

Teaching Reform Practice of Vegetable Seed Production Technology Course: Based on the Integration of "Practice-Theory" School-Enterprise Collaborative Training Model

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Abstract: Vocational education serves as a critical pathway for cultivating high-skilled talent and supporting regional economic development, with its core focus being the refinement of students' practical abilities. To address the longstanding issues inherent in the traditional "Vegetable Seed Production Technology" course, the teaching team engaged in deep collaboration with leading industry enterprises. Guided by the core philosophy of "practice-theory" integration, they conducted systematic teaching reforms. This study deconstructed and reconstructed typical work task modules based on authentic production scenarios through in-depth enterprise research; innovatively implemented a cyclical teaching model featuring the "field-based classroom" and "dual-teacher joint guidance"; and established a multidimensional assessment system and incentive mechanism integrating process evaluation and outcome evaluation. Reform practices demonstrate a significant improvement in student skill assessment pass rates, a marked enhancement in job suitability and professional identity, and the concurrent impetus for the growth of teachers' practical teaching abilities, thereby fostering a positive ecology of "mutual development in teaching and learning, and shared success for both school and enterprise". This model provides a replicable practical pathway for agricultural higher vocational programs to resolve the disconnection between industry and education, effectively contributing to the quality and efficiency of skilled talent cultivation.

Keywords: Vocational Education; Vegetable Seed Production Technology; Teaching Reform; School-Enterprise Collaboration

1. Introduction

Vocational education serves as a vital component of China's national education system and human resource development. It undertakes the crucial mission of cultivating diverse talent, transmitting technical skills, and promoting employment and entrepreneurship, thereby acting as a strategic engine for empowering industrial transformation and upgrading and driving high-quality economic development^[1]. In 2021, the "Opinions on Promoting the High-Quality Development of Modern Vocational Education" issued by the General Office of the Communist Party of China Central Committee and the General Office of the State Council emphasized that vocational education must adhere to the market-oriented and employment-promoting educational direction, strengthen the core focus on cultivating "practical abilities," and explicitly required vocational schools to proactively deepen innovations in school-enterprise collaborative education models^[2]. The following year, the Ministry of Education's "Notice on Accelerating the Reform of Key Tasks in the Construction of the Modern Vocational Education System" further explicitly called for supporting regions to organize schools and enterprises to jointly develop typical production practice projects, guiding students to learn and apply knowledge and vocational skills in authentic professional environments, fundamentally enhancing the relevance and adaptability of talent cultivation^[3]. This series of top-level designs has charted the course for teaching reform in vocational education.

Peer institutions have conducted exploratory reforms in courses related to agriculture. For instance, Chongqing Three Gorges Vocational College collaborated with enterprises to establish a "Field College," synchronizing the academic calendar with the agricultural production cycle and implementing a flexible "Semesters Follow the Farming Season" mechanism. This approach allows

students to participate in real spring ploughing production tasks, thereby enhancing graduate employability^[4]. Similarly, Guangxi Agricultural Vocational and Technical College fundamentally restructured its curriculum around the seed production processes of regional staple crops (such as corn and sugarcane). It replaced the discipline-knowledge-logic organization with a series of complete "production tasks" as carriers to sequence teaching content. This enables students to proactively construct knowledge, acquire skills, and develop competencies while completing specific work projects, achieving remarkable results^[5-6]. Although these reforms have different emphases, their core success lies in the steadfast adherence to the "practice-oriented" principle.

However, focusing specifically on the field of "Vegetable Seed Production Technology," its high technical requirements, long cycles, and multiple stages place extremely high demands on students' practical operational abilities and comprehensive problem-solving skills regarding actual production issues. Existing research predominantly concentrates on macro-level model discussions or seed production for major crops, while systematic reform research and practice for the Vegetable Seed Production Technology course, based on the "practice-theory integration" concept under deep school-enterprise collaboration, remains a gap.

The traditional "Vegetable Seed Production Technology" course at our institution faced four major prominent problems. In response, our teaching team, in collaboration with Wuhan Yafei Seed Industry Technology Co., Ltd., and guided by the "Practice-Theory Integration" reform direction, has conducted a comprehensive and in-depth reform exploration of the course. This aims to provide an effective solution for cultivating high-skilled talent that meets the development needs of the modern seed industry.

2. Analysis of Course Teaching Problems

2.1 Monotonous Teaching Method with Severe Imbalance Between Practical and Theoretical Instruction

The traditional teaching approach places excessive emphasis on theoretical knowledge. Students primarily depend on textbooks and instructor-provided materials as their main sources of information, resulting in overreliance on lecture-based methods, insufficient exploratory learning, and limited teaching variety. Practical training is constrained by limited facilities and materials, preventing students from systematically mastering operational skills across the entire vegetable seed production process. This leads to a disconnect between theoretical knowledge and practical application.

2.2 Significant Disconnect Between Teaching Objectives and Industry Requirements

Traditional instruction focuses predominantly on knowledge acquisition, whereas industry demands skilled personnel capable of rapid adaptation and minimal operational errors. The conventional emphasis on theory over practice results in students' weak comprehensive knowledge application abilities and inadequate professional competence development. Consequently, employers must invest substantial resources in retraining new hires, revealing a considerable gap between talent training outcomes and actual industry needs.

2.3 Insufficient Interdisciplinary Integration and Limited Comprehensive Problem-Solving Capability

The curriculum content of Vegetable Seed Production Technology lacks effective coordination with other relevant courses such as Plant and Plant Physiology, Soil and Fertilizer Science, and Agricultural Meteorology. This deficiency prevents students from effectively integrating multidisciplinary knowledge to analyze and resolve complex practical problems, failing to meet the modern seed industry's demand for comprehensively skilled professionals.

2.4 Simplistic Assessment Mechanism Inadequate for Promoting Comprehensive Student Development

The original course evaluation system presents notable shortcomings. First, the assessment content is unbalanced, with final examinations focusing predominantly on theoretical knowledge retention while lacking effective quantitative metrics for evaluating practical skills and professional competence.

Second, the evaluation process is unilateral, conducted almost exclusively by course instructors without participation from industry employers, resulting in poor correlation between assessment outcomes and actual job performance. Third, the incentive function remains underdeveloped, as conventional grading methods provide insufficient motivation for students' intrinsic learning drive, ultimately failing to support their continuous competency development.

3. Course Reform Implementation Pathway

3.1 Restructuring Course Content: Building a Modular Curriculum System Based on Typical Work Tasks

3.1.1 Conducting In-Depth Enterprise Research and Deconstructing Typical Work Tasks

The project team teachers conducted thorough research at the production frontlines of enterprises, focusing on the vegetable seed production technician role. Through systematic analysis, they deconstructed the complex vegetable seed production process into six core typical work task modules, including emasculation and isolation, pollination and labeling. These modules comprehensively cover the full-range skill requirements from pre-production preparation to post-production handling.

3.1.2 Collaborative School-Enterprise Development and Restructuring of Loose-Leaf Work Manuals

Based on these six work tasks, both the school and enterprise jointly established a curriculum development team. This team systematically reorganized and integrated theoretical and practical knowledge points. Combining the "Technical Regulations for Cauliflower Production," they compiled the loose-leaf "Cruciferous Vegetable Seed Production Work Manual," ensuring both the advanced nature and flexibility of the teaching content.

3.2 Innovating the Teaching Model: Establishing the "Field-Based Classroom" and Implementing "Dual-Teacher Joint Guidance with Cyclical Teaching"

3.2.1 Extending the Teaching Environment to the Production Frontline, Realizing "The Field as the Classroom"

The project transferred the core teaching venue from the classroom to the standardized seed production base of the enterprise. The teaching schedule aligns with the enterprise's production plan and agricultural seasons, ensuring genuine integration between the teaching process and the production process. During the hybrid seed production season for cauliflower, students are stationed at the base full-time. Enterprise technical experts serve as corporate mentors, conducting live demonstrations and explaining key technical points and standards on-site. School teachers, acting as academic mentors, organize teaching activities, guide students in observation and questioning, and provide timely explanations. Students engage in practical training within the authentic production environment, completing real production tasks and achieving "learning through practice and practicing through learning."

3.2.2 Establishing a Cyclical Reflective Teaching Model of "Daytime Practice-Evening Theory"

To address specific problems and common challenges encountered during daytime practice, evening theoretical seminars are organized in enterprise meeting rooms or on online platforms. School teachers provide in-depth explanations of the theoretical principles underlying these practical issues, guiding students to transform experiential understanding into rational knowledge. Corporate mentors share typical cases and lessons learned from production. This cyclical teaching model — "observation (daytime), practice (daytime), reflection/theoretical enhancement (evening)"—significantly strengthens students' ability to apply theoretical knowledge and enhances their capacity to solve complex problems.

3.3 Optimizing the Assessment System: Establishing a Multi-dimensional Evaluation and Dynamic Incentive Mechanism

3.3.1 Implementing a Comprehensive Evaluation System of "Process Assessment (60%) + Summative Assessment (40%)"

The process assessment is led by corporate mentors who conduct quantitative evaluations of students' daily/task-specific performance using the "Student Practice Evaluation Form," covering

multiple dimensions such as operational compliance, task completion quality, and professional competence. The summative assessment adopts the format of an "open-book exam (focusing on case analysis) + final project presentation and defense," emphasizing the evaluation of students' abilities in knowledge integration, critical reflection, and communication skills.

3.3.2 Introducing a Corporate-style Dynamic Incentive Mechanism

The program incorporates corporate performance management concepts into teaching by establishing internship performance subsidies. Enterprises distribute internship subsidies based on students' process assessment ratings, with significantly differentiated subsidy standards that greatly stimulate student motivation and competitive awareness. Upon course completion, students with outstanding evaluation results receive a "Outstanding Intern" certificate jointly issued by the school and enterprise, along with priority recommendations for employment to partner companies and other industry organizations, thereby establishing a positive framework of "merit-based rewards and excellence-based referrals."

3.4 Promoting Comprehensive Student Development: Emphasizing Physical-Mental Synergy and Cultivating Passion for Agriculture, Rural Areas, and Farmers

3.4.1 Organizing Diverse Recreational and Sports Activities to Safeguard Student Well-being

Alongside intensive practical learning, the program organizes basketball games, fun sports meets, and other activities. These initiatives help students relieve stress, build friendships, and enhance team cohesion, ensuring they engage in learning with full mental and physical vitality.

3.4.2 Integrating Labor Education and Fostering Commitment to Agricultural Development

The program regularly invites national and provincial model workers as well as agricultural experts to the field-based classroom. They share inspiring stories of dedicating their lives to agriculture, influencing students through the "model worker spirit" and "craftsman spirit." Students visit modern agricultural industrial parks and seed processing centers to learn about cutting-edge technologies and development roadmaps in modern seed industry. These experiences deepen their understanding of the strategic significance that "seeds are the microchips of agriculture," gradually nurturing a profound passion, vocational pride, and commitment to understanding, loving, and serving agriculture.

4. Course Reform Effectiveness

4.1 Dual Enhancement of Student Skill Levels and Theoretical Knowledge Mastery

Over the two years since the reform's implementation, students' practical operational abilities have been honed to an unprecedented degree. As shown in Table 1, the skill assessment pass rates for the 2022 and 2023 cohorts increased significantly by 17% and 27% respectively compared to the pre-reform 2021 cohort. More importantly, over 59% of students achieved an operational proficiency and standardization comparable to that of seasoned enterprise technicians, enabling them to independently manage tasks within a production segment. Through student interviews and theoretical tests, it was found that over 90% of students reported a deeper and more lasting understanding of theoretical knowledge, attributing this to the "practice first, theory later" or "simultaneous practice and theory" model. They could particularly articulate the scientific principles underlying each operational technique, truly realizing the transition from "knowing what" to "knowing why." This effectively fulfills the educational objective of integrating knowledge and practice.

Table 1: Summary of Student Skill Operational Assessments over the Past Three Years

Cohort	Number Passing (Number with Excellence)	Number Failing	Total Number	Pass Rate (Excellence Rate) (%)	Remarks
2021 Cohort	14 (8)	14	28	50 (29)	Before School-Enterprise Cooperation Reform
2022 Cohort	26 (22)	13	39	67 (56)	Initial Reform Implementation
2023 Cohort	23 (19)	7	30	77 (63)	Continuous Reform Deepening

4.2 Significant Enhancement of Students' Professional Competence and Employability

Through immersion in authentic corporate environments and culture, students' professional competence has been comprehensively elevated. Enterprises reported that the adaptation period for interns or graduates after the reform has been noticeably shortened. Several graduates from the 2022 cohort (graduating in 2025) were directly hired by partner enterprises due to their outstanding performance during internships.

4.3 Concurrent Improvement of Teachers' Practical Teaching and Research Capabilities

Through collaborative guidance of students with corporate experts and solving production challenges, teachers have significantly enhanced their practical operational skills, industry insight, and ability to integrate production, education, and research. All faculty members in the course team have been certified by the institution as "dual-qualified" teachers. Teachers have transformed typical cases collected from production and technical challenges encountered into rich teaching resources, enriching classroom instruction with renewed vitality. Furthermore, building on this cooperation, the school and enterprises jointly applied for and secured two provincial-level research projects, truly realizing mutual promotion of teaching and research.

4.4 School-Enterprise Cooperation Enters a New Phase of Deep, Mutually Beneficial Integration

The reform has broken the previous cooperation impasse of "schools being enthusiastic while enterprises remained passive," forming a close collaborative partnership characterized by joint talent cultivation, co-managed processes, shared achievements, and mutual responsibility. For enterprises, the "dual-qualified" teaching team not only excellently completed student internship guidance tasks but also leveraged their theoretical strengths to provide over 100 professional technical training sessions annually for enterprise staff, enhancing the overall talent quality of the enterprises. Student participation in production also alleviated workforce shortages during peak seasons to some extent and infused new vitality into the enterprises. For enterprises, participating in talent development is no longer merely an expenditure but yields tangible talent support, intellectual support, and potential innovation momentum, achieving a profound transformation from being "stakeholders" to a "development community."

5. Conclusion and Prospects

This study addressed the long-standing shortcomings of the traditional "Vegetable Seed Production Technology" course by exploring and implementing a school-enterprise collaborative training model based on "practice-theory" integration. By restructuring course content around typical work tasks, innovating teaching formats through the "field-based classroom," and optimizing evaluation mechanisms with multidimensional assessments, it effectively resolved the disconnection between theory and practice. The reform significantly enhanced students' technical skills, professional competence, and teachers' practical teaching abilities, while deepening the level and substance of school-enterprise collaboration, with remarkable results.

However, the reform practice also revealed issues requiring urgent optimization. Firstly, conflicts between academic and production cycles necessitate further exploration into more flexible adjustment of teaching plans or using modern agricultural facilities (e.g., greenhouses) to partially mitigate seasonal limitations. Secondly, challenges in management and costs associated with long-term enterprise-based teaching arose. Extended student internships increased pressures regarding safety, daily life, and psychological management, alongside significantly higher operational costs, demanding more robust onsite management systems and stable funding mechanisms.

Looking ahead, the teaching team will focus on: Firstly, actively developing and utilizing virtual simulation training software to simulate key production processes and abnormal situation handling, serving as an effective supplement to field practice. Secondly, further refining flexible teaching management mechanisms by exploring models such as credit bank systems and concentrated holiday practices to better align with production seasons. The ultimate goal is to establish a more efficient, flexible, and sustainable school-enterprise collaborative education model, cultivating high-skilled talent who are "willing to work in the field, capable of retaining their positions, practically competent, and effective performers" to support the revitalization of China's seed industry in the new era.

Fund Projects

Project of Supply-Demand Matching Employment Education Program (Phase II) of the Ministry of Education "Targeted Talent Training Program" (Principal Investigator: Shengmei Ji, Project Number: 20230100366)

Scientific Research Project of Hubei Provincial Department of Education for 2023 "Integration of Large-Scale and Standardized Production Technologies for Specialty Vegetable Cauliflower" (Principal Investigator: Haiping Wang, Project Number: B2023564)

References

- [1] State Council. *Circular on the Implementation Plan for National Vocational Education Reform*. 2019.
- [2] General Office of the Central Committee of the Communist Party of China, General Office of the State Council. *Opinions on Promoting the High-Quality Development of Modern Vocational Education*. (2021-10-12).
- [3] General Office of the Ministry of Education. *Notice on Accelerating the Reform of Key Tasks in the Construction of the Modern Vocational Education System*. (2023-07-17).
- [4] Chongqing Three Gorges Vocational College. *Field Classroom Cultivates New-Generation Farmers: Chongqing Three Gorges Vocational College Conducts Farming Education Practice*. (2025-04-27).
- [5] Liang Qingping, Jian Feng, Zhou Xiaozhou, et al. *Exploration on the Development and Implementation of the Project Course "Seed Production Technology" in Higher Vocational Education*. *Journal of Guangxi Agriculture*, 2012, 27(6): 59 - 61+74.
- [6] Liang Qingping, Huang Shaojun, Jian Feng, et al. *Teaching Reform Practice of the "Seed Production Technology" Course Based on Competency Standard*. *Career Horizon*, 2012, 8(7): 133 - 135.
- [7] Jiang Dayuan. *Work Process Systematization: Vocational Education Curriculum Development with Chinese Characteristics*. *Journal of Shunde Polytechnic*, 2014, 12(3): 1 - 11+27.
- [8] Zhao Zhiqun. *Guidelines for Developing Integrated Work-Study Curricula in Vocational Education*. Beijing: Tsinghua University Press, 2009.