

Reconstruct the Curriculum to Cultivate New Talents Who Know and Love Agriculture in the New Era

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Keywords: Agricultural electrification; Smart agriculture; Undergraduate teaching; Training program; Curriculum system

Abstract: The new agricultural science is not a new starting point, and the construction of new agricultural science should seize the key point of multidisciplinary cross-fertilization. Building smart agriculture, realizing the deep integration of agriculture and information technologies such as Internet of Things, and cultivating new talents who know and love agriculture in the new era have become the development trend of new agricultural and forestry talents training in China. In the face of the development needs of agricultural industrialization, large-scale and intelligence, we must change the current phenomenon of overly fine and narrow professional division and the disconnection between talent training and social needs, in order to cultivate compound agricultural talents that match the current agricultural development needs. Smart agriculture is a typical interdisciplinary field. Based on the specialty of agricultural electrification, the curriculum system is reconstructed, and the two curriculum groups of smart agriculture and smart electricity are constructed, gradually changing from strong electricity to weak electricity, and adding agricultural related courses to form the talent training program of smart agriculture. With the mission of strengthening agriculture and loving agriculture, and taking social demand as the target, we reverse the teaching system and build a professional training roadmap containing basic competencies, professional core competencies and expanded competencies, so as to truly solve the problem of disconnection between talent training and market, and provide valuable reference for the talent training of smart agriculture in China.

1. Introduction

The Outline of China's National Plan for Medium and Long-term Education Reform and Development (2010-2020) clearly proposes to comprehensively improve the quality of higher education, improve the quality of talent cultivation, innovate education and teaching methods, and explore a variety of training modes, with "innovative talent cultivation mode" becoming the top priority. In 2017, the Ministry of Education issued the "New Engineering Research and Practice Project Guide", which is not only to develop new engineering majors, but also to show the way and direction for the transformation and upgrading of traditional engineering majors. In the 2016

Document No.1 of the Central Government explicitly put forward the idea of promoting "Internet+" modern agriculture, and in 2019, the construction of new agricultural science is on the agenda. The traditional agriculture needs to be transformed into modern agriculture, which will inevitably lead to the integration of information technology such as Internet of Things into the transformation and upgrading of the whole agricultural industry chain, and smart agriculture will certainly promote agricultural informatization, and smart agriculture will also become the future development trend of modern agriculture [1]. The development of smart agriculture is inseparable from information perception, transmission and processing technology, and it can be said that the Internet of things and other advanced science and technology are the important support of smart agriculture [2]. As a traditional engineering subject, the specialty of agricultural electrification (specialty code: 082303) is renamed from the original specialty of agricultural electrification and automation, which belongs to the first-level discipline of agricultural engineering (subject code: 0823) and is a broad-caliber, multidisciplinary interdisciplinary major. At present, domestic colleges and universities offering agricultural electrification majors are mainly provincial agricultural colleges and universities, and the number is very small. As a local agricultural college, the construction of new engineering and new agricultural science is not only an opportunity but also a challenge. We must combine the characteristics of the school, the orientation of the school and the characteristics of local economic development to timely reform the agricultural electrification specialty [3].

2. Development Status of Agricultural Electrification Specialty in Hebei Agricultural University

The specialty of agricultural electrification of Hebei Agricultural University was established in 1987. In 2003, it was authorized to confer master's degree in agricultural electrification and automation, and in 2013, it was authorized to confer doctor's degree in agricultural electrification and automation. In 2019, it was approved as the first-class undergraduate specialty construction site in Hebei Province. After more than 30 years of accumulation and precipitation, the major of agricultural electrification has formed a talent training system covering undergraduate, master and doctoral degrees, and become an important training base for agricultural electrification talents in Hebei Province.

Professional orientation: insisting on the principle of moral education, focusing on Beijing-Tianjin-Hebei cooperative development strategy, docking with Xiongan New Area, facing the whole country, cultivating high-level engineering and technical talents with good scientific and cultural literacy and high sense of social responsibility, adapting to the needs of modern agriculture, strong innovation and entrepreneurship spirit and engineering practice ability, building an industry university research talent training base of innovation, R & D and application in the field of agricultural electrification and informatization, and providing talents and scientific and technological support for regional economic and social development.

The agricultural electrification specialty of our university integrates the application of electrical, automation, information, biological sensing and other science and technology. In the long-term schooling, it has gradually formed a comprehensive application of rural electrical equipment automation technology and agricultural engineering information sensing and processing technology with the characteristics of rural distribution network, agricultural informatization and agricultural equipment intelligence, focusing on rural and agricultural in the north, especially in Beijing, Tianjin and Hebei regions, which has a strong role in promoting the sustainable development of agriculture and rural economy in China (especially in the northern region).

3. Exploration on the Talent Cultivation of Agricultural Electrification from a New Perspective

According to the requirements of agricultural engineering in The National Standard for the Teaching Quality of Undergraduates in Colleges and Universities, the agricultural electrification major of our university has carried out in-depth industry research, optimized the curriculum, scientifically formulated the 2019 version talent training program, developed and implemented the roadmap of talent training, focused on subject specialized knowledge, practical skills education and innovation and entrepreneurship cultivation, and built a trinity of knowledge, ability and literacy coordinated training framework. Our university has established a training framework for the coordinated development of knowledge, ability and literacy. Recently, the university has formulated the Action Plan for First-class Undergraduate Education (2021-2025) of Hebei Agricultural University. In order to accelerate the construction of first-class undergraduate education and comprehensively improve the quality of talent cultivation, the university has launched the revision of the 2021 edition of undergraduate professional talent cultivation program.

3.1. Based on the Specialty of Agricultural Electrification, the Talent Cultivation of Smart Agriculture Has Original Advantages

With the rapid development of the Internet of Things, cloud computing and other high technologies, China's agriculture has entered the stage of smart agriculture development [2]. At present, many experts and scholars have given the definition of "smart agriculture", but there is no unified and accepted view, but there is consensus in many aspects, such as interdisciplinary, informatization, intelligence and so on. In 2020, the Ministry of Education officially included smart agriculture in the catalogue of national undergraduate majors in general higher education institutions. As a new major, Huazhong Agricultural University and Jilin Agricultural University are the first universities to set up smart agriculture major in China. The former relies on the college of plant science and technology, while the latter relies on the college of agriculture. Both of them are based on the specialty of large agriculture, by adding some artificial intelligence courses.

It has original advantages to reform the specialty of agricultural electrification and train talents in the direction of intelligent agriculture with the specialty of agricultural electrification. The specialty of agricultural electrification is a broad-caliber engineering major, and the major of agricultural electrification in our university carries out teaching in two main lines of "electrification" and "informatization". With the continuous support of national policies, while ensuring the quality of rural power supply and consumption, agricultural electrification should vigorously strengthen the cross integration of professional knowledge, especially information technology, artificial intelligence, etc. to inject power into traditional agriculture.

3.2. Knowledge Structure Demand of Smart Agriculture Professionals

Smart agriculture is more extensive in terms of the objects involved and the means of processing. The existing disciplines, whether it is related to agronomy, computer science or agricultural engineering, cannot meet the requirements. It is necessary to clarify what kind of talents are needed for the development of smart agriculture, and what are the differences and connections between its knowledge structure and the talent training system of the existing disciplines.

The fundamental way out of agriculture still depends on science and technology, and smart agriculture is an advanced stage of agricultural production. Compared with traditional agriculture, smart agriculture makes full use of the achievements of modern information technology, relying on a variety of sensor nodes deployed in agricultural production sites, and realizes intelligent

management of agricultural intelligent perception, remote diagnosis, intelligent decision-making and control, disaster warning and so on through wireless communication network. Experts can guide online, integrating Internet of Things technology, cloud computing, machine vision, wireless communication and expert systems, so that traditional agriculture truly "intelligent". Smart agriculture can not only complete accurate perception, control and decision-making, but also include agricultural e-commerce, food traceability and anti-counterfeiting, etc., so as to achieve more complete information infrastructure support and more intimate public services. Only by vigorously developing scientific and technological innovation and improving agricultural production capacity and competitiveness can we create an all-weather, all-process, all-space unmanned farm and make the cell phone a 'new farming tool' for farmers.

The high-quality development of smart agriculture requires the cultivation of high-end applied senior technical talents who can deeply understand the new objects and mechanisms of agriculture and can have a global understanding of the new situation of agriculture. However, whether it is the emerging artificial intelligence, data science and big data technology, or traditional engineering, agricultural electrification, the proportion of courses closely related to smart agriculture in the discipline teaching system is not particularly high and systematic enough.

Most of the students of Hebei Agricultural University come from rural areas and feel that they have been admitted to university to break away from the hard life of facing the soil, and their deep-rooted ideas make them unwilling to study agriculture related majors. "Lack of understanding of modern agriculture" and "lack of interdisciplinary integration of agriculture and information" are the common understanding of the lack of knowledge structure of existing talents in the development of smart agriculture so far, and it is necessary to start a new specialty or transform the existing specialty. As an important supporting specialty of agricultural engineering, agricultural electrification specialty of our university adapts to the needs of social development, and makes targeted changes to the existing teaching system, so as to adapt to the development trend of smart agriculture industry and serve agriculture, rural areas and farmers.

3.3. The Cultivation Scheme of Agricultural Electrification Specialty with Multi-Disciplinary Cross Integration

3.3.1. Develop a multi-disciplinary and cross integration talent training plan program with the concept of output orientation

The goal of talent cultivation is not only related to the management of scholars, but also involves multiple parties such as the state, employers and students. According to the social demand for agricultural electrification talents, we attract industries and employers to participate in the formulation of talent training objectives and graduation requirements, and optimize the talent training program according to the requirement of coordinated development of knowledge, ability and quality.

Adhering to the construction concept of "student-centered, output-oriented, and continuous improvement", the university will set the standard for engineering education accreditation and national standards for teaching quality, and invite industries and employers to participate in the formulation of reasonable training objectives and graduation requirements for agricultural electrification majors, and comprehensively evaluate the training quality based on this. As a traditional engineering department, agricultural electrification specialty needs to be transformed and upgraded, guided by "information + agriculture". On the one hand, it ensures the quality of rural power supply and use, on the other hand, "enters the mainstream and has characteristics", and takes the road of "smart agriculture" development. The graduates can apply professional knowledge and

technology to social practice and meet the new requirements of modern professional farmers' literacy development.

3.3.2. Reconstructing the curriculum system and building two curriculum groups of "smart electricity" and "smart agriculture"

The deepest teaching reform is the curriculum, professional transformation and upgrading must be the progress and promotion of the whole curriculum system [4]. Consolidate the major basic courses and professional basic courses, and on this basis, build two curriculum groups of "smart electricity" and "smart agriculture" along the two main lines of "electrification" and "informatization" (as shown in Figure 1). Based on the concept of OBE education, we implement teaching reform from teaching resources, teaching methods, project practice teaching and other dimensions around the core courses, reasonably increase the difficulty of the courses, expand the depth of the courses, enhance the academic challenge, create "golden courses", and effectively improve the quality of teaching.

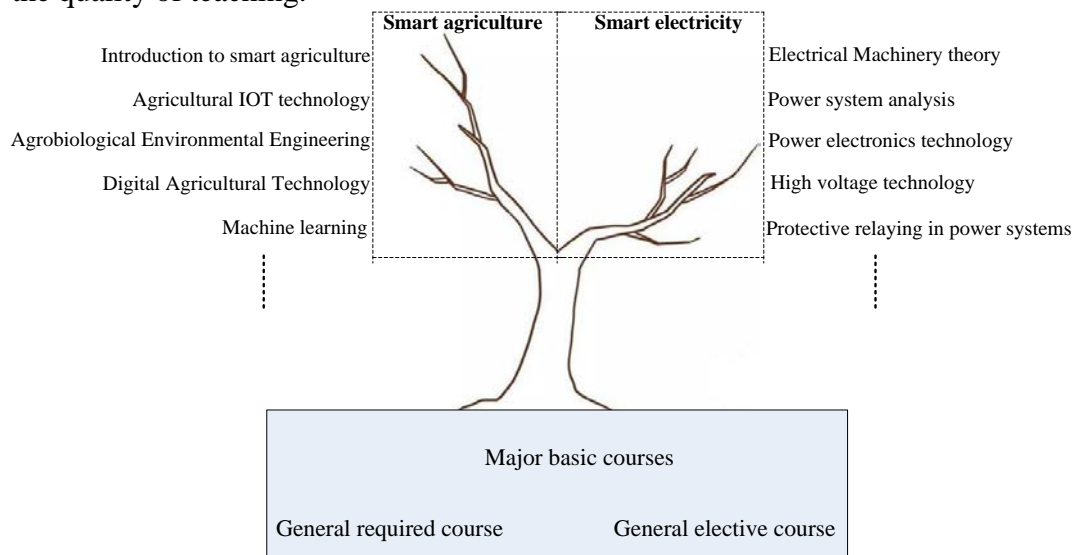


Figure 1: Two curriculum groups of the major of agricultural electrification.

3.3.3. Improve the roadmap for cultivating practical ability of agricultural electrification specialty in accordance with engineering education certification

According to the new version of the agricultural electrification professional talent training program, the roadmap of practical ability cultivation of agricultural electrification majors is improved by combining the practice teaching platform of the school and college, so as to make students comprehensively improve their basic ability, professional core ability and expansion ability, in order to more strongly support the cultivation of innovative and entrepreneurial talents. Reform and innovation in the three major aspects of knowledge objectives, ability objectives and quality objectives, combining professional cognitive education, professional skills practice with innovation and entrepreneurial thinking training and curriculum ideological and political education, establishing the concept of coordinated development of the trinity of knowledge, ability and literacy, and effectively providing double-creative talent guarantee and intellectual support for the regional economy to improve quality and efficiency and modern agricultural industry transformation and upgrading.

3.3.4. Integrating resources and constructing "five-in-one" spiral progressive practical teaching system

Taking engineering education certification as the breakthrough point, adhering to the guidance of social needs, taking engineering application as the background, taking engineering technology as the main line, and taking ability training as the core, and make every effort to cultivate students' innovation consciousness and engineering practice ability. Through the integration of experimental teaching content, construction of internship training bases, innovation and entrepreneurship education and scientific research feedback teaching, a five-in-one spiral progressive practical teaching system of "experimental teaching, project teaching, internship training, graduation design, innovation and entrepreneurship" (as shown in Figure 2) is constructed to comprehensively improve students' engineering practice and innovation ability, We should cultivate innovative and entrepreneurial talents who can meet the needs of industry development, meet the needs of modern rural agriculture, and accurately connect with the construction of beautiful countryside.

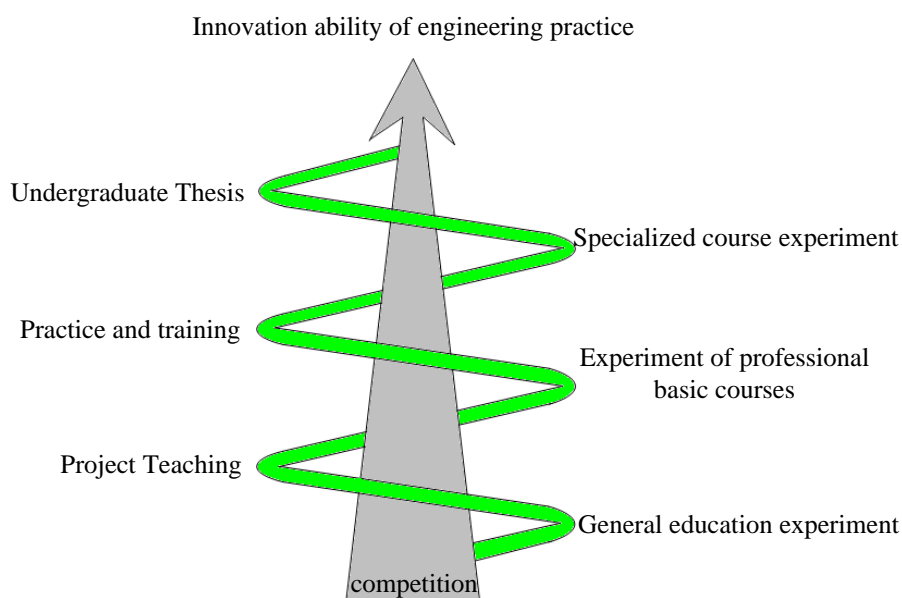


Figure 2: The five-in-one spiral progressive practical teaching system.

4. Expected reform results

4.1. A multi-disciplinary and output-oriented talent training program for agricultural electrification

In order to accelerate the construction of first-class undergraduate programs and comprehensively improve the quality of talent training, the university has launched the revision of the 2021 version of talent training program. As the first-class undergraduate program specialty construction point in Hebei Province, the agricultural electrification program must be revised and improved with the concept of output orientation, in line with the national standards of teaching quality and engineering education accreditation, revising and improving the interdisciplinary talent training program.

4.2. Build a "five-in-one" spiral progressive practice teaching system of the whole course

The practical teaching is integrated into the whole process of students' learning, highlighting the cultivation of students' innovation consciousness and engineering practice ability, and promoting the cultivation of application-oriented advanced engineering and technical talents of agricultural electrification.

4.3. Explore a set of teaching methods suitable for agricultural electrification specialty in local agricultural colleges and universities

Establish a new research-based learning model that promotes knowledge updating and ability cultivation, carry out discussion-based and participatory interactive teaching based on projects and tasks, cultivate students' critical thinking ability and the ability to identify, analyze and solve problems; carry out online and offline hybrid teaching, promote the deep integration of information technology and education teaching, guide students' active learning, change "make me study" into "I want to learn", and create "golden course".

5. Conclusion

Facing the new situation, new challenges, new requirements and new tasks of higher education, the major actively promotes comprehensive reform, adheres to the basic law of higher education and the law of talent growth, adheres to the close integration of teaching, scientific research and production, deepens and expands the "Taihang Mountain Road", takes moral education as the fundamental task, takes student development as the center, breaks through the traditional path dependence, and gives full play to the industrial advantages, deepen the integration of industry and education, improve the personnel training coordination mechanism, innovate the interdisciplinary training mode, face the new agriculture, new countryside, new farmers and new ecology, focus on the development of modern agricultural industry and rural revitalization strategy, serve for the agriculture, rural areas, rural residents and the construction of beautiful countryside, and create a large number of high-quality talents needed by modern agricultural industry, and provide talent support and intellectual support for improving the competitiveness of modern agricultural industry and gathering new momentum of development. It can be said with certainty that graduates in the direction of smart agriculture have a broad space to display their talents in the field of rural agriculture.

Acknowledgement

This work was supported by the Cooperative education project of Higher Education Department of Ministry of Education, Neusoft education technology Co., Ltd (8ad34079-a36d-4366-8048-3016fdaf5b78) and Beijing cyberrobot technology Co., Ltd (201901040039), and the research and practice project of higher education teaching reform of Hebei Education Department (2020GJJG085, 2019GJJG105).

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