

Exploring Teaching Reform in the Course Labor Education—Modern Agricultural Production Technology

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Abstract Addressing issues such as the overemphasis on theory, insufficient practice, simplistic assessment, and shallow integration of course-based ideological and political education in the course Labor Education—Modern Agricultural Production Technology, this paper, grounded in teaching practices from 2024 to 2025, systematically explores reforms across four dimensions: restructuring course objectives, optimizing teaching models, reforming the evaluation system, and integrating labor education with course-based ideological-political education. By implementing modular teaching, diversifying field practice activities, incorporating smart agriculture case studies, and establishing a comprehensive process-oriented evaluation mechanism covering skill proficiency, teamwork, project performance, and ideological-political awareness, the reform has successfully facilitated a pedagogical shift from "knowledge transmission" to "competency development". The findings demonstrate significant enhancements in students' labor skills, professional interest, innovative mindset, and awareness of serving agriculture, rural areas, and farmers ("Three Rural Issues"). The educational objectives of cultivating morality through labor (cultivating ideological and political education), promoting learning through labor, and nurturing skills through labor were effectively achieved, offering a practical and referenceable pathway for labor education curriculum reform in the new era.

Key words Labor education, Modern agriculture, Teaching reform, Field practice, Competency-based, Multi-dimensional evaluation

0 Introduction

With the deepening implementation of the Rural Revitalization Strategy and the modernization of agriculture and rural areas, modern agriculture is rapidly transitioning from traditional experience-based practices to technology-intensive operations, demanding higher-caliber agricultural professionals equipped with both interdisciplinary knowledge and practical capabilities^[1-3]. As a vital component of the labor education framework in higher education, the Labor Education course integrates the teaching of agricultural science and technology with the training of production practice skills. It serves as a crucial platform for implementing the educational principle of "Comprehensive Development through Five Key Aspects (Moral, Intellectual, Physical, Aesthetic, and Labor Education)" and enhancing students' social responsibility and labor consciousness^[4-5]. The course not only bears the instructional responsibility of imparting modern agricultural knowledge and cultivating fundamental operational skills, but also shoulders the educational mission of transmitting farming culture, elevating labor literacy, and promoting the spirit of labor^[6].

However, several challenges persist in current course teaching practices: First, content design leans heavily towards theory, with insufficient time and intensity dedicated to field practice, resulting in a relatively weak labor experience for students; second, the teaching model remains dominated by the traditional "teacher lectures, students take notes" approach, making it difficult to stimulate students' interest in labor and their capacity for proactive thinking; third, the assessment criteria are predominantly outcome-oriented, neglecting systematic evaluation of skill devel-

opment, collaborative abilities, and attitude cultivation during the labor process; fourth, the integration of course-based ideological and political education within the course is insufficiently profound, failing to fully leverage the value-guidance role of agricultural labor education in fostering affection for and a service mindset towards agriculture, rural areas, and farmers ("Three Rural Issues")^[7-11].

To effectively address these issues, the course teaching team, taking undergraduates enrolled in the course between 2024 and 2025 as a pilot cohort, undertook systematic teaching reforms centered on four core dimensions: restructuring teaching content, innovating teaching methods, optimizing the evaluation mechanism, and integrating labor education with course-based ideological and political education cultivation. This paper systematically summarizes the reform pathways, implementation strategies, and practical outcomes of the Labor Education—Modern Agricultural Production Technology course, aiming to provide experiential reference for optimizing labor education courses in the new era.

1 Overall design of the teaching reform

1.1 Reform philosophy and objectives The course Labor Education—Modern Agricultural Production Technology covers core areas such as cultivation techniques, agricultural machinery operation, facility agriculture, crop management, and resource utilization. It intersects multiple disciplinary fields including crop science, agricultural engineering, environmental science, and management science, characterized by its highly comprehensive content, demanding practical tasks, and distinct seasonality and regionality^[5,12]. In response to the four teaching challenges outlined in the Introduction, this teaching reform established the fundamental philosophy of "student-centered, competency-focused, value-guided". It aims to achieve a pedagogical transformation

from "knowledge transmission" to "competency development", and from "outcome assessment" to "educating through the process".

The reform objectives encompass three levels: At the knowledge level, students are required to systematically master the fundamental principles and operational procedures of modern agricultural production technologies; at the competency level, emphasis is placed on enhancing students' hands-on operation, problem analysis, and teamwork abilities within authentic labor contexts; at the literacy level, efforts are concentrated on cultivating students' course-based ideological and political education, sense of agricultural identity, and social responsibility, thereby achieving the educational goal of "cultivating morality through labor (course-based ideological and political education cultivation), promoting learning through labor, and nurturing skills through labor".

1.2 Overall framework design Centered on the aforementioned objectives, the course established an integrated teaching system comprising "Modular Teaching + Field Practice + Process Evaluation + Course-Based Ideological and Political Education Integration". The reform approach unfolds primarily along the following three aspects:

1.2.1 Systematic restructuring of teaching content and methods. The teaching content is systematically organized into four progressive modules: "Basic Skills—Professional Practice—Technology Application—Smart Agriculture". This structure not only covers fundamental agronomic operations and the application of agricultural knowledge, but also aligns with the development trends of modern agricultural science and technology, emphasizing the design of diverse work projects and the construction of authentic labor scenarios. Teaching methods move beyond the traditional "teacher demonstration + student imitation" model, strengthening a pedagogical organization that combines task-based learning, scenario simulation, teamwork, and reflective evaluation. By introducing methods such as smart agriculture case studies, on-site problem diagnosis, and task contracting (project-based assignments), students are guided to engage in "learning by doing, reflecting while learning" within authentic or simulated environments.

1.2.2 Establishing a comprehensive, process-oriented, multi-dimensional teaching evaluation mechanism. The course has established a comprehensive evaluation system that integrates "process + outcome" and "knowledge + competency + attitude". Students' work attitudes, spirit of cooperation, quality of task completion, reflective abilities, and innovative mindset are all incorporated into the assessment scope; the evaluation agents shift from being solely teacher-led to involving both teachers and students in co-assessment, effectively enhancing the objectivity and motivational effect of the evaluation. Through an evaluation design featuring "process documentation + project presentations + outcome showcases + peer evaluation within teams", an organic unity of "promoting learning through labor and fostering education through re-

flection" is achieved.

1.2.3 Deepening the integration of course-based ideological and political education with educational goals. Value-oriented elements such as the concept of green development and the Rural Revitalization Strategy are fully integrated into both the course content and practical processes. Drawing upon China's achievements in modern agricultural development and the practical needs of rural areas, students are guided to establish correct values of respecting labor, valuing agriculture, and serving agriculture, rural areas, and farmers ("Three Rural Issues"). By incorporating reflective sessions like "My Labor Story" and showcases of labor achievements, students' sense of responsibility, social concern, and commitment to their nation are strengthened.

As illustrated in Fig. 1, the implementation pathway of the course reform can be summarized as follows: Using modular teaching content as the vehicle, driven by field practice and project-based learning, safeguarded by process-oriented evaluation, and guided by course-based ideological and political education as the value compass, these four elements synergistically advance, ultimately achieving the tripartite educational goal encompassing knowledge, competency, and literacy.

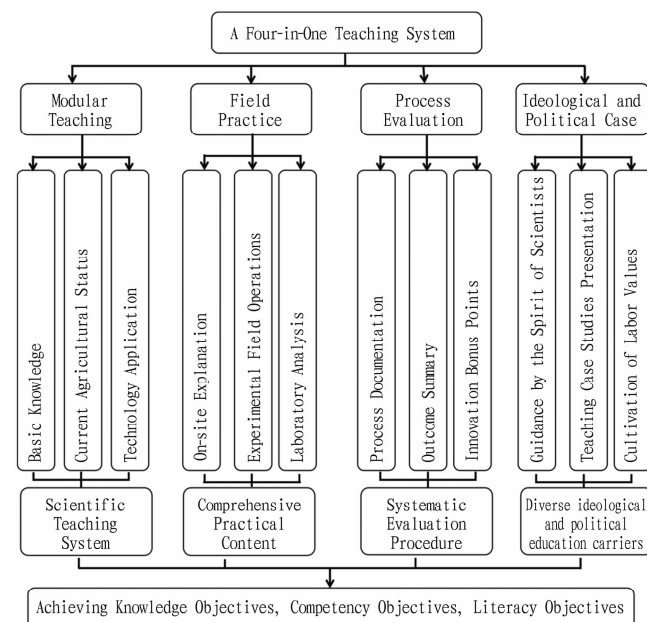


Fig. 1 Implementation framework of the four-in-one teaching system for the course reform

2 Key reform measures and implementation

2.1 Practice-oriented and theory-integrated teaching model

The course Labor Education—Modern Agricultural Production Technology has long suffered from pedagogical drawbacks characterized by "emphasizing theory over practice" and "prioritizing cognition over experience", making it difficult to foster students' sense of identity with and responsibility towards agricultural labor. Therefore, the course reform is tightly centered on the educational objectives of "knowing agriculture, loving agriculture, revitalizing

agriculture", actively promoting a new teaching model of "practice-orientation + theory-integration". The reform leverages the research platforms of the Key Laboratory of Coarse Cereals Processing of the Ministry of Agriculture, Chengdu University and the resources of both on-campus and off-campus experimental fields. It organically integrates classroom teaching, base training, and laboratory research. In terms of instructional design, a modular structure is adopted, focusing on key stages of agricultural production—such as land preparation, seeding and seedling raising, field management, pest and disease control, harvesting and storage, and quality evaluation—spanning the entire life cycle of coarse cereal crops. The lecture component emphasizes explanations of modern breeding technologies, agricultural mechanization, informatization, and green production methods, covering topics such as crop domestication pathways, precision seeding equipment, drip irrigation and fertilization systems, and soil sensor technology. Simultaneously, utilizing three typical coarse cereal crops—buckwheat, oats, and quinoa, explanations of breeding objectives, ecological adaptability, nutritional value, and processing characteristics are provided, guiding students to develop a systematic understanding from "agronomic traits" to "food functionality". For example, classroom demonstrations showcase the laboratory's achievements in detecting functional components in buckwheat (such as rutin and D-chiro-inositol), and discuss their applications in breeding and nutritional fortification, effectively enhancing students' perception of the value of scientific research.

2.2 Comprehensive practical training driven by project-based learning Modern agricultural production faces multiple challenges such as low mechanization rates, weak climate adaptability, and shortages of technical personnel. The curriculum reform adopts "problem orientation" as its pedagogical core, guiding students to engage in Project-Based Learning (PBL) centered on concrete agricultural issues, thereby honing their practical operational skills and comprehensive problem-solving abilities, while establishing a closed-loop instructional task system of "field experimentation—laboratory verification—comprehensive evaluation".

Taking the "Screening of High-Flavonoid Functional Buckwheat Varieties" project as an example, students are required to complete the following task chain:

- (i) Conduct literature reviews to analyze genetic resources and functional compound distributions in tartary buckwheat and common buckwheat;
- (ii) Cultivate different strains in experimental fields, implement zonal management, and document agronomic parameters including emergence rate, growth stages, and seed setting;
- (iii) Employ UPLC-MS/MS and near-infrared spectroscopy in laboratories to quantify indicators such as calcium, rutin, and protein content in grains;
- (iv) Generate varietal comparison reports and propose practical recommendations integrating seeding density and field management techniques.

Similarly, the oat project focuses on saline-alkali tolerance and nutritional enhancement. Students conduct fertilizer density trials under simulated saline-alkali soil conditions, and assess processing potential in laboratories using analytical equipment for structural and functional properties including germination rate, germination vigor, root parameters, and nutritional quality. Through such cross-scenario, interdisciplinary task-driven approaches, students not only develop practical operational competencies, but also enhance capabilities in research design, experimental analysis, and comprehensive presentation, achieving the transition from "labor perception" to "labor cognition", gradually cultivating robust agricultural engineering thinking and technical literacy.

2.3 Standardized skill and operational protocol training

Modern agriculture emphasizes standardization, precision, and intelligence, imposing heightened demands on practitioners' professional skills and operational protocols. The course reform prioritizes "strengthening skill standards" and "standardizing operational procedures" as pedagogical focal points, aiming to enhance students' hands-on abilities and awareness of labor norms.

In tillage and sowing instruction, students must master application scenarios of drilling, hill-drop, and broadcasting seeding methods, and conduct precision seeding trials using small-scale seeders and manual tools in fields, performing comparative analyses on key factors such as emergence rate, seedling uniformity, and weed control under varying row spacings and sowing depths. Students are also required to master technical parameters including machinery calibration settings, working depth, and seeding density, evaluated through on-site assessments, peer scoring, and skills competitions.

During field management training, the curriculum emphasizes green control principles, requiring students to master insect trap placement and botanical pesticide application techniques, and understand the dependency of processing quality on production site management conditions. In the harvest evaluation phase, students utilize laboratory drying equipment, grain cleaners, and processing machinery, to measure key post-harvest quality parameters such as moisture content and impurity rate, thereby constructing an integrated quality control chain from field to processing.

Through standardized skill training, students consistently report "learning how to perform tasks correctly and more systematically", demonstrating significant improvements in labor skills and professional competence.

2.4 Establishing a process-oriented evaluation mechanism to enhance both practical skills and cognitive abilities

Traditional agricultural labor education assessments overemphasize "task completion", neglecting the cognitive processes and reflective capacities underlying labor activities. This course constructs a comprehensive process-oriented, multi-dimensional evaluation system (Table 1), to foster continuous reflection and growth during labor engagement. Evaluation encompasses the entire workflow: "pre-

class preparation—field operation—process documentation—reflective summarization—outcome presentation", specifically inclu-

ding skill proficiency, teamwork, problem analysis, operational compliance, and work attitude.

Table 1 Composition of course assessment

Class	Attendance	Practical Operation & Skill Proficiency	Project Task Completion	Stage Outcome Presentation	Course-based ideological-political awareness	Term Paper
Reform Class	10	20	20	15	15	20
Control Class	40	—	—	—	—	60

Course assessment includes:

- (i) Labor process documentation (field operation logs, division of labor records, management plan implementation);
- (ii) Experimental and analytical results (agronomic trait and quality analysis datasheets, processing methods, statistical charts);
- (iii) Outcome presentation and summarization (presentation slides, short papers, video reports);
- (iv) Course-based ideological-political awareness and labor insights (course reflection journals).

Additionally, an "Innovation Bonus" component is incorporated, incentivizing novel management approaches, innovative field tool designs, or processing parameter improvements. This systematic and diversified evaluation approach holistically stimulates students' practical engagement and engineering mindset. Empirical results demonstrate significantly enhanced student participation and sense of responsibility, confirming the evaluation system's efficacy in shifting course objectives from "knowledge delivery" to "competency cultivation".

2.5 Deep integration of course-based ideological and political education to cultivate commitment to agriculture, rural areas and farmers Agriculture is not merely an industry; it serves as a vital pillar for national security, livelihood foundations, and cultural heritage preservation. Guided by the principle of "ideological and political education integration in curriculum", the reform fully implements the fundamental mission of fostering virtue and talent, leveraging Chengdu University's distinctive strengths in coarse cereal nutrition and processing research, to organically integrate patriotism, sense of responsibility, and agricultural affinity throughout the teaching process.

Instruction emphasizes guiding students to develop reverence and passion for agriculture through hands-on labor, and to comprehend the strategic significance of "empowering agriculture through technology" within the context of national development. In pedagogical practice, the course connects agricultural research achievements with national strategies. For instance, when teaching grain production techniques, the story of Academician Yuan Longping's "rice-under-my-feet dream" is introduced, illustrating hybrid rice's strategic role in national food security. In the oat module, China's technological breakthroughs in functional oat products are highlighted, enabling students to recognize agricultural technology's contribution to the "Healthy China" initiative. When exploring regional specialty agriculture, the case study of Liangshan tartary buckwheat's transformation "from wild grass to

poverty-alleviation crop" in Sichuan is shared, helping students appreciate modern agriculture's value in rural revitalization.

The reform further synchronizes "labor immersion" with "critical reflection", organizing rural fieldwork for students to engage with issues like left-behind children and rural hollowing, thereby igniting practical concern and social responsibility for agriculture, rural areas and farmers. Concurrently, tasks such as themed presentations on "Modern Agricultural Technology and Social Impact" are designed, encouraging students to articulate labor insights and document life-changing agricultural innovations through multimedia and written narratives, thus deepening professional identity and strengthening ideological conviction. In this process, instructors evolve from knowledge transmitters to ideological and political education facilitators, employing methods like case study analysis, field mentorship, and achievement exhibitions to guide students' transformation from knowledge acquisition to value internalization.

Outcomes demonstrate marked enhancement in students' social responsibility, collectivist spirit, and sense of professional mission, cultivating a cohort of new agricultural talents with "profound agricultural empathy, technical proficiency, and genuine commitment to farming", laying a solid foundation for developing high-caliber agriculture professionals in the new era.

3 Outcomes of teaching reform

As a core practical course for agricultural majors, its instructional quality directly impacts students' mastery of modern agricultural techniques, understanding of agricultural labor, and cultivation of scientific literacy. Addressing traditional shortcomings like "theory-practice disconnection", "inadequate labor immersion", and low student engagement, the course leverages integrated campus and community resources, anchored by the Key Laboratory of Coarse Cereals Processing, implementing reforms including practice-oriented pedagogy, project-based learning, standardized skill training, and process evaluation systems. Post-reform, students show significant improvement in operational skills, research design and data analysis capabilities, agricultural literacy, and labor accountability.

Specific manifestations include:

3.1 Enhanced theory-practice integration Building on classroom knowledge of modern breeding, mechanization, and smart farming technologies, students engage deeply in end-to-end field practices: land preparation, seeding, fertilization, pest control, harvesting, and grain quality testing. Through "dual-scenario

learning", students develop holistic understanding of agricultural workflows, with markedly enhanced comprehension and application of theoretical knowledge.

3.2 Markedly improved student engagement and motivation

Standardized operational assessments, skills competitions, and project presentations incentivize proactive participation across all stages. Instructors observe substantial increases in attendance and on-site enthusiasm, with heightened interactive discussions in classrooms and fields, fostering a positive labor atmosphere.

3.3 Effective cultivation of comprehensive competencies and innovative mindset

Through projects like buckwheat variety screening and oat saline-alkaline tolerance research, students not only acquire fundamental operational skills, but also independently conduct experimental design, data collection, and analysis, proposing evidence-based field management recommendations. Outcome exhibitions and innovation assessments cultivate problem-solving abilities and scientific literacy.

3.4 Favorable course satisfaction and academic performance

According to 2024 – 2025 evaluation data from multiple control teaching groups (Table 2), students in reform classes demonstrated higher practical skill pass rates, project completion rates, and course satisfaction than control groups, indicating the reforms effectively enhanced instructional quality and student engagement.

Table 2 Outcomes of course reform in Labor Education—Modern Agricultural Production Technology %

Teaching Group	Pass Rate	Excellence Rate	Course Satisfaction
24 - 1 (Reform Class)	92.0	52.0	100.0
24 - 2 (Control Class)	82.0	34.0	90.0
25 - 1 (Reform Class)	96.0	58.0	100.0
25 - 2 (Control Class)	86.0	32.0	88.0

4 Conclusion

This reform established an integrated pedagogical framework combining modular teaching, field practice, process evaluation, and ideological and political education integration, effectively enhancing students' technical competencies, professional identity, and social responsibility. It validates the feasibility of a competency-based approach guided by value cultivation. However, several limitations require attention: first, field practice faces seasonal and weather constraints, necessitating more stable scheduling; second, uneven task distribution and limited individual engagement occur in some project teams; third, instructional depth in

smart agriculture technologies requires further development. Future initiatives will focus on: developing virtual simulation modules to overcome spatiotemporal limitations of field instruction; establishing industry-academia partnerships to expand off-campus training bases; creating longitudinal databases to track student labor literacy development, providing data-driven support for continuous pedagogical enhancement.

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