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Exploration and Practice of Ideological and Political Education in the Landscape Plant Genetics and Breeding Course—Discussion on Teaching Reform Based on the Concept of "Three-Wide Education"

Zhao Yiyang, Zhang Deqiang*

College of Landscape Architecture, Beijing University of Agriculture, 102206, Beijing, China
**Corresponding author: DeqiangZhang@bjfu.edu.cn*

Abstract: *As a core course in landscape architecture, plant genetics and breeding urgently requires the integration of knowledge imparting and value guidance through the curriculum-based ideological and political education in the new era. Guided by the "Three-wide Education" concept (wide-ranging, whole-process, and all-round education), this study systematically explores practical approaches for curriculum-based ideological and political education, combined with course characteristics and industry demands. Key aspects include mining ideological elements, innovating teaching models, building resource platforms, and optimizing evaluation systems. By incorporating ideological and political elements such as the spirit of scientists, cultural confidence, and ecological civilization into teaching, alongside blended online-offline instruction, case-based teaching, and practice-oriented education, a multidimensional educational system has been established. Practices have proved that this model significantly enhances students' professional identity, social responsibility, and innovation capabilities, providing a replicable paradigm for ideological and political reform in agricultural and forestry curriculum.*

Keywords: *Ideological and Political Elements; Genetics and Breeding; Talent Cultivation; Three-Wide Education; Agricultural and Forestry Universities*

1. Introduction

The construction of ecological civilization is a crucial undertaking that bears on the wellbeing of the people and the future of our nation, representing an inherent requirement for realizing the Chinese Dream of great rejuvenation. As emphasized in the report of the 19th CPC National Congress: "We must firmly establish a socialist ecological civilization outlook, promote a new modernization pattern featuring harmonious coexistence between man and nature, and make our generation's contribution to ecological conservation". This profound statement provides important guidance for agricultural and forestry universities in cultivating innovative talents for the new era [1]. With the comprehensive implementation of the *Guidelines for Curriculum-based Ideological and Political Education in Colleges and Universities*, curriculum-based ideological and political education has become a key approach for universities to fulfill their fundamental mission of fostering virtue through education [2]. As a core course for cultivating landscape architecture professionals, the Landscape Plant Genetics and Breeding is featured by tight integration of theory and practice, as well as deep convergence between science and humanities. However, traditional teaching methods often emphasize "professional knowledge" at the expense of "moral education", with insufficient integration of ideological-political elements into professional knowledge, failing to meet the demand for talents with both professional competence and moral integrity in the new era. Therefore, exploring approaches to ideological and political education in this course represents both an inherent requirement of educational reform and a practical need to serve national strategies for ecological civilization construction and rural revitalization.

Establishing a new model of ecological civilization for undergraduate programs in agricultural and forestry universities under the "New Agricultural Science" initiative, comprehensively strengthening the integration of ideological and political education with agricultural pedagogy, and serving rural revitalization and national ecological civilization construction constitute the mission and responsibility of agricultural talent cultivation in the new era. Through thorough investigation of genetics and

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breeding courses for both undergraduate and graduate students, combined with practical teaching experience in the undergraduate's Landscape Plant Genetics and Breeding course, this study proposes pathways for integrating ideological and political elements with professional knowledge, aiming to provide practical references for the reform of ideological-political curricula in agricultural and forestry universities.

2. The Necessity and Goal Orientation of Curriculum-based Ideological and Political Education

The Curriculum on Genetics and Breeding of Landscape Plants is a course that focuses on studying the genetic laws of plants and breeding technologies. Its teaching content not only includes abundant professional knowledge but also contains many ideological and political elements. For example, exploring the developmental history of breeding technologies can demonstrate the importance of scientific spirit; the conservation of germplasm resources can be closely associated with cultural confidence; the research and development process of new cultivars can reflect the concept of ecological civilization. By thoroughly exploring these ideological and political elements and integrating them into teaching, we can not only deepen students' understanding and mastery of professional knowledge, but also effectively cultivate their patriotic sentiment, scientific literacy, and as sense of social responsibility. The curriculum-based ideological and political education should adopt the "Three-Wide Education" framework (wide-ranging, whole-process, and all-round education), establishing the following objectives:

(1) Knowledge Objectives: Master the core theories and techniques of genetics and breeding;

(2) Ability Objectives: Develop innovative capabilities to solve practical breeding problems;

(3) Value Objectives: Establish the ecological concept that "lucid waters and lush mountains are invaluable assets", promote the spirit of scientists, and enhance cultural confidence and professional mission awareness.

3. Exploration and Integration Pathways of Ideological and Political Elements in Curriculum

3.1 Strengthening Comprehensive Coverage of Ideological and Political Education System, Promote "Three-Wide Education", and Inspire Students' Sense of Mission in Forestry Strengthening and Revitalization

Enhancing special curriculum-based ideological and political education and improving graduates' commitment to serving national green development strategies are crucial measures for agricultural and forestry universities to fulfill the fundamental task of fostering virtue through education and address the core question of "what kind of people to cultivate, how to cultivate them, and for whom to cultivate them".

For example, when teaching the genetics chapter in the Landscape Plant Genetics and Breeding course, the author systematically introduced the historical development of cutting-edge genetic technologies, deeply explored the "Sinicized" ideological and political elements in agricultural and forestry education, and transformed internationally advanced theoretical knowledge and techniques into teaching content, hence significant teaching outcomes were achieved. The main innovative measures include: (1) Review the discovery, verification, development, practice, and application processes of important laws of genetics to help students fully understand the fundamental principles of scientific development and basic research methodologies, thereby cultivating a rigorous scientific attitude and spirit of exploration; (2) Introduce the latest international developments and discuss opportunities and challenges in the agricultural and forestry industries. For example, by explaining the "kill switch" function in genetically modified organisms developed through gene-editing technology, the importance of safety evaluation for transgenic crops was emphasized, motivating students to follow current events and enhance their capacity for independent innovation; (3) Explore classic cases and introduce the achievements of representative figures in China's agricultural and forestry sector. Examples include the stories of model figures such as "Li Baoguo - the New Foolish Old Man of Taihang Mountain", "Zhu Zhidi - Founder of Triploid Populus Tomentosa", "Li Zhensheng - Father of Wheat Distant Hybridization", and "Yuan Longping - Father of Hybrid Rice" [3-6]. These narratives allow students to appreciate the spirit of scientists, understand the intersection of genetics principles with agricultural and forestry practices, and spark their interest in contributing to the agricultrual and forestory sector. Through the integration of ideological and political education in course teaching, students' enthusiasm

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and aspiration for the forestry industry are significantly enhanced.

3.2 Emphasizing the Integration of Historical Culture and Scientific Spirit to Cultivate Students' Rigorous and Truth-Seeking Research Attitude

When teaching the "Hybrid Breeding" chapter, the author specifically introduced Academician Yuan Longping's "Dream of Cooling Under Rice Crops" to highlight his scientific spirit of dedicating himself to farmland and overcoming challenges. Through vivid narration, students gained a profound understanding of Yuan Longping's tremendous contributions to hybrid rice research and his scientific attitude of fearing no difficulty and daring to explore. Additionally, by comparing historical events such as Zhang Qian's introduction of Western Region plants during China's Han Dynasty with contemporary cases of germplasm resource conservation, the author demonstrated the historical contributions of Chinese civilization to landscape plants breeding. This integration of history and reality not only enhanced students' pride in Chinese civilization but also deepened their understanding of the significance of landscape plants breeding. When explaining the discovery process of Mendel's Genetics Laws, the author incorporated education on scientific perseverance with the concept of "Eight Years of Meticulous Effort". By describing Mendel's persistence and rigorous approach throughout his research, students were guided to appreciate the long-term and meticulous nature of scientific exploration. The author hopes that students can draw inspiration from Mendel's story to develop a research spirit characterized by perseverance, rigor, and truth-seeking.

3.3 Optimizing Curriculum Design to Bridge Ecological Civilization Construction with Professional Mission

Through in-depth analysis of landscape plants' applications in ecological restoration and urban greening, we integrate China's "Carbon Peak and Carbon Neutrality" strategy to guide students in profoundly contemplating the significance and value of breeding technologies in promoting sustainable development. In the "Molecular Breeding" chapter, the author thoroughly discusses ethical boundaries of gene-editing technology in biodiversity conservation, aiming to cultivate students' sense of responsibility for ecological and environmental protection, and enabling them to prioritize ecological balance and environmental conservation in future work and life. Further, through learning these content, students will come to understand that with technological advancements, breeding techniques have transcended traditional selection methods and expanded to the molecular level, thereby providing innovative solutions to challenges previously insurmountable by conventional approaches. Concurrently, the instructional materials also emphasize that when applying these advanced technologies, careful consideration must be given to their potential ecological risks and ethical implications, hereby guiding students to develop comprehensive and scientific ways of thinking.

3.4 Emphasizing Comprehensive "Theory-Experiment-Practice" Training and Integrating Practical Teaching with Labor Education to Enhance Students' Professional Identity

Agricultural and forestry disciplines integrate theory, experiment, and practice, constituting essential components of fundamental sciences. In teaching practice, I have adopted a combined approach of classroom instruction and laboratory work, with particular emphasis on developing students' practical operational skills. For example, I guided students in participating in campus plant maintenance and germplasm resource surveys and also organized a "Named Tree Planting" activity during Tree-planting Day, integrating labor education with life education to reinforce the educational philosophy of "Unity of Knowledge and Action". Further, the author led a social practice team composed of undergraduates, graduate students, and young faculty members to visit demonstration bases in the agricultural and forestry sector, including the Populus Tomentosa breeding base in Guan County, Shandong. During these visits, they studied the design and operational procedures of breeding programs, experienced the research spirit of "Perseverance through Difficulties and Diligent Investigation" embodied by Academician Zhu Zhidi's Populus Tomentosa breeding team, and discussed the critical role of Triploid Populus Tomentosa in ensuring China's strategic timber security and advancing national green development initiatives.

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4. Practical Pathways for Curriculum-based Ideological and Political Education

4.1 Building a "Teacher-Student Co-created" Ideological and Political Resource Database

Through collaboration between instructors and students, we have effectively integrated diverse teaching resources including texts, images, and videos. For example, we established a comprehensive ideological and political material database containing over 100 short videos and thousands of images. This material database is rich in content, covering multiple aspects such as the stories of scientists, cases of traditional culture, and practices of ecological protection. Through this approach, we have successfully developed a multidimensional "professional knowledge + ideological and political education" teaching resource system, designed to provide students with a more comprehensive and in-depth learning experience.

4.2 Innovating "Blended Online and Offline" Teaching Models

By utilizing online education platforms like the Course Center and Chaoxing Learning Pass, we are able to offer a wide variety of online courses. These courses incorporate not only conventional teaching content but also embedded ideological and political micro-lectures and interactive discussion modules, thereby significantly expanding the temporal and spatial dimensions of instruction. To further enhance teaching effectiveness, we have adopted both the BOPPPS instructional design model and the peer instruction classroom approach. These two modes emphasize problem-driven learning and group discussions to effectively stimulate students' active thinking and participation. Taking the "mutation breeding" teaching module as an example, we introduced the practical case study of "Colorful Rapeseed Flowers Contribute to Agricultural-cultural-tourism Integration". This approach guides students to deeply discuss the socioeconomic value and impact of breeding technologies, enabling them to learn and reflect in practical applications while strengthening their comprehension and application capabilities of course content [7].

4.3 Strengthening the "Dual-Teacher Collaboration" Faculty Development Program

To enhance the implementation effectiveness of curriculum-based ideological and political education, we propose to establish a joint teaching team consisting of both discipline-specialized instructors and ideological-political educators. This team would regularly organize and conduct curriculum-based ideological and political seminars to promote communication and cooperation among teachers and jointly explore how to more effectively integrate ideological and political education into professional courses. For example, South China Agricultural University has made active attempts and explorations in this regard. By implementing a "Three-level, Four-tier" teacher training system, it has effectively improved the ability and level of their teaching staff in ideological and political education [8].This comprehensive system includes primary, intermediate and advanced training, covering four dimensions of theoretical learning, practical implementation, pedagogical research and achievement demonstration, ensuring targeted professional training and development at all career stages. Further, Qingdao University of Technology has also relied on its experience in building provincial ideological and political courses to form a replicable and scalable teaching paradigm. The paradigm has been widely applied within the institution while providing valuable references for other universities, thereby promoting the advancement of curriculum-based ideological and political education across higher education institutions.

4.4 Improving the "Multidimensional Dynamic" Assessment System

We have implemented a comprehensive evaluation approach that combines "formative assessment" with "summative assessment", incorporating specific indicators for ideological and political education objectives. Specifically, In course assignments, students are required not only to complete traditional academic tasks but also to write a review article on the "Spirit of Breeding Scientists" to deeply understand the connotation of the scientific spirit and its significance in contemporary society. Moreover, in practical components, our student assessment places particular emphasis on teamwork competencies and social service awareness, ensuring students develop the ability to apply acquired knowledge to real-world problem-solving while cultivating their sense of social responsibility. In this way, we aim to achieve an integrated assessment of students' knowledge acquisition, skill enhancement, and value formation, thereby fostering their balanced development across multiple dimensions.

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5. Outcomes and Reflections on Curriculum-based Ideological and Political Education

According to the latest survey results, 85% of students reported significantly enhanced professional identity through the implementation of curriculum-based ideological and political education. Further, 90% of students can actively integrate acquired breeding techniques with ecological conservation concepts, demonstrating the positive role of curriculum-based ideological and political education in cultivating students' comprehensive abilities. The teaching team has also been recognized for their outstanding performance in curriculum-based ideological and political education, receiving the title of "Model Course on Ideological and Political Education" and "Teaching Team" at the university level. This is undoubtedly a strong testament to the significant improvement in the teachers' ability to teach ideological and political education. Further, the students' high level of participation in rural revitalization volunteer services, with over 300 subjects, not only reflects their sense of social responsibility but also demonstrates the achievements of the university's practical teaching. Not only that, multiple practical projects that the students participated in have also won national honors, further confirming the university's significant achievements in cultivating talent with a "strong understanding and love for agriculture".

Within the current Landscape Plant Genetics and Breeding course, we observed occasional unnatural integration of ideological and political elements with professional knowledge, resulting in perceived artificiality among some participants. To address this, we plan to refine the alignment between ideological and political components and instructional content through developing immersive teaching tools like virtual simulation experiments to enhance learning experiences. The curriculum-based ideological and political education for the Landscape Plant Genetics and Breeding represents not a standalone task but a systematic endeavor. It requires professional knowledge as its foundation, with talent cultivation as its fundamental objective, and innovative thinking as its driving force. Looking ahead, we must continue to deepen the Outcome-Based Education (OBE) concept, and establish an interconnected ideological and political education system featured by "curriculum + program + discipline". Through this system, we aim to lay a solid foundation for cultivating a new generation of landscape professionals who possess not only strong technical competencies but also profound patriotic sentiment and social commitment.

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