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The Integration and Innovation of Modern Agricultural Professional Courses Based on the BTEC Teaching Model

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Abstract: ***This paper analyzes the current issues in professional education, such as the weak alignment between course content and occupational requirements, monotonous teaching methods, and insufficient cultivation of students' general competencies. It explores the integration and innovation of modern agricultural professional courses based on the BTEC teaching model. Strategies are proposed, including curriculum development, innovative implementation models, and the establishment of an assessment mechanism for coursework outcomes. Additionally, measures such as deep university-enterprise collaboration, innovative practical teaching models, and faculty capacity building are suggested to support curriculum reform in higher vocational education.***

Keywords: BTEC teaching model, Higher vocational education, Modern agriculture specialty, Teaching reform.

1. Introduction

Against the backdrop of the in-depth advancement of China's "Rural Revitalization" strategy and the continuous deepening of ecological civilization construction, the modern agricultural industry, as an important part of the green economy, is ushering in unprecedented policy dividends and development opportunities. According to statistics from the Ministry of Agriculture and Rural Affairs, the scale of China's modern agricultural industry exceeded 10 trillion yuan in 2022, with an annual growth rate maintaining above 8%. This booming industrial situation has created an increasingly urgent demand for the cultivation of high-quality agricultural technical and skilled talents [1].

With the innovative development of global vocational education, the BTEC (Business & Technology Education Council) teaching model, recognized internationally as a model of vocational education, has been widely promoted and applied worldwide due to its distinct orientation towards vocational competence and its characteristics of cultivating talents through practice. Through modular curriculum design and situational teaching, this model constructs a highly simulated vocational learning environment, bridging the gap between traditional education and industry needs [2].

Suzhou Polytechnic Institute of Agriculture is an agricultural vocational college with a century-long history (founded in 1907), which has cultivated a large number of talents for the development of regional modern agriculture. Since introducing BTEC courses in 2016, the college has achieved localized transformation and innovation of modern agricultural professional courses, achieving remarkable results in cultivating students' practical and innovative abilities and core vocational qualities. Based on the pilot experience of the college, this paper deeply explores the optimization path for the localized implementation of BTEC courses, aiming to provide a reference practical plan for cultivating compound talents in modern agriculture in the new era.

2. Current Issues in Modern Agricultural Education in China

2.1 Weak Alignment Between Curriculum Content and Occupational Requirements

In current modern agricultural professional teaching, the problem that the curriculum content is not closely connected with vocational post requirements is relatively prominent. Although the core professional courses cover many important fields such as plant production environment and crop cultivation, in actual teaching, some curriculum content fails to fully consider the latest development trends of the agricultural industry and the actual needs of enterprises [3]. For example, in the course of crop pest and disease control, the teaching content may focus more on the imparting of theoretical knowledge, while paying insufficient attention to the control methods of new pests and diseases in the current market and the pest and disease problems faced by enterprises in actual production. In addition, the curriculum setup involves less in some emerging agricultural technology fields, such as agricultural Internet of Things technology, smart agriculture, and ecological agriculture, which leads to a certain gap between the knowledge learned by students and the actual post requirements when they face the rapid development and changes of the industry after graduation.

2.2 Gap Between Practical Training and Real Production Scenarios

Classroom teaching mainly focuses on classroom lectures, lacking diversified teaching methods. This teaching method is difficult to stimulate students' learning interest and enthusiasm, and is not conducive to cultivating students' practical ability and innovative thinking. In the practical teaching link, although students carry out practical training such as crop cultivation, seedling production, and pest control on campus, there is still a certain gap between the practical training content and the actual production scenarios [4]. For example, the facilities and equipment of the training base may not fully simulate the actual production environment of enterprises, resulting in a certain adaptation period for students when they enter enterprises for internships. In addition, the utilization rate of off-campus internship bases needs to be improved. Some internship links may be formalized, students fail to go deep into the production front line of enterprises, unable to fully exercise practical ability.

2.3 Insufficient Cultivation of Students' General Abilities.

Students' general abilities include self-management, communication and cooperation with others, problem-solving and task completion, operation and application of modern scientific and technological means, design and innovation, etc. [5]. However, in actual teaching, more emphasis is often placed on the imparting of professional knowledge and skills, while the cultivation of students' general abilities is ignored. For example, in course assessment, although the BTEC teaching model mainly uses coursework and focuses on the cultivation of students' professional skills and general abilities, in actual operation, due to various reasons, the assessment of general abilities may not be comprehensive and in-depth. In addition, in teaching activities, there is a lack of courses and practical links specifically aimed at cultivating general abilities, and students have few opportunities to exercise their general abilities, which will affect their comprehensive quality and future career development.

3. Curriculum Integration and Innovation Based on the BTEC Model

3.1 Occupation-Oriented Curriculum Optimization

Drawing on BTEC's curriculum development concept that takes post needs as the starting point [6], a school-enterprise curriculum development team composed of enterprises, teachers and industry experts was established to systematically analyze the core abilities that posts should possess, and build a "trinity" modular curriculum system. Guided by industrial needs and centered on ability cultivation, as shown in Figure 1, the professional curriculum content is divided into three modules: professional basic courses, professional core courses and professional extension courses, so as to realize the organic integration of theoretical knowledge and practical skills.

Closely focusing on the core of vocational ability cultivation, improve the supporting new curriculum standards, clarify curriculum objectives and teaching contents, integrate the operation skills of new generation information technologies such as the Internet of Things and big data, and modern production tools such as drones and intelligent equipment into relevant courses, and formulate curriculum standards in line with reality.

Teachers can arrange teaching contents by themselves according to the teaching syllabus, and introduce actual cases from factories and enterprises in the teaching process, so that students can learn the knowledge and skills required by enterprises, laying a solid foundation for their future employment.

Table 1: Curriculum System of Modern Agricultural Major

Module Category	Module	Courses
Professional Courses	Professional Foundation Modules	Plant Growth Environment, Horticultural Facilities, Intelligent Greenhouse Regulation, Plant Basics
	Professional Core Modules	Crop Production Technology, Green Prevention and Control of Crop Pests and Diseases, Internet of Things Application Technology, Modern Agricultural Equipment Technology, Plant Protection UAV Technology
	Professional Extension Modules	Internet of Things Technology, Family Farm Operation and Management, E-Commerce, Agricultural Enterprise Management, Agricultural Product Quality Inspection

3.2 Innovative Teaching Models

3.2.1 Developing Online Course Digital Resources via the Xuexitong Platform

The program has built a systematic digital teaching resource system for modern agriculture on the Xuexitong platform, ensuring full coverage of online resources for all core courses. These digital resources are continuously enriched, including:

(1) A micro-lecture video library covering all key professional knowledge points;

(2) An enterprise case library spanning the entire industrial chain from intelligent equipment application to agricultural product e-commerce;

(3) A virtual experiment library featuring practical training content such as agricultural IoT system deployment and intelligent greenhouse control.

With modular design and multi-terminal accessibility, these resources form a "theory-case-practice" integrated digital teaching solution, providing robust support for blended teaching. Currently, the platform resources receive an average of 12,000 monthly visits, with a utilization rate exceeding 90%, effectively enhancing teaching outcomes and resource efficiency.

3.2.2 Implementing the Blended Teaching Mode of "Online Self-Paced Learning + Offline Practical Training"

This mode revolves around "online self-paced learning + offline practical training + diversified interactive communication" to innovate the entire teaching process:

(1) Before class: Students preview micro-lectures via the online platform, and teachers adjust their teaching plans based on student performance analytics.

(2) During class: A "four-stage progressive" task-driven approach is adopted (task assignment → scheme design → project execution → result presentation), incorporating diverse methods such as group discussions and role-playing. For instance, in the Horticultural Plant Cultivation course, students work in groups to simulate enterprise operations, deepening their vocational awareness through role-playing; in social survey practices, they collect and analyze first-hand

industry data. In Crop Cultivation, teaching is delivered in alignment with production processes, with a focus on developing students' hands-on skills.

(3) After class: Extended training is conducted via the virtual training platform, and teachers offer personalized guidance through instant messaging tools like WeChat.

3.2.3 Establishing a blended teaching model of "integration of virtual and real, unity of theory and practice"

Through the in-depth integration of information technology with education and teaching, the transformation and upgrading of the teaching model have been realized. For example, in the course of Crop Pest and Disease Control, with the help of AR (Augmented Reality) technology, three-dimensional presentation and interactive diagnosis of disease symptoms have been achieved, which significantly enhances students' cognitive experience. In the training module of intelligent greenhouse environment control, students can complete the whole process of training from environmental monitoring, parameter analysis to the formulation of control strategies in a three-dimensional virtual scene by wearing VR equipment

3.3 Establishing a Diversified Process-Oriented Evaluation System with Competence as the Core

Drawing on the BTEC teaching assessment methods [7], we have introduced a diversified evaluation model into the assessment of modern agricultural professional courses.

3.3.1 Coursework Assessment Methods

In terms of coursework assessment, a combination of experimental reports (accounting for 30%), project proposals (accounting for 40%), and practical operation assessments (accounting for 30%) is adopted, with a focus on evaluating students' practical application abilities.

3.3.2 Enterprise Certification-based Practical Skill Assessment

An enterprise mentor evaluation mechanism has been introduced into the practical operation assessment. Technical experts from cooperative enterprises assess students' skill levels in accordance with industry certification standards. In the past two years, 85% of students have passed the enterprise certification.

3.3.3 Student Self-evaluation and Peer Evaluation System

By establishing a system of student self-evaluation and peer evaluation, each student is required to submit a reflection report upon completion of a project and participate in group peer evaluation. This has effectively improved students' autonomous learning and teamwork abilities. This evaluation system has changed the traditional single evaluation model centered on examinations, making the cultivation of students' professional abilities more in line with the employment needs of modern agricultural enterprises.

3.4 Strengthening the Construction of Information Platforms and Resources to Ensure the Smooth Implementation of Teaching Reform

3.4.1 Industry-Education Integration Practice Platform for Modern Agriculture

The major has established in-depth cooperative relationships with 12 leading agricultural enterprises in Suzhou and surrounding areas, jointly building a "trinity" practice platform system for industry-education integration. Specifically, it includes: 3 productive training bases (with a total area of 2,000 square meters) built on campus, equipped with advanced equipment such as intelligent greenhouse control systems and agricultural Internet of Things platforms; off-campus, practice teaching bases co-constructed with 9 well-known enterprises (e.g., DJI Agriculture, XAG, etc.), forming a training network covering the entire industrial chain of agricultural production. Through this collaborative education model of "on-campus bases + off-campus bases", students can be provided with practical opportunities in real positions every year, covering emerging fields of modern agriculture such as intelligent equipment operation, digital agricultural management, and agricultural product e-commerce operation. This deeply integrated school-enterprise cooperation model has effectively solved the "last mile" problem in vocational education and achieved seamless connection between talent training and industrial needs.

3.4.2 Measures and Outcomes of Teaching Team Enhancement

The major has thoroughly implemented the "Dual-Qualification Teacher Quality Improvement Plan" and comprehensively enhanced the level of the teaching team through the following measures: First, strengthening international certification training. In the past three years, a total of 25 key teachers have been selected to participate in official BTEC teaching method training in the Netherlands, covering all teachers of core professional courses. Second, deepening enterprise practice training. A system for teachers' enterprise practice has been established, requiring professional teachers to go to cooperative enterprises for two months of practical training every year, with a total of 48 person-times having completed the practice training so far. Through systematic training, the teaching ability of the faculty has been significantly improved, achieving fruitful results. For the 2023 cohort, the ratio of students to full-time teachers in this major is 19:1. The proportion of dual-qualification teachers among professional teachers is 87.1%, forming a team of "dual-qualification" teachers who are proficient in both theoretical teaching and production practice. In 2025, the team was selected into the National Vocational Education Teacher Teaching Innovation Team (Modern Agricultural Technology major).

3.4.3 Construction and Outcomes of Smart Agriculture Teaching Resources

In 2022, our university was successfully approved for the Provincial-level Smart Agriculture Virtual Simulation Training Base Construction Project, which is funded by a special grant from the Provincial Department of Education. This project focuses on developing virtual simulation training systems covering cutting-edge fields such as smart agriculture and precision planting, including 23 VR/AR training modules and 15 online virtual experiment projects, effectively supporting the development of online-offline blended teaching. In May 2023, our university's "Facility Agriculture and Equipment Professional Resource Database" was successfully selected into the first batch of Jiangsu Provincial Vocational Education Professional Teaching Resource Database construction projects. Currently, 16 standardized courses have been built, with a total of 3,317 teaching materials developed, 741 courses offered, and 2,448 users served. In 2024, our university completed the construction of the virtual simulation software project for pest and disease control in agricultural parks, further enriching virtual training resources. The continuous construction and improvement of these teaching resources have provided a solid guarantee for the teaching reform of modern agricultural majors in our university and promoted the continuous improvement of talent training quality.

4. Evaluation of Reform Effectiveness

The BTEC teaching model is founded on two core educational concepts: Competence-Based Education (CBE) theory and the systematic curriculum view of work processes [8]. The CBE theory emphasizes vocational ability cultivation as the core, focusing on developing students' practical operation skills and professional qualities; the systematic curriculum view of work processes advocates organizing teaching content in accordance with actual work procedures, achieving seamless integration between the learning process and work processes. These theoretical characteristics make the BTEC model particularly suitable for cultivating technical and skilled talents in modern agriculture.

Through three years of teaching practice verification, the curriculum reform of modern agricultural majors based on the BTEC teaching model has achieved remarkable results. The new curriculum system realizes the organic integration of theoretical knowledge and practical skills through a three-level modular design of "foundation-technology-expansion", among which the annual update rate of technical module courses reaches over 30%. The task-driven teaching method has effectively improved students' post competence through the implementation of 32 real agricultural projects, with a project result conversion rate of 18.7%. The diversified evaluation mechanism has increased the proportion of process assessment to 70%, significantly promoting the all-round development of students' comprehensive vocational qualities. The implementation results show that the reformed teaching model has increased the proportion of graduates employed in relevant fields by 25 percentage points, raised the starting salary level by 18%, and achieved a 92% satisfaction rate among employers.

5. Conclusions and Prospects

The localized practice and adaptation of the BTEC teaching model in the modern agriculture major of our university have achieved certain results. In the future, further improvements can be made in the following aspects to continuously meet the demand for high-quality skilled talents in modern agriculture.

5.1 Building a School-enterprise Community with a Shared Future

It is proposed that local governments take the lead in establishing a regional alliance for industry-education integration in modern agriculture, formulate the Industry Standards for Modern Agricultural Talent Cultivation, and establish a "dual-subject" talent cultivation mechanism involving both schools and enterprises. Focus will be placed on promoting "three co-construction initiatives": co-constructing industrial colleges (to achieve full coverage in key agricultural counties and cities within 3 years), co-constructing technological innovation centers (with no fewer than 20 annual joint research projects), and co-constructing talent databases (to realize lifelong tracking of graduates' career development). By establishing a school-enterprise benefit-sharing mechanism, we will truly achieve resonance between talent cultivation and industrial needs.

5.2 Establishing a Dynamic Curriculum Adjustment Mechanism

It is suggested to develop a big data-based curriculum early warning system to monitor in real time changes in new technologies, processes, and standards in the field of smart agriculture. A curriculum development committee consisting of industry experts, enterprise technical backbones, and professional teachers will be set up to hold quarterly curriculum standard revision meetings, ensuring that teaching content keeps pace with industrial development. Emphasis will be placed on building a "loose-leaf" textbook system, with the annual update rate of core professional courses not less than 20% and the development cycle of emerging technology courses controlled within 6 months.

5.3 Improving the Training System for "Dual-qualified" Teachers

Within three years, 20 teachers will be selected to take temporary positions in leading agricultural enterprises (each for no less than 2 months), 20 enterprise technical backbones will be recruited as industrial mentors, and 20 dual-qualified teachers with an international perspective will be trained. Meanwhile, teachers' enterprise practice experience, technological research achievements, and teaching reform effectiveness will be included in the evaluation indicators for professional title promotion, comprehensively enhancing the teaching innovation ability and technical service level of the faculty.

These systematic reform measures will help higher vocational education build a more open, flexible, and efficient talent cultivation system, provide strong talent support for the transformation and upgrading of the modern agricultural industry, and ultimately realize the organic connection between the education chain, talent chain, industrial chain, and innovation chain, thereby better serving the implementation of the Rural Revitalization Strategy.

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Author Profile

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