers"

To address people's basic needs for food and clothing and improve their living standards, Chinese breeders persevered and overcame immense challenges in an era of limited resources and poor conditions. They dedicated their entire lives to the cause of breeding, significantly enhancing the nation's grain production levels. Their efforts effectively resolved issues related to food and clothing for the people and contributed to socioeconomic development. In 1964, Yuan Longping, the father of hybrid rice, meticulously inspected row by row and panicle by panicle in experimental fields. After 16 d of persistent effort, he discovered a male-sterile rice plant among 140 000 rice panicles, pioneering the research on male sterility in rice in China. Despite suffering from stomach pain, Yuan Longping persevered through numerous challenges to continue his research on male sterility in rice. By 1970, he had developed over 3 000 hybrid rice combinations, yet the results ended in failure. Academician Yuan Longping grew stronger with each setback. He revisited research materials, refined his approach, and ultimately turned his attention to wild rice in Hainan. There, he finally discovered a naturally male-sterile rice plant, achieving three-line hybrid rice breeding and significantly increasing rice yield[6]. Similarly, Academician Fu Tingdong spent seven to eight hours each day meticulously inspecting rapeseed plants one by one in both university experimental fields and rural rapeseed fields, persevering in his search for male-sterile rapeseed plants. After more than two years of relentless searching, he finally discovered the world's first practically valuable Polima male sterility type of rapeseed in 1972. He selflessly shared this breakthrough with relevant research institutions in China, ushering in a new chapter in hybrid rapeseed breeding[7]. Using the stories of breeders as ideological and political teaching materials, students

can learn from their hardworking and dedicated scientific spirit. This approach enhances students' interest in learning, strengthens their identification with the profession, deepens their understanding of the importance of agriculture in socioeconomic development, national construction, and social service, and inspires their sense of responsibility and mission to strengthen and revitalize agriculture.

**Cultivating students' patriotic feelings of strengthening the country through science and technology based on the fact that science and technology are the primary productive forces**

Science and technology are the primary productive forces, and crop breeding cannot be separated from advanced scientific technologies. Transgenic crop breeding is one of the key methods in this field. In the early 1990s, China experienced consecutive outbreaks of cotton bollworm disasters, which led to an average nationwide yield reduction of over 40%. These disasters severely affected a large number of cotton farmers and the textile industry. Bollworms not only caused devastating damage but also exhibited strong resistance to pesticides, leading to frequent incidents of farmers suffering from pesticide poisoning each year. At that time, Monsanto Company in the United States had developed Bt transgenic insect-resistant cotton using genetic modification technology. However, the conditions for its introduction were extremely stringent, with costs exceeding 100 million yuan, and core patents were non-transferable. Guo Sandui, known as the "Father of China's Insect-Resistant Cotton", was tasked with this critical mission and led a research team to tackle the challenge of developing insect-resistant cotton. After two years of relentless day-and-night research, China successfully developed univalent insect-resistant cotton in 1994, becoming the second country in the world to possess independent intellectual property rights for this technology. This achievement safeguarded the interests of cotton farmers and provided strong assurance for China's cotton security[8]. By the end of 2022, domestically developed transgenic insect-resistant cotton accounted for over 99% of the total insect-resistant cotton planting area in China. The success of insect-resistant cotton serves as a case study to cultivate students' sense of responsibility and mission toward strengthening the nation through science and technology and revitalizing agriculture through science and technology.

**Fostering the belief that lucid waters and lush mountains are invaluable assets to enhance students' environmental awareness**

Germplasm resources serve as the material foundation for crop breeding. They represent a vital natural resource shaped by long-term natural selection and human intervention, constituting a precious shared heritage of humanity. It is imperative to strengthen the collection, identification, research, and utilization of germplasm resources, particularly the exploration and application of those with distinct regional characteristics. For example, Academician Yuan Longping discovered a naturally occurring male sterile plant in wild rice germplasm resources in Sanya, Hainan, which enabled the three-line system for hybrid rice, increased rice yield, and addressed issues related to food security for the people. The black rice from Yangxian County, Shaanxi, is a rare and unique rice variety in China with a cultivation history of over 3 700 years. It possesses distinct regional characteristics and exceptional quality, and has been certified as a "Product of Protected Geographical Indication" by the General Administration of Quality Supervision, Inspection and Quarantine. Yangxian black rice contributes to promoting local agricultural development and rural revitalization. Meanwhile, we should guide students to protect germplasm resources with regional characteristics, enhance their knowledge and capabilities through the process of collecting and preserving these resources, and foster their commitment to applying academic research to the practical development of the country. This supports the advancement of rural ecological civilization and embodies the ecological philosophy that "lucid waters and lush mountains are invaluable assets."

**Integrating practical course teaching with "labor education" to cultivate students' spirit of hard work and perseverance**

The practical teaching content of this course is highly aligned with the educational purpose and value of "labor education" in the new era. The teaching practice venues are mostly in greenhouses, farmland, and similar areas. Students typically work in groups, completing practical teaching tasks through division of labor, cooperation, and collaborative efforts. For example, the practical teaching of rape self-pollination and cross-breeding is conducted in the field, requiring students to collaborate in tasks such as land preparation, sowing, transplanting, field management, weed and pest control, manual emasculation and pollination, and experimental documentation. Through the integration of labor with breeding skills training during the practical teaching process, students can develop critical thinking, love for labor, hard work and teamwork spirit.

## Pathways for Integrating Curriculum Ideological and Political Education in *Crop Breeding*

**Serving the rural revitalization strategy by establishing curriculum ideological and political construction goals**

Local universities are rooted in regional economic development, while the *Crop Breeding* course addresses the talent demands of modern agricultural industrial upgrading. It aims to serve the rural revitalization strategy by cultivating high-quality applied talents with solid professional capabilities, awareness and passion for agriculture, strong national pride, and innovative consciousness and ability. When developing the undergraduate talent training program and syllabus for *Crop Breeding*, the requirements for talents under the rural revitalization development strategy should be incorporated. The concept of ideological and political education must be organically integrated with the training objectives and

graduation requirements. The curriculum teaching objectives of *Crop Breeding* should strengthen ideological and political goals alongside knowledge and competency goals. Teaching should be guided by ideological and political education to drive professional knowledge acquisition and skill development, creating a tripartite collaborative educational effect that organically combines explicit and implicit education.

**Deeply integrating curriculum content with curriculum ideological and political elements to fulfill the educational function of the course**

Ideological value-based guidance should be integrated into all aspects of the syllabus and education of the *Crop Breeding* course. The teaching of course knowledge and practical breeding training cultivates students' scientific values, worldview, and outlook on life, as well as their passion for agriculture, and rural areas, thereby achieving the educational goals of specialized courses. The content of the *Crop Breeding* course includes germplasm resources, breeding objectives, various breeding methods, breeding experimental techniques, seed production and management, among other topics. Professional knowledge of the course can be organically integrated with ideological and political elements by optimizing the teaching content, thereby achieving a subtle yet effective educational impact. For example, when teaching "germplasm resources", the case of U. S. soybean breeding is introduced, where the use of China's "Beijing Black Soybean" germplasm resource helped rescue the American soybean industry. However, China still imports a large amount of soybeans from the United States every year. This case serves to inspire students' patriotic sentiments while enabling them to deeply understand the importance of ecological environmental protection and the political philosophy that "lucid waters and lush mountains are invaluable assets."

**Flexibly employing diverse teaching methods to enhance the effectiveness of curriculum ideological and political education**

During classroom instruction, teachers adopt flexible and varied teaching methods to integrate ideological and political elements into the teaching process. The "case-based teaching method" involves exploring typical cases in professional course teaching. For example, when teaching "distant hybridization breeding", the story of Academician Li Zhensheng can be shared. He responded to the national call and, through over 20 years of dedicated work, developed the new wheat variety "Xiaoyan No. 6" from the progeny of distant hybridization between *Elymus repens* and wheat, which is resistant to eight physiological races of stripe rust[9]. This case is used to cultivate students' spirit of endurance, hard work, and perseverance. The "situational teaching method" employs images, videos, and audio to deliver classroom knowledge. For example, when teaching "male sterility and the breeding of hybrid varieties", video materials of media interviews with Academician Yuan Longping describing the breeding process of three-line hybrid rice can be played to foster students' scientific spirit of striving for excellence and daring to innovate. In the "classroom discussion method", for example, using the topic "Genetically-modified Crops and Human Health" when teaching "Transgenic Technology and *Crop Breeding*", students are divided into groups to discuss, express their views freely, and debate different perspectives, thereby cultivating their ability to identify, analyze, and solve problems.

**Taking moral education as the foundation and continuously improving teachers' ability in curriculum ideological and political education**

Centering on students and taking fostering virtue through education as the fundamental goal of education, we should constantly enhance teachers' own humanistic level, moral cultivation, ability and quality in curriculum ideological and political education, give full play to teachers' subjective initiative, and continuously strengthen their feelings for the country and their awareness of "agriculture, rural areas and farmers". First, professional teachers should firm their political ideals and beliefs, and maintain political sobriety. They should constantly study Marxist classics, earnestly learn and understand General Secretary Xi Jinping's thought on socialism with Chinese characteristics for a new era, and improve their political literacy. Secondly, professional teachers should be self-disciplined and self-motivated, strengthen the study of teachers' morality and style, and take the lead in setting an example. In their daily lives and teaching practices, they should influence students with their noble character and moral integrity, serving as role models and fostering the development of correct values among students. Thirdly, professional teachers should constantly innovate, broaden their horizons, keep pace with the times, and continuously improve their ideological and political teaching ability. They should stimulate students' internal motivation, organically integrate professional knowledge with students' ideological quality and moral cultivation, generate ideological resonance, and ensure the effectiveness and educational value of ideological and political education in professional courses[10].

## Effect of Curriculum Ideological and Political Construction in *Crop Breeding*

In recent years, the ideological and political construction of the *Crop Breeding* couse has continuously deepened the exploration of its inherent ideological and political elements. A teaching system integrating curriculum ideological and political education has been established while reshaping students' understanding of the values of agronomy majors and enhancing their enthusiasm for engaging in agricultural-related research. Students from this major actively applied for the National Undergraduate Life Sciences Competition. Among them, a project guided by the author himself, titled "Effects of CRISPR/Cas9-Mediated Knockout of OsSBEⅡb Gene on Rice Agronomic Traits and Expression of Genes Related to Starch Synthesis Pathway", won the third prize in the

National Undergraduate Life Sciences Competition (2025, Scientific Inquiry Category). According to data statistics, compared with graduates of agronomy majors in previous years, students who have undergone the ideological and political education in the *Crop Breeding* course have developed a renewed understanding of the importance and necessity of agronomy majors. An increasing number of them are willing to pursue careers in agriculture, engage in agricultural research, and continue their further studies after graduation. It demonstrates that the ideological and political education in the *Crop Breeding* course has transformed students' perspectives and strengthened their sense of urgency and mission to contribute to rural revitalization.

## Conclusions

The ideological and political construction in the *Crop Breeding* course should continuously refine its teaching content and methods through both teaching and learning. We must fully leverage the ideological and political elements of the course and deepen these aspects in alignment with societal needs. Through the study of the *Crop Breeding* course, students should achieve a "three-in-one" outcome integrating course knowledge, working ability, and social emotional values. This course aims to cultivate high-quality talents who study, understand, and cherish agriculture, thereby contributing to China's rural revitalization efforts.

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tasks were addressed by proposing an improved YOLOv8s-based potato detection algorithm, and its efficiency and reliability were validated through simulation experiments. First, at the visual perception level, the introduction of the InceptionNeXt backbone network and CBAM dual attention mechanism constructed a multi-scale feature fusion framework, significantly enhancing target detection capability in complex scenarios. The improved YOLOv8s achieved an mAP of 95.29% on the dataset, representing an 8.37% increase over the original model, and the detection accuracy for small targets (AP_S) reached 98.70%. This study provides a high-precision and robust solution for agricultural automation equipment, extendable to applications such as fruit and vegetable sorting and industrial part assembly, advancing smart manufacturing technology toward practical implementation.

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