

Exploring the Comprehensive Education Model of Science and Technology Academies in Animal Husbandry and Veterinary Medicine under New Agricultural Science

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Abstract: In the context of the development of new agricultural science, optimizing the training model for agricultural master's programs has become a key focus of reform in professional degree graduate education at local universities. This paper first outlines and clarifies the training objectives for high-level, interdisciplinary, application-oriented agricultural master's students. Next, it examines the organizational structure and operational mechanisms of the science and technology courtyard model, with Foshan University serving as a case study to highlight the model's implementation, the comprehensive education strategies employed, and the achieved outcomes. Finally, the paper identifies the primary challenges faced by the science and technology courtyard model and proposes corresponding countermeasures.

Keywords: New Agricultural Science; Science and Technology Courtyard; Agricultural Master's Program; Animal Husbandry and Veterinary Medicine; Training Model

1. Introduction

In 2017, relevant departments proposed the development of new engineering disciplines, and in 2022, in order to meet the needs of major national strategies, the Ministry of Education officially issued the "Guidelines for the Training of New Agricultural Science Talents," establishing 12 new undergraduate majors in fields such as food safety, ecological civilization, smart agriculture, nutrition and health, and rural development. This marked the official commencement of the new agricultural science initiative in

higher education. Rooted in the opportunities and challenges presented by the modernization of agriculture and rural areas, new agricultural science fosters the deep integration of agricultural disciplines with life sciences, information technology, engineering, new energy, new materials, and social sciences [1,2]. It aims to create innovative concepts and models for agricultural higher education, training modern agricultural leaders with a solid scientific foundation, broad vision, diverse knowledge structure, strong innovation capacity, and high comprehensive quality [3].

In terms of talent training objectives, new agricultural science places a greater emphasis on cultivating interdisciplinary talents to meet the future needs of agricultural and rural modernization in China [4-7]. Specifically, the training objectives for professional master's programs in animal husbandry and veterinary medicine are as follows.

The Master of Agriculture in Animal Husbandry is a professional degree linked to the qualification of serving in the fields of research and development, promotion and application of animal husbandry technology. It primarily aims to cultivate high-level, interdisciplinary, application-oriented professionals with comprehensive skills. These graduates will be equipped to work in enterprises, institutions, and management departments within the fields of animal husbandry technology research, application, development, promotion, operation and management, teaching and scientific research, rural development, agricultural education, and vocational and technical education.

The Master of Veterinary Medicine degree is designed to meet the needs for practicing veterinarians and official veterinarians in the

country. It targets institutions involved in animal diagnosis and treatment, animal breeding and production enterprises, veterinary drug production and marketing, as well as departments responsible for animal disease prevention and control, veterinary health supervision and law enforcement, veterinary administration, and entry-exit quarantine. This program aims to cultivate high-level applied professionals skilled in animal diagnosis and treatment, animal disease quarantine, technical supervision, administration, market development, and management.

In the context of the development of new agricultural science, the major agricultural universities are actively exploring the cultivation mode of agricultural masters. Two key models have emerged: the "Science and Technology Academy+" model and the school-enterprise cooperation and collaborative education model [8-10]. The "Science and Technology Academy +" model involves sending graduate training units to the front line of agricultural production, where they focus on research and addressing practical challenges in agricultural and rural production. This model aims to cultivate high-level, application-oriented talents who are passionate about agriculture and dedicated to its advancement. It facilitates the close integration of teaching and education, fieldwork and classroom learning, theory and practice, scientific research and promotion, as well as innovation and service [2,3]. This approach has stimulated agricultural universities nationwide to deepen the reform of graduate training models. The school-enterprise cooperation and collaborative education model focuses on enhancing the comprehensive innovation and practical abilities of agricultural professionals [6]. Through various approaches, such as school-enterprise cooperation, collaborative education, exchange student programs, multidisciplinary talent integration, diversified practice models, and the establishment of a "dual tutor system," this model prioritizes students' active participation and emphasizes the applicability and practicality of education [6,7]. It is designed to meet the talent needs of China's agricultural development.

2. Training Model for Agricultural Masters at the Pig Science and Technology Academy

In 2021, it is the beginning of the "Science and Technology Academy" training model for accelerating the development of agricultural and rural science and technology talents. By August 2023, the number of Science and Technology Academy nationwide had reached 1,048. The "Science and Technology Academy" model involves universities leveraging their scientific and technological capabilities and educational resources in partnership with agricultural enterprises [4-7]. Graduate tutors are appointed to guide agricultural professional degree students, who are placed in agricultural enterprises and production settings for extended periods. While completing theoretical coursework, students focus on solving practical problems in agricultural and animal husbandry production. This model aims to cultivate high-level, application-oriented agricultural talents who are knowledgeable about, passionate about, and committed to advancing agriculture. The ultimate goal is to achieve a win-win outcome, promoting both scientific and technological progress in enterprises and the effective training of university talent.

2.1 Foshan University-Guangxi Yangxiang Pig Technology Yard Overview

Relying on Foshan University's philosophy of "building a first-class domestic, high-level applied university with distinct regional characteristics," and guided by the principles of "moral education as the foundation" and "strengthening agriculture as one's responsibility," the university aims to cultivate applied talents with excellent character, strong learning abilities, and innovative consciousness. Adhering to the concept of "moral education, student-centered approach, goal-oriented, and continuous improvement," the Pig Science and Technology Academy draws on the experience of China Agricultural University, based on Foshan University, Guangxi Yangxiang Group Co., Ltd. and Guangdong Yangxiang Science and Technology Co., Ltd. of the United Nations in the field of pig science and technology enterprises in Guangxi, Guangxi Guigang base as the main body of the construction of the five years, the "Pig

Science and Technology Academy" was established. With animal husbandry and veterinary students immersed in industry and rural areas, and supported by enterprises and production bases, the courtyard focuses on areas such as intelligent equipment engineering, smart farms, breeding pig quality performance evaluation, breeding pig selection, production, health and nutritional feed management, disease prevention and control, veterinary public health, laboratory testing and diagnosis, and germplasm resource protection. The model follows the development law of professional master's degree education and innovatively integrates training with production, forming a collaborative platform for schools, students, enterprises, and breeders. This platform not only cultivates talent but also promotes scientific research and serves the breeding industry. The model fosters integration across cities, counties, schools, enterprises, and agriculture, positioning the "Pig Science and Technology Academy" as a cradle for cultivating high-level, application-oriented, interdisciplinary, and innovative talents, while advancing graduate education and practice in pig breeding.

2.2 Organizational Structure and Operations

Foshan University adopts a full-time learning model for its agricultural master's program, with a typical study period of 3 years, extendable to a maximum of 4 years. The program consists of three main components: coursework, practical training, and degree thesis research. A dual tutor system is implemented, according to different cultivation directions, external supervisors should generally be selected and recruited for professional degree students, and the cultivation mode of joint supervision by both internal and external supervisors should be implemented, with the internal supervisors being the main cultivation mode. Off-campus tutors primarily guide students in real-world applications and industry-related tasks. The daily management of graduate students during their time at the university follows the same procedures as for full-time academic master's students.

The school's training program encourages active student participation in the Science and

Technology Academy. In the first year, students complete professional foundational courses on campus, solidifying their knowledge, fostering scientific research interests, and establishing a theoretical basis for practical research at the Science and Technology Academy. In the second semester, students, through a two-way selection process, choose to join relevant science and technology academies or other enterprises under the school-enterprise cooperation and collaborative education model. During the second and third years, students engage in practical learning at the Science and Technology Academy, where they visit corresponding farms and farmers. They address real-world issues based on their observations and consult with both on-campus and off-campus tutors to guide their practical learning and thesis work. This process enhances students' ability to identify, research, and solve problems, fostering their comprehensive development.

2.3 Tutor Selection and Student Management in the Science and Technology Academy

To improve and refine the selection mechanism for professional master tutors, a group of technical experts with strong moral character, extensive experience, and solid research capabilities will be selected from practice bases to serve as tutors for the Pig Science and Technology Academy. The selection of off-campus tutors will follow the university's established standards for such appointments. The list of selected off-campus tutors will be submitted to the university's graduate management department for review and approval. Upon successful review, appointment letters will be issued, and a training subsidy for off-campus tutors will be provided at a rate of 200 yuan per student per month. Each off-campus tutor will receive a total subsidy of 2,000 yuan per student, for 10 months per year.

To improve the off-campus tutor assessment system, students will be required to communicate regularly with both off-campus and on-campus tutors—at least once a week—to identify and address any issues in their graduate practice or thesis work. Additionally, the collaboration between on-campus and off-campus tutors will be

strengthened to ensure joint formulation of graduate training programs, creating a "dual-teacher" team that leverages complementary strengths, mutual support, and clear role division. Both sets of tutors will meet at least once a month to discuss graduate training, scientific research, and other related matters, working together to enhance the quality of graduate education. Furthermore, a professional master's practice guidance group will be established to manage, supervise, and assess students' professional practice. This group will ensure that students' "out-of-the-classroom, production-focused" activities are conducted smoothly and efficiently.

2.4 Streamline the Management of Practical Teaching

Starting with internship management, practical teaching outcomes, and mastery of knowledge and skills, we will standardize and refine management criteria, establish clear practical teaching assessment standards, and set specific internship goals for graduate students. Corresponding rules and regulations will be formulated to ensure consistency. Monthly summary reports will be used to assess the knowledge and practical skills students acquire during their internships. Tutors and relevant personnel from the Swine Science and Technology Academy will collaborate to evaluate students based on a set percentage standard.

During the postgraduate training process, both off-campus tutors from the Science and Technology College and on-campus tutors will jointly participate in key meetings for postgraduate students. These meetings include, but are not limited to, the opening report (first semester of the second year), mid-term review (second semester of the second year), practical assessment (first semester of the third year), and pre-defense and final defense (second semester of the third year).

Among them, the professional master's practice assessment working group, consisting of both on-campus and off-campus tutors, evaluates graduate students' professional practice at the end of the first semester of their third year. The postgraduates will report on issues encountered during the training process, provide a practice summary, discuss thesis progress, and present training outcomes. The

assessment results are categorized as excellent, qualified, or unqualified.

3. Enhance Talent Training in Pig Science and Technology Courtyards through Comprehensive, Systematic Education

3.1 The Effective Transformation of Scientific Research and Practice Resources into Curriculum Training, the Building of 'Two Bridges' and the Implementation of 'Two Genders in One Degree' Have Empowered and Increased the Effectiveness of Deepening the Connotation Construction of the New Agricultural Science

Leveraging the resources of the Pig Science and Technology Courtyard and laboratory, we integrate educational, scientific research, and clinical practice resources to establish "two bridges." First, we align course content with scientific research resources to stimulate students' research thinking, laying the foundation for cultivating high-level innovative talents. Second, we connect course knowledge with clinical practice to develop applied talents who are committed to grassroots work and passionate about agriculture, rural areas, and farmers. This approach enables us to achieve the goal of "standing tall and standing firm" in high-level training.

3.2 Feedback and Reform of Teaching in the Pig Technology Courtyard

In the training of agricultural masters, the teaching of theoretical courses is student-centered, primarily utilizing TBL (Team-Based Learning) and CBL (Case-Based Learning) methods. These are supplemented by lectures, illustrations, animation videos, mind maps, and literature sharing. The use of multiple teaching methods ensures that students not only master professional knowledge and improve their technical skills but also develop key soft skills. During their practice at the Science and Technology Academy, veterinary master's students study antibody production, epidemiological investigations, and pathogen isolation and identification. Each student works on a specific topic, contributing to the creation of typical teaching cases.

3.3 Pig Science and Technology Academy Facilitates Student Participation in Academic Competitions

After participating in the Swine Science and Technology Academy, students' sense of achievement in learning has significantly improved. Over the past five years, students from the Academy have achieved the following accolades: One first prize in the National "Challenge Cup" College Students' Extracurricular Works Competition; three first prizes, five second prizes, and three group awards in the National Life Science Competition; three first prizes in the "Challenge Cup" Provincial College Students' Extracurricular Works; two Guangdong Province Silver Awards in the Internet + College Students' Innovation and Entrepreneurship Competition; five students have led laboratory open innovation fund projects, and three students have been project leaders in additional open innovation fund initiatives.

3.4 The 'Pig Science and Technology Academy' Serves Agriculture, Rural Areas, and Farmers, Fostering a Passion for Rural Development

The practice process of the Pig Science and Technology Academy emphasizes value guidance. Guided by the principle of "cultivating applied talents with strong moral character, academic excellence, and innovative consciousness," it seamlessly integrates the delivery of professional knowledge with high values. This approach fosters students' development of a correct outlook on life and values, strengthens national self-confidence, and deeply cultivates a sense of family and country. By implementing the value orientation of "establishing morality and educating people," it achieves the effect of quietly nurturing character and ideals.

The "Science and Technology Academy" integrates ideological and political education throughout the entire process, subtly fostering a deep connection to agriculture, rural areas, and farmers. Through daily, in-depth interactions with farmers and related technical personnel, students' emotional ties are strengthened, their sense of mission and responsibility is deepened, and their passion for agriculture, rural development, and

serving farmers is enhanced.

In 2018, the outbreak of African swine fever, an acute, severe, and highly contagious disease, swept across the country. During this crisis, students practicing at the grassroots level gained a profound understanding of the industry's challenges. They worked alongside company employees and farmers to establish an "iron bucket protection" strategy to combat the epidemic. Their collective efforts helped minimize the loss of live pigs and contributed to maintaining the stability of the production and supply system for live pigs in the industry and the country. Through daily interactions with farmers and technical personnel, these students not only deepened their emotional connection to the industry but also strengthened their sense of mission and responsibility, deepening their love for agriculture and their dedication to rural areas and farmers.

During the COVID-19 pandemic after 2020, many graduate students voluntarily stayed at the farms to ensure the continuity of their research. On one hand, they complied with epidemic prevention requirements, and on the other hand, the farms were relatively isolated from the outside world, with stricter hygiene and epidemic prevention measures, which provided better self-protection and bio-security. Long-term interaction with farm employees, living and eating together, also strengthened their love for agriculture and heightened their awareness of serving agriculture and rural areas.

4. Effectiveness of the "Pig Science and Technology Academy" Operations

4.1 The Pig Science and Technology Academy Has been Deeply Rooted in the Grassroots of the Industry for over 7 Years Since Its Establishment, Fully Implementing the Policy of "Writing Papers on the Land."

It has collaborated with more than 100 professionals in animal husbandry and veterinary teaching practices, with over 30 undergraduate theses completed within the academy. In total, 26 graduate students and 56 undergraduates have been trained, and graduate students have participated in more than 10 corporate research projects. The base places great emphasis on scientific research

cooperation, having signed 8 horizontal research projects with the school. Additionally, the animal husbandry and veterinary master's students trained at the base have published 22 papers, including 5 SCI-indexed papers, and filed 17 patents, including 12 invention patents and 5 utility model patents.

4.2 Graduates of the "Pig Science and Technology Academy"

There are 26 postgraduate students who have completed their practice and graduation at the Science and Technology Academy. Among them, three have continued their doctoral studies in China, three students are employed at domestic universities, and one student has been admitted to a public institution. Below is the feedback from students across various units:

During his postgraduate studies, Yu received a second-class academic scholarship every year, published 3 papers, including 2 in core journals, and participated in several utility model patents, with two granted. After graduation, he joined Chongqing Three Gorges Vocational College, where he focused on teaching and research related to pig production and led a provincial scientific research project. To enhance his professional skills and meet the "dual-qualified" teacher standards, he participated in practical training at farms and agricultural administrative departments annually. During his internship at the Chongqing Animal Husbandry Extension Center, he received a letter of appreciation from the center. In addition to his teaching duties, Yu contributed to the compilation of national key planning books and farmers' training materials, including the "Batch Management of Sows," and participated in the development of local standards (Chongqing's Mountain Luhua Chicken Breeding Technical Specifications) and international occupational standards (Tanzania Animal Breeding Technician Level 5, Sri Lanka Animal Production Technician Level 6). Relying on the school's "double high construction," he has been actively involved in poverty alleviation and rural revitalization efforts in the Chongqing Three Gorges Reservoir area. Since starting his career, he has received multiple accolades, including the "Excellent Organizer" award at the 10th School-level

Skills Competition, "Advanced Individual in Promotion" from the Animal Husbandry and Veterinary Society of Wanzhou District, Chongqing, and "Excellent Annual Assessment" for public institution staff in both 2022 and 2023. He has also been recognized as an "Excellent Teacher" for two consecutive years (2022-2024).

Mr. Kuang is currently employed by Guangzhou Yuexiu Group Co., Ltd. During his time at university, he won both first and second-class national scholarships for postgraduate students. He published three papers as the first author and co-author in national core journals, such as China Animal Husbandry Magazine. His work was recognized with a third prize for outstanding papers by the Livestock Ecology Branch of the Chinese Society of Animal Husbandry and Veterinary Medicine. He also led the completion of the undergraduate innovation project titled "Genome-wide Association Analysis to Identify Genetic Variations Associated with Boar Residual Feed Intake" and successfully applied for five national invention patents, four of which have been granted. During his internship, he practiced at a national core breeding farm, where he was awarded the Outstanding Graduate Practice Award in April 2020.

Gao won the "Qiushi Science and Technology Innovation Award" for his social practice, as well as the National Encouragement Scholarship and First-Class Academic Scholarship during his studies. He published several research papers in both domestic and international journals and was recognized as an outstanding graduate student. His graduation thesis was honored as an outstanding thesis at the university level.

5. Challenges and Solutions for the "Pig Science and Technology Academy"

Based on the goal of cultivating high-level agricultural master's talents, the professional master training model of the Science and Technology Academy aligns with the new knowledge system, discipline organization, and talent development requirements for building new agricultural science. However, during the development process, it is essential for schools, enterprises, and the academy to collaborate and continuously improve the mechanisms for scientific research funding,

incentives, and promotion. This includes providing financial support, encouraging student achievements, rewarding scientific research, and establishing mechanisms for advancing both external and internal tutors. Adjustments should be made according to local conditions and timelines, ensuring that the "Science and Technology Academy" model better supports the development of animal husbandry and veterinary medicine. This approach will strengthen the integration of theory and practice, facilitating the cultivation of high-level, application-oriented, compound talents and contributing to the advancement of new agricultural science.

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