Practical Exploration of the "Curriculum Ideology and Politics + Innovation and Entrepreneurship" Collaborative Education Model in the Construction of Horticulture Major: A Case Study of Horticultural Plant Pathology

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Abstract Using the curriculum of horticultural plant pathology as a starting point, this paper investigates the collaborative education model of "curriculum ideology and politics + innovation and entrepreneurship". It expounds the necessity of constructing this model, proposes implementation paths from aspects such as the integration of ideological and political elements, the cultivation of innovation and entrepreneurship capabilities, and the construction of a collaborative education mechanism. Furthermore, it analyzes the practical effects, challenges encountered, and corresponding response strategies, thereby offering a valuable reference for the training of professionals in horticulture.

Key words Horticulture major, Curriculum ideology and politics, Innovation and entrepreneurship, Collaborative education, Horticultural plant pathology

1 Introduction

"Mass entrepreneurship and innovation" have emerged as significant drivers of economic and social development. The horticultural industry, as a vital sector within agriculture, plays a crucial role in the strategy for rural revitalization. The conventional talent cultivation model for horticulture major primarily emphasizes the transmission of professional knowledge, often neglecting the development of students' innovative thinking, entrepreneurial skills, and social responsibility. As a core curriculum within the horticulture major, horticultural plant pathology encompasses not only essential professional knowledge, such as the diagnosis and management of plant diseases, but also integrates substantial ideological and political elements, and innovation and entrepreneurship resources. Exploring the collaborative educational model of "curriculum ideology and politics + innovation and entrepreneurship" and effectively combining these elements with the instruction of horticultural plant pathology curriculum is of considerable importance for cultivating horticultural professionals capable of meeting the demands of the contemporary era.

2 Necessity of constructing the collaborative education model of "curriculum ideology and politics + innovation and entrepreneurship"

2.1 Adapting to the development needs of the horticultural industry With the rapid advancement of the horticultural industry, the demand for skilled professionals has significantly increased. One the one hand, horticultural enterprises require individuals who possess innovative thinking and entrepreneurial capabilities, enabling them to develop new products and technologies as well as to explore emerging markets. On the other hand, the horticultural industry is intrinsically linked to the ecological environment and food safety, necessitating that practitioners possess a strong sense of social responsibility and professional ethics. Establishing the collaborative educational model of "curriculum ideology and politics + innovation and entrepreneurship" can foster students' innovative thinking, entrepreneurial skills, and social responsibility, thereby enhancing their capacity to meet the developmental demands of the horticultural industry[1-2].

2.2 Enhancing students' comprehensive qualities Curriculum ideology and politics plays a crucial role in guiding students to develop accurate worldviews, outlooks on life and values, while fostering patriotic sentiments, a collectivist spirit, and a sense of social responsibility. Concurrently, innovation and entrepreneurship education can stimulate students' innovative thinking and entrepreneurial enthusiasm, as well as improve their practical skills, teamwork capabilities, and communication proficiency. The integration of these educational components into horticultural plant pathology curriculum can holistically enhance students' overall competencies and bolster their competitiveness in the job market.

2.3 Promoting the innovative development of horticulture discipline The advancement of the horticulture discipline necessitates ongoing innovation. By implementing the collaborative educational model of "curriculum ideology and politics + innovation and entrepreneurship", students' innovative thinking can be effectively stimulated, while their research skills and innovative spirit are cultivated. Engagement in innovation and entrepreneurship activities enables students to identify challenges in the field of horticultural plant pathology and to propose viable solutions, thereby

Received: August 8, 2025 Accepted: October 29, 2025

Supported by First-class Curriculum "Plant Immunology" Project of Tianjin Agricultural University.

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fostering the innovative development of the horticulture discipline.

3 Implementation path of the "curriculum ideology and politics + innovation and entrepreneurship" collaborative education model in the curriculum of horticultural plant pathology

3.1 Deep integration of ideological and political elements into the curriculum instruction

3.1.1 Spiritual guidance of scientists. The advancement in horticultural plant pathology is inextricably linked to the contributions of numerous scientists. In the curriculum instruction, the research endeavors and accomplishments of these scientists are presented to students, thereby fostering their scientific ethos and patriotic sentiments. For example, the narrative of Academician Zeng Shimai, a distinguished plant pathologist in China, is highlighted. Academician Zeng has devoted many years to the study of wheat rust, making substantial contributions to the security of wheat production in China. His rigorous academic approach, innovative spirit characterized by bold exploration, and dedication to the nation and its people serve to inspire students to aspire to high ideals and goals while diligently pursuing their professional studies.

3.1.2 Infiltration of professional ethics education. Horticultural plant protection is directly linked to the safety of agricultural production as well as the quality and safety of agricultural products. In the curriculum instruction, methods such as case analysis are employed to guide students in developing appropriate professional ethical standards. For example, cases involving pesticide residues exceeding permissible limits due to improper pesticide application are presented to help students understand the significance and responsibility inherent in horticultural plant protection work. Emphasis is placed on the necessity of adhering to academic ethics and professional norms in scientific research and practice, with the aim of fostering students' integrity and sense of responsibility.

3.1.3 Integration of the concept of ecological civilization. Horticultural plant pathology is intrinsically linked to the ecological environment. In the instructional process, the concept of ecological civilization should be incorporated to guide students in developing an understanding of sustainable, green development. For example, green control technologies, including biological and physical control methods, should be elucidated to help students appreciate the limitations of chemical control and the importance of environmentally friendly approaches in safeguarding the ecological environment. Furthermore, students should be encouraged to engage in relevant research endeavors that contribute to advancing the sustainable development of agriculture.

3.1.4 Combination of traditional culture and professional curriculum ideology and politics. Ancient agricultural texts contain valuable insights into the prevention and control of plant diseases. In the curriculum instruction, relevant excerpts from these classical works, such as the descriptions of crop disease management methods found in the *Complete Treatise on Agriculture*, are presented to help students appreciate the wisdom of past scholars and strengthen their cultural confidence. Additionally, students are encouraged to critically consider how traditional knowledge can be integrated with modern scientific and technological advancements to develop more environmentally sustainable and effective approaches to disease prevention and control.

3.2 Cultivation of innovation and entrepreneurship abilities throughout the entire educational process

3.2.1 Innovating teaching content and methods. In the teaching of horticultural plant pathology curriculum, incorporating content related to innovation and entrepreneurship is advisable. This may include the introduction of advanced technologies and recent research developments in plant disease management, alongside innovative and entrepreneurial case studies within the horticultural industry. Reforming pedagogical approaches by implementing case-based learning, project-driven instruction, and similar methods can enhance students' engagement and foster innovative thinking. For example, when discussing the epidemiological patterns of plant diseases, presenting real-world cases enables students to analyze causative factors and influences, subsequently formulating effective prevention and control strategies.

3.2.2 Building practical teaching platform. Practical teaching platforms, including laboratories, internship bases, and industry-university-research collaboration centers, can be established to offer students extensive hands-on learning opportunities. In the horticultural plant pathology curriculum, students are organized to engage in practical training at horticultural production bases, plant hospitals, and other internship locations. This approach enables them to gain a comprehensive understanding of the occurrence and management of plant diseases in real-world settings, thereby enhancing their practical skills and problem-solving abilities. Additionally, students are encouraged to participate in faculty-led research projects to foster their research competencies and innovative thinking.

3.2.3 Carrying out innovation and entrepreneurship activities. Various innovation and entrepreneurship activities are organized, including innovation and entrepreneurship competitions and project roadshows, to foster students' innovative thinking and entrepreneurial enthusiasm. In the horticultural plant pathology curriculum, students are guided to undertake research, development, and promotion projects related to new technologies and products for plant disease prevention and control, aligned with the curriculum content[3]. For example, students participated in the "Challenge Cup" National College Student Curricular Academic Science and Technology Works Competition, engaging in project planning, technological research and development, and market promotion centered on the theme of "research and application of new biopesticides".

3.3 Ensuring the effectiveness of education through the development of collaborative educational mechanism

3.3.1 Government-university-enterprise collaborative education.

Collaboration between government and enterprises is being enhanced to facilitate the integration of internal and external resources for talent development. The government can implement relevant policies to encourage enterprises to partner with universities in talent cultivation and scientific research initiatives. Enterprises, in turn, can offer students internship and training opportunities, employment positions, and technical support. For example, universities may collaborate with local horticultural enterprises to establish industry-university-research institutes cooperation bases, jointly conducting research and development on plant disease prevention and control technologies, as well as talent cultivation. Universities can capitalize on their strengths in talent development and scientific research innovation to provide technical assistance and a talent pool for enterprises.

3.3.2 Strengthening the construction of the teaching staff. The teaching staff plays a pivotal role in talent cultivation. It is essential to strengthen teacher training to improve their professional competencies and innovative capabilities. Teachers are encouraged to participate in training programs focused on curriculum ideology and politics, as well as innovation and entrepreneurship education, to ensure they are well-versed in the latest educational theories and methods. Additionally, outstanding individuals with innovative mindsets and entrepreneurial experience are actively recruited to enhance the quality of the teaching team. Furthermore, a bidirectional communication mechanism between teachers and industry technicians is established to facilitate mutual learning and collaboration.

3.3.3 Improving the reform of the evaluation mechanism. A scientific and rational evaluation system should be established to comprehensively assess students' learning outcomes and overall competencies. Regarding the evaluation content, emphasis should be placed not only on students' mastery of professional knowledge but also on their innovative thinking, entrepreneurial skills, teamwork abilities, and other relevant attributes. Concerning evaluation methods, a diversified approach should be employed, combining formative and summative assessments, as well as integrating teacher evaluations, student self-assessments, and peer reviews[4]. For example, in the assessment of the horticultural plant pathology curriculum, in addition to traditional written examinations, supplementary components such as practical laboratory assessments, project report evaluations, and assessments of innovation and entrepreneurship achievements may be incorporated.

4 Practical effect of the "curriculum ideology and politics + innovation and entrepreneurship" collaborative education model

4.1 Significant improvement in the overall quality of students The implementation of the "curriculum ideology and politics + innovation and entrepreneurship" collaborative education model has markedly enhanced the overall quality of students. Within the realm of curriculum ideology and politics, students have demonstrated improved professional ethics, a heightened sense of social responsibility, and strengthened patriotic sentiments. For example, during practical activities related to plant disease prevention and control, students consciously adhere to professional ethical standards and actively address real-world challenges faced by farmers. Regarding innovation and entrepreneurship, students have developed and refined their innovative thinking, entrepreneurial skills, and practical abilities. For example, participation in innovation and entrepreneurship competitions enables students to propose novel project plans and acquire competencies in project implementation. Furthermore, through teamwork cooperation, students have cultivated effective communication and collaboration skills, thereby enhancing their ability to work collectively.

4.2 Significant enhancement in employment competitiveness Students trained under this model demonstrate both professional expertise and capabilities in innovation and entrepreneurship, making them highly sought after by employers. There has been a notable improvement in both the employment rate and quality of graduates, alongside an expansion in the range of employment sectors. Beyond traditional posts such as horticultural research and technology dissemination, some graduates have pursued entrepreneurial ventures, achieving significant economic and social benefits in areas including plant disease control services and the production of green agricultural products. For example, certain students have applied their knowledge of plant disease control techniques to establish biotechnology firms and pesticide sales enterprises, offering specialized disease diagnosis and management services to farmers, which have received considerable acclaim.

4.3 Enhancement of discipline development and social service capacity The implementation of the "curriculum ideology and politics + innovation and entrepreneurship" collaborative education model has significantly advanced the development of the horticulture discipline. By fostering partnerships with enterprises, teachers are able to promptly grasp industry requirements and technological development trends, thereby facilitating the translation of scientific research outcomes into practical applications and enhancing the discipline's capacity for social service[5]. For example, the research and development project on new technologies for plant disease prevention and control, conducted collaboratively by teachers and enterprises, has provided effective technical support for agricultural production and yielded substantial economic and social benefits. Furthermore, the advancement of the discipline has attracted a greater number of outstanding talents, thereby further promoting its progress.

5 Challenges and coping strategies

5.1 Challenges

5.1.1 High integration difficulty. There are notable challenges in the effective integration of curriculum ideology and politics with innovation and entrepreneurship education. Teachers are required to demonstrate advanced comprehensive qualities and teaching

abilities, enabling them to seamlessly incorporate ideological and political elements alongside innovation and entrepreneurship concepts into their professional curriculum instruction. However, currently, some teachers lack a profound understanding and mastery of both curriculum ideology and politics and innovation and entrepreneurship education, which often results in a disjointed or superficial approach during the teaching process.

5.1.2 Imperfect collaborative mechanism. The mechanism for collaborative education among the government, universities, and enterprises remains imperfect. Throughout the cooperation process, issues such as inadequate communication and an uneven distribution of benefits among stakeholders adversely affect the effectiveness of collaborative education. For example, enterprises exhibit limited enthusiasm for participating in talent cultivation, primarily due to concerns regarding the disproportionate relationship between input and output, as well as the absence of effective incentive mechanisms.

5.1.3 Limited resources. The resources available for innovation and entrepreneurship education remain relatively limited. Challenges such as inadequate development of practical training bases and a shortage of qualified mentors in innovation and entrepreneurship have hindered the effective cultivation of students' capabilities in these areas. Furthermore, insufficient investment in innovation and entrepreneurship education has impeded the smooth implementation of certain related activities[6].

5.2 Coping strategies

5.2.1 Enhancing teachers' capabilities. Specialized training sessions, pedagogical discussions, and various activities are conducted to assist teachers in mastering the methods and skills related to curriculum ideology and politics, as well as innovation and entrepreneurship education. Teachers are encouraged to engage in teaching research and reform, to explore the "curriculum ideology and politics + innovation and entrepreneurship" teaching model tailored to the horticultural plant pathology curriculum, thereby improving teaching effectiveness and educational quality.

5.2.2 Improving the collaborative mechanism. The collaborative education mechanism involving the government, universities, and enterprises should be enhanced by establishing an effective system for communication, coordination, and benefit distribution. This system must clearly define the responsibilities and rights of all parties to strengthen cooperation and facilitate exchanges. The government must implement policies that provide tax incentives and financial support to enterprises, thereby encouraging their active participation in talent cultivation. Additionally, universities and enterprises formalize their collaboration through cooperation agreements to ensure the seamless advancement of joint initiatives.

5.2.3 Increasing resource input. Investment in resources for innovation and entrepreneurship education should be increased, and the development of practical training bases must be enhanced through joint funding from the government and universities to offer students greater opportunities for hands-on experience. Additionally, enterprise experts and entrepreneurs should be actively recruited as part-time mentors to provide professional guidance. Furthermore, a dedicated fund for innovation and entrepreneurship ought to be established to support students in their innovative and entrepreneurial endeavors[7].

6 Conclusions

In the context of "innovation and entrepreneurship", it is both necessary and feasible to explore a collaborative educational model that integrates curriculum ideology and politics with innovation and entrepreneurship for the horticulture major. The application of this model within the horticultural plant pathology curriculum has effectively incorporated ideological and political elements into the instruction and established a collaborative educational framework. This approach has yielded significant outcomes, including the enhancement of students' comprehensive qualities and employability, as well as the strengthening of disciplinary development and social service capabilities.

In the future, this model requires further refinement. Regarding curriculum ideology and politics, continuous efforts will be made to explore and enrich ideological and political elements, innovate teaching methods, and enhance instructional effectiveness. Concerning innovation and entrepreneurship, it is essential to strengthen the educational framework, improve practical platforms, and offer increased opportunities and support for students. In terms of collaborative education, efforts will focus on deepening partnerships with government and enterprises, establishing a robust mechanism for industry-university-research collaboration, and jointly advancing the quality of talent cultivation. Simultaneously, it is essential to strengthen international exchanges and cooperation, and assimilate advanced educational concepts and experiences from abroad, thereby invigorating talent cultivation[8]. It is anticipated that, through the collaborative efforts of all stakeholders, the "curriculum ideology and politics + innovation and entrepreneurship" collaborative education model will significantly enhance the training of horticultural professionals, thereby providing robust talent support for the advancement of the horticultural industry and the implementation of rural revitalization strategies.

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3.3.1 Vegetation landscape renovation and improvement. In response to the prevailing issues of monoculture forest composition, minimal seasonal variation, and inadequate ecological stability, a systematic plant landscape strategy aimed at "expansion, color enhancement, and efficiency improvement" has been implemented. The "expansion" approach is employed, which involves planting appropriate trees and shrubs along forest edges, forest gaps, clearings, and open areas with gentle slopes, utilizing available spaces without compromising the existing vegetation. Regarding the selection of tree species, *Ceiba speciosa*, *Bauhinia variegata*, *Plumeria rubra*, *Eugenia uniflora*, *Michelia figo*, *Ficus microcarpa*, and *Osmanthus fragrans* were carefully chosen due to their excellent ecological adaptability (as native or naturalized species) and their notable ornamental attributes, including attractive flowers, fruits, foliage, and fragrance. Regarding configuration methods, the traditional row planting style is replaced by a natural cluster arrangement to better simulate the natural community structure of plants. Emphasis is placed on integrating evergreen and deciduous species, as well as fast-growing and slow-growing plants, alongside creating undulating forest canopy lines and varied forest edge contours. The objective is to develop a near-natural plant community landscape characterized by rich coloration, diverse stratification, and distinct seasonal scenery, thereby comprehensively enhancing the region's biodiversity and aesthetic value.

3.3.2 Construction of recreational facilities and associated projects. The construction of recreational facilities and associated projects consistently adheres to the principles of "ecological priority, adapting measures to local conditions, and human-centered design".

(i) Mountain hiking trail system. To facilitate effective connectivity among various functional areas while minimizing disturbance to the ground surface, approximately 0.808 km of hiking trails have been constructed in accordance with the mountain's terrain. The pavement prioritizes the use of ecologically permeable materials, such as permeable stone or crushed stone, with a consistent width of 1.36 m, allowing two individuals to walk side by side comfortably. In hazardous sections, including steep slopes, sharp bends, and areas adjacent to cliffs, necessary safety guardrails and rest seats have been installed to ensure the safety and comfort of visitors. The route planning strategically utilizes existing mountain roads and fire lanes, optimizing and widening them to effectively connect various functional areas, thereby creating a convenient and comfortable circular tour route.

(ii) Landscape and recreational facilities. To improve the landscape aesthetics and functional services, two pavilions and one corridor have been constructed within the park. Their design and materials are harmoniously integrated with the surrounding natural environment, offering villagers sheltered spaces to protect against wind and rain, as well as areas to pause and appreciate the scenery. Additionally, a stone tablet has been installed to provide an introduction to the park and to reinforce its cultural heritage.

(iii) Supporting service facilities. An ecological parking lot, constructed using grass pavers, has been established. Additionally, classified garbage bins and other facilities have been installed to enhance the park's service functions and to maintain a clean and orderly environment.

4 Conclusions

Amid the rapid growth of forest and rural tourism, rural forest parks that combine scenic forest landscapes with distinctive rural characteristics are increasingly recognized as popular leisure destinations. These parks not only fulfill rural residents' desires for spiritual and cultural enrichment and a healthy lifestyle but also significantly contribute to the advancement of rural tourism, thereby enhancing farmers' incomes and promoting prosperity. The development of the forest park in Xijiao Village, Henghe, represents a concrete initiative and an active effort to implement the comprehensive objectives of the national rural revitalization strategy, which emphasizes "thriving industries, a pleasant living environment, civilized rural customs, effective governance, and prosperous livelihoods". Furthermore, this project offers valuable insights and serves as a reference model for other regions.

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