

# Teaching Reform of Veterinary Microbiology Based on the Hybrid Teaching of Ideology and Politics

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**Abstract:** The veterinary microbiology teaching team thoroughly implements the national education policy, and iteratively promotes the implementation of the teaching reform of Sanquan education. The teaching team is focused on a “student-centered” approach to education, emphasizing the foundation of “cultivating people and nurturing the root and soul of the nation.” By integrating “knowledge exploration, skill training, and value shaping” into the talent training plan, they are reshaping curriculum objectives and emphasizing ideological education in the syllabus. The teaching content system is being reconstructed, combining multiple interactions of blended teaching with the “six-in-one” ideological education model, to achieve the educational goals of the new agricultural “in-class-extracurricular” approach. This effort provides an empirical basis for the ideological and political teaching reform of the veterinary microbiology curriculum.

**Keywords:** Veterinary microbiology; Ideological and political teaching; Educational reform

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## 1. Introduction

The Party’s 20th report emphasizes that the digitalization of education should be promoted, and digital teaching will lead the new direction of higher education in the future. Especially in the post-epidemic period, under the background of the new era, the efficient integration of digitalization, informatization, and course teaching can break the limit of time and space, realize resource sharing, enhance students’ creativity, and bring new experiences. Hybrid teaching has gradually become a normal mode of teaching, promoting the interactive integration of online and offline teaching<sup>[1]</sup>. The rapid development of information technology, especially in the post-epidemic era, has accelerated the change of teaching and learning from content and form to design. Hybrid teaching has become the forefront of change, which is widely regarded as the new normal of teaching<sup>[2]</sup>. The deep integration of technology and education has brought new educational concepts, modes, and teaching methods, accelerated the reform of educational concepts, learning methods, and teaching means, changed the teaching scene, and promoted the close combination of ideological and political construction of curriculum and hybrid teaching reform<sup>[3]</sup>. In 2020, the report issued by the Ministry of Education further points out that the

ideological and political resources of various courses are fully explored, giving full play to the educational role of each course and pointing out the direction for the real promotion of ideological and political construction in teaching<sup>[4]</sup>. The elements of ideological and political education, including the theoretical knowledge, values, and spiritual pursuit of ideological and political education, are integrated into each course, which has a subtle influence on students' ideology and behavior<sup>[5]</sup>. Curriculum ideological and political education is the inevitable requirement to construct the collaborative education pattern of ideological and political education in the new era. Curriculum ideological and political education has become the consensus of education in colleges and universities, but how to improve the teaching quality of curriculum ideological and political education is still an important problem faced by higher education managers<sup>[6]</sup>. At present, the hybrid ideological and political teaching in colleges and universities is faced with difficulties such as insufficient teaching competence of professional teachers, lack of interaction between students and the learning environment, imperfect evaluation systems, and insufficient overall integration<sup>[7]</sup>.

The veterinary microbiology course encompasses animal medicine and related subjects, focusing on microorganisms that cause diseases in livestock, poultry, and zoonotic diseases. This course explores the relationship between these pathogenic microorganisms and their hosts, serving as a crucial link within the curriculum. It covers a broad range of topics, spans various disciplines, and is characterized by its strong practical applications. Veterinary microbiology is a demonstration course and a first-class course in Guangdong Province. The teaching design of the teaching team should make learners realize that the curriculum is not only the main position of learning professional knowledge but also the carrier of ideological and political education. The ideological and political education runs through the talent training system. Teachers are the main force, the main battlefield of curriculum construction, the main channel of classroom teaching, and the second classroom is the main teaching method.

## **2. Veterinary microbiology course**

### **2.1. Course overview**

Veterinary microbiology is a basic course offered for sophomore undergraduates majoring in animal medicine, which mainly studies the basic characteristics of microbial biology and experimental diagnostic techniques as well as microorganisms that cause diseases in livestock, poultry, and zoonotic diseases. It is the main bridge connecting basic veterinary courses and veterinary clinical courses. The purpose is to guide students to establish the internal relationship between pathogenic microorganisms and animal diseases, and to guide the diagnosis, treatment, and prevention of pathogenic diseases. Since its establishment in 1998, the veterinary microbiology course has been an important core course of animal medicine specialty (National Specialty, National First-Class Undergraduate Major Construction Point, Key Major of Guangdong Province) and the ideological and political demonstration team of Guangdong Province. At the same time, the course is also the first batch of online open construction courses, the first batch of course ideological and political key courses, and the school's high-quality resource-sharing course. It has been awarded the Excellent Case of "Science and Technology Fighting Epidemic" by the School Construction Planning and Development Center of the Ministry of Education, and the second prize of Excellent Case of Online Teaching in Guangdong Province. The secondary college where the course is located is the provincial benchmark school of entrepreneurship and innovation and the demonstration college of Sanquan education system reform.

### **2.2. Course objectives**

The veterinary microbiology course aligns with the school's talent training orientation of being "grassroots-

oriented and service-focused” and the professional training goals of animal medicine. It adheres to a guiding philosophy that emphasizes both knowledge acquisition and skill development, with a core focus on fostering well-rounded individuals. The course places importance on students’ knowledge orientation and skill training, while also prioritizing the cultivation of emotions, attitudes, and values. Based on this, the following course objectives have been formulated.

- (1) Knowledge objectives: To repeat the basic knowledge of microorganisms that cause human and animal diseases; identify the characteristics of different microorganisms, select appropriate procedures for isolation, culture, and identification of pathogenic bacteria; strengthen the connection between core knowledge and the frontier of science and technology; expand the interdisciplinary knowledge around bacteria, fungi, and viruses and promote ecological civilization, prevention and control, standardized breeding, and aseptic operation.
- (2) Skill objectives: To identify the pathogenic characteristics of different microorganisms and clarify the pathogenicity and the mechanism of action; design the separation and identification procedures of different microorganisms and put forward prevention and control strategies; conduct hybrid teaching to strengthen students’ independent learning, deep learning, teamwork, and critical thinking; conduct the second classroom to cultivate students’ innovative spirit of exploration and practical skills in solving complex problems.
- (3) Emotional objectives: The course aims to guide students in embracing and practicing the concept that “clear waters and green mountains are as valuable as gold and silver mountains,” while fostering a deep connection to agriculture, rural areas, and farmers. It seeks to cultivate students’ personal development through teamwork, peer learning, and skill practice. The emphasis on practice-based teaching integrates learning, reflection, and hands-on experience to enhance students’ ability to discern right from wrong.
- (4) Value-shaping objectives: To cultivate students’ scientific ethics based on disciplines and industries; enhance students’ sense of mission and responsibility to serve agricultural and rural modernization and the all-round revitalization of the countryside; cultivate cultural confidence and national pride as well as the feelings of family and country.

### **3. Reform measures of ideological and political teaching in veterinary microbiology course**

#### **3.1. Curriculum ideological and political teaching team construction**

Veterinary microbiology is a basic course in the undergraduate teaching of agronomy colleges. The discipline has developed rapidly and is widely integrated with animal immunology, clinical diagnostics, and animal pathology, and intersects with medical microbiology in certain parts of the course. How to be both professional and political in the teaching practice of veterinary microbiology has become the primary problem for front-line teachers. Teachers have the responsibility of teaching and educating people and implementing teaching content, serving as the key to talent training. They need to uphold a rigorous scientific attitude while carrying out professional education, but also to realize moral education<sup>[8]</sup>. The person in charge of the course is the party branch secretary of the “double-qualified” teachers. The teacher organizes collective lesson preparation with the guidance of the party building, formulates a teaching implementation plan dominated by ideological and political courses, and builds a learning platform to assist the teaching<sup>[9]</sup>. The lecturers should improve the awareness of the ideological and political teaching of the curriculum, and explore the ideological and political elements contained in the veterinary microbiology course according to the theoretical research and frontier progress in ideological and political education such as the characteristics of the times, current affairs, and hot

spots. Teachers should also actively participate in online and offline courses to ensure high teaching quality and effective ideological integration into the course; with digital tools and technical means, practical ideological teaching is carried out in small class teaching, enhancing the creativity and inspiration of the teaching process, fully activating the ideological elements in the course practice, and realizing accurate and effective integration.

### **3.2. Ideological and political concepts and objectives of the course**

The student-centered education is the foundation of the education concept, integrating knowledge exploration, skill training, and value shaping into the talent training program. In line with the requirements for the construction of ideological education, the approach integrates six key educational elements—patriotism, political identity, ecological civilization, scientific thinking, innovative spirit, and professional quality—into the classroom, curriculum, and extracurricular activities. This “six-point” ideological education model creates a cohesive framework that links classroom instruction, practical education, and college-wide initiatives, thereby achieving a comprehensive educational experience for students in the new agricultural disciplines.

### **3.3. Ideological and political design ideas of the course**

Focusing on the core teaching elements of scientific thinking in animal disease diagnosis and the integration of multiple disciplines, the approach shifts from individual pathogen identification and prevention to a broader perspective, guiding value-based education and achieving quality goals. The integration of scientific thinking in pathogen diagnosis with ideological and political education is implemented through a viewpoint-chain-case approach, enhancing students’ ability to diagnose diseases and forming clear skill goals. By combining hybrid teaching methods with clinical cases, the practical application of advanced knowledge and skills is emphasized, reshaping the teaching process across four dimensions to enhance students’ research output and critical thinking, thus achieving knowledge goals. The integration of problem-based learning (PBL) with virtual simulation experiments further strengthens the logical structure of professional inquiry knowledge, driving innovation and the reconstruction of teaching content.

### **3.4. Ideological and political implementation process in the course**

#### **3.4.1. Four-dimensional reconstruction of teaching content and creation of an ideological and political “micro-environment”**

The teaching content is organized around the diagnosis and prevention of common animal diseases, structured into four key modules following a “total-score-total-score” format. These modules integrate clinical diagnosis and control programs derived from real cases encountered by teachers, along with first-hand clinical data from the animal hospital’s practice and teaching base. These practical cases are systematically connected to the comprehensive theoretical knowledge, with clinical diagnosis tasks designed to align with the chapters of the syllabus. Chapter content is stratified to include sections like general theory, where students engage in online massive open online course (MOOC)-based independent learning, and specific diagnosis of animal diseases. The teaching closely follows the syllabus and academic frontiers and incorporates ideological and political elements. This collaborative approach between teachers and students fosters the creation of a “micro-environment” rich in ideological and political materials, which subtly permeates the learning experience.

#### **3.4.2. Systematic integration of ideological and political elements to create a curriculum education environment**

The ideological and political aspects of the course are methodically organized to create a comprehensive and systematic educational environment <sup>[10]</sup>. By clarifying the logical relationships between the various ideological

and political elements within the course, the teaching team aims to form a complete and cohesive learning experience. Utilizing PBL, BOPPPS, and hybrid teaching methods supported by tools like virtual simulations, Superstar, and Rain Classroom, they have developed a small private online course (SPOC) hybrid teaching model. The course's ideological and political content is distilled into three core principles: "protecting agriculture with history," "supporting agriculture through virtue," and "defending industry by virtue." These principles are woven into 16 chapters and 45 ideological and political cases, divided into four main sections. The cases present three ideological and political themes: cultivating an understanding of microorganisms, developing scientific thinking through various disease diagnosis and control scenarios, and fostering love and dedication with examples of exemplary characters. The overarching aim is to instill a deep appreciation for agriculture and a commitment to understanding and advancing it, both through the diagnosis and prevention of animal diseases. This approach creates a multidimensional educational environment that extends "in-class, after-class, online, and offline," offering students a comprehensive "new world" of learning.

### **3.4.3. The "six-in-one" ideological and political education environment**

This approach aims to construct a cohesive practice community for the professional course "ideological and political education," ensuring seamless integration and alignment across various educational elements<sup>[11]</sup>. Beyond the foundational principle of "ideological and political education, classroom first," this model brings together the college, major, teachers, theory, practice, and the second classroom to form a "six-in-one" ideological and political education mode centered on "knowledge-guidance, learning-integration, understanding, and action." Through school-enterprise cooperation, the "school-enterprise education" model is realized by fostering an ideological and political education community. This includes engaging corporate executives as head teachers and incorporating their expertise into school teaching. The "practical education" aspect is brought to life through class-themed youth league day activities, professional skills competitions, rural revitalization efforts, poverty alleviation initiatives, and volunteer activities such as stray animal rescue. These efforts collectively aim to provide a comprehensive, real-world educational experience that aligns with the ideological and political goals of the curriculum.

## **3.5. Hybrid teaching based on ideology and politics**

The veterinary microbiology course mainly adopts a combination of online and offline learning methods, and the ideological, political, and professional knowledge learning are divided into online and offline learning activities.

### **3.5.1. Online learning activities**

Leveraging the Superstar platform within the classroom, combined with unit tests, reflective thinking, case discussion groups, and team learning tasks, facilitates a robust educational experience. By utilizing a variety of technical tools such as learning apps, discussion forums, mind mapping, collaborative documents, Rain Classroom, and WeChat, both teachers and students can engage in iterative group discussions and foster deep interactions. These resources support a dynamic learning environment that enhances collaboration and enriches the educational process.

### **3.5.2. Offline learning activities**

Offline learning activities encompass various face-to-face classroom teaching and learning interactions. These include teacher-led questions, student responses, group collaboration and presentations, and assignments and reports completed outside of class. Utilizing visual thinking tools, post-it notes, posters, and other materials,

these activities support autonomous learning, group discussions, and reflective practices. They foster dynamic interactions and deep engagement between teachers and students through methods such as group sharing, reporting, and reflection.

There are four modes of hybrid ideological and political teaching for the veterinary microbiology course: (1) Ideological and political courses: Students integrate ideological and political education through online learning and classroom case studies. They participate in group discussions, share their experiences, or write reflective essays based on these discussions. (2) PBL combined with ideological and political courses: This mode involves online learning and group analysis of clinical cases. It includes anonymous voting after group presentations to recognize the best speaker, team, and presentation materials. Both teachers and students engage in experience sharing and feedback. (3) Practical teaching integrated with ideological and political courses: Students first study key points of disease diagnosis online, then visit the animal hospital at the teaching practice base. There, they focus on clinical cases and a pathological picture library, engage in discussions, and reflect on their experiences after class. (4) Hybrid ideological and political teaching: Teachers address core difficulties and facilitate pre-class discussions on topics. In-class activities include group reports, student questions, and reflections, with the Rain Classroom software supporting pre-class testing.

### **3.6. Course assessment**

Evaluating learning outcomes is a crucial aspect of teaching, as it reflects the quality of learning and the challenges of formative assessment <sup>[12]</sup>. The key evaluation metrics for hybrid teaching methods should be scientifically determined based on course objectives and the integration of ideological and political education. These metrics should assess moral education goals and teaching designs that emphasize ideological and moral character, professional and technical skills, and scientific literacy <sup>[7]</sup>. In the veterinary microbiology course, assessment combines both process and final evaluations, with the final score divided into 40% for process evaluation and 60% for final evaluation. The final evaluation focuses on professional knowledge and skills, while also incorporating ideological and political elements, such as practical skills, teamwork, and professional quality. Information technology platforms monitor students' learning progress, allowing teachers to provide timely feedback. In final evaluations, group reports, PowerPoint presentations, teamwork, and individual contributions are assessed, reflecting the integration of ideological and political elements in the examination process.

## **4. Ideological and political highlights of the veterinary microbiology course**

### **4.1. “Knowledge-guidance-learning-integration-enlightenment-action” six-links innovation: The “six-in-one” ideological and political education model**

The latest research findings and ideological elements are integrated into classroom teaching, utilizing independently developed online open courses from Guangdong, Hong Kong, and Macao. This ensures that the teaching content remains cutting-edge and relevant. The innovative “six-in-one” ideological and political education model decomposes ideological goals into actionable teaching cases, emphasizing the importance of ideological guidance beyond the classroom. This approach facilitates a multi-dimensional and comprehensive education experience, bridging schools and enterprises.

### **4.2. Building the “point-line-surface” vertical ideological and political case and the “systematization” of ideological and political education**

Teachers and students collaborate to establish a serene micro-environment for ideological and political



materials, thereby crafting a conducive setting for curriculum education. This process involves thoroughly integrating ideological and political components into the educational experience to form a comprehensive ideological and political education environment. By addressing the “point” of specific ideological and political elements, organizing the “line” of ideological and political content, and developing the “surface” of the ideological and political education model, an all-encompassing “point-line-surface” ideological and political education system is achieved.

## **5. Teaching reform results**

The hybrid teaching and curriculum ideological and political reform of veterinary microbiology courses have achieved remarkable results, and the quality of talent training and curriculum construction has been further strengthened.

### **5.1. Improved quality of talent training**

The overall quality of students has seen significant improvements, with enhanced awareness of agriculture, rural areas, and farmers, alongside notable advancements in innovation and entrepreneurship abilities. Over the past three years, 3% of graduates have embarked on their own business ventures and led nearly 300 national, provincial, and university-level innovation and entrepreneurship training programs. The clinical practice skills of high-quality applied talents have improved, and employer satisfaction with graduates’ comprehensive quality and professional capabilities stands at 98.31%. The quality of talent training has received widespread recognition from both society and students. Many students have won provincial awards for their contributions to southern Guangdong’s red stories, paintings, and film and television works. Additionally, outstanding achievements in military service have been recognized as exemplary cases of employment and entrepreneurship, and numerous students have been commended for their participation in local epidemic prevention and control nucleic acid testing. These accomplishments underscore the clear effectiveness of the course education.

### **5.2. Significant social effect of practical education**

During the summer vacation, teachers and students engaged in various activities: they developed strategies for the Maoming apiculture industry chain, conducted a market survey of pork, explored scientific methods for fish control, carried out rescue missions for stray animals, and promoted Chinese martial arts culture. Participation in extracurricular activities and epidemic prevention and control volunteering increased significantly, highlighting the tangible impact of practical education.

### **5.3. Enhanced students’ innovation and competitiveness**

The students have won the first prize and second prize in the National Small Animal Physician Skills Competition many times; the first prize in the National College Students Animal Medicine Professional Skills Competition; the silver and bronze prizes in China International Internet College Students Innovation and Entrepreneurship Competition; prizes in both the national and Guangdong Province.

### **5.4. Achievements in curriculum construction**

The course was awarded as the Guangdong Provincial Curriculum Ideological and Political Demonstration Course (provincial first-class course) and the first Curriculum Ideological and Political Excellent Case of Guangdong Province. The ideological and political education mode of the course is also shared in the university and the educational technology academic conference of universities in the province. The establishment of a

university-enterprise ideological and political practical education base creates a brand of practical education and has been reported to have a remarkable effect by the media.

## 6. Conclusion

The veterinary microbiology course is grounded in the Sanquan education concept, establishing a robust educational framework. Teaching reform and innovation have led to notable achievements in resource accumulation, teaching methods, and reform reflection. Guided by the ideological and political framework and supported by multi-departmental collaboration, the course integrates ideological and political elements through enhanced teacher awareness, content reconstruction, and curriculum integration. This has led to the development of a “full-staff, all-round” Sanquan education curriculum system. The teaching reform process follows a cycle: initial implementation, mid-stage modification, and final summary and reflection, providing a valuable reference for ideological and political teaching reforms in related disciplines across China.

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- (5) Demonstration Project of Ideological and Political Reform of Guangdong Education Department (Guangdong Higher Education Letter [2021] No. 21)
- (6) Guangdong Provincial Department of Education, Provincial First-Class Undergraduate Courses (Guangdong Higher Education Letter [2023] No. 33)

## Disclosure statement

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