

Exploration of Ideological and Political Education in Veterinary Microbiology Experimental Technology

Jiedan Liao*

School of Animal Science and Technology, Foshan University, Foshan 528225, Guangdong Province, China

*Corresponding authors: Jiedan Liao, liaojiedan@163.com

Copyright: © 2024 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: The veterinary microbiology experimental course plays a key role in education and practice, integrating “knowledge, skills, and qualities” into the talent cultivation program. The syllabus has been revised to emphasize the course’s ideological and political education objectives. The extraction of ideological and political elements focuses on developing a curriculum that includes ideological and political teaching materials and cases, ensuring coherence across classroom teaching, social practice, and online courses. By organically integrating ideological and political elements within stories, along with professional knowledge, operational skills, and social practice, the course aims to enhance the appeal and effectiveness of ideological and political education in the experimental course.

Keywords: Veterinary Microbiology Experimental Technology; Ideological and political education; Exploration

Online publication: September 26, 2024

1. Introduction

In May 2020, the Ministry of Education issued the Guiding Outline for Ideological and Political Construction of Curriculum in Institutions of Higher Learning, which pointed out that the ideological and political construction of curriculum should be promoted according to the characteristics of majors, and put forward ideological and political requirements for ideological and political construction of agronomy courses. “Curriculum ideological and political education” is the expansion and deepening of “ideological and political curriculum,” the direct channel of ideological and political education in colleges and universities, and an important measure to construct the ideological and political education system in colleges and universities ^[1]. College teachers should fully implement the core concept of “cultivating people by virtue” in the course teaching, integrate value shaping, skill training, and knowledge teaching ^[2], give full play to the educational role of each course, and comprehensively improve the quality of talent training ^[3]. As an experimental course, the microbiology experimental course is set to enable students to master the main techniques and methods of microbiology experiments, help students verify theoretical knowledge with experiments, and transform theoretical knowledge

into practical skills ^[4]. Microbial scholars in different research fields in China have explored the ideological and political elements and implementation paths in microbiology experiments from different perspectives. For example, Zhang *et al.* reformed the teaching content, explored the ideological and political integration points of the microbiology experimental course, introduced typical cases, and carried out multi-directional ideological and political education ^[1]. Deng *et al.* integrated ideological and political education into the classroom teaching of “microbiology experiment” by conducting mixed online and offline teaching, introducing history, combining theory with practice, broadening horizons, and classroom discussion ^[5]. Guo *et al.* pointed out that there are ideological and political problems in the experimental course of food microbiology, analyzed and designed the ideological and political integration scheme of the food microbiology experimental course, explored the ideological and political education methods from the aspects of teaching content and methods, and realized the organic integration of the course content and ideological and political elements ^[6]. Zhou *et al.* explored the effective integration of medical microbiology experimental course teaching and ideological and political education ^[7]. Jia *et al.* carried out the exploration and practice of ideological and political education of the marine microbiology experimental course from aspects such as curriculum construction, teaching concepts, teaching objectives, teaching methods, assessment and evaluation system, teaching reflection, and so on ^[8].

The microbiology experimental course undertakes the tasks of cultivating students to establish the concept of laboratory biosafety and standardizing the use of microorganisms and safe development of microbial resources; it also plays an important fundamental role in shaping students’ legal personality and thinking of biosafety ^[9]. In recent years, frequent global biosafety events, such as new H1N1 swine flu, Ebola, and COVID-19, have warned of the principle and process of microbial events and their impact on human society. A series of reforms in ideological and political courses of microbiology have been carried out in universities and some results have been achieved. The integration of biosecurity perspectives into microbiology experimental courses aims to reframe ideological and political elements within the context of current times. By finding new entry points, ideological and political elements are seamlessly incorporated into each experimental project, allowing students to genuinely experience biosecurity values during their experiments. This approach not only fosters a sense of ownership and scientific enthusiasm among students but also lays a solid foundation for nurturing talent essential to national biosecurity ^[9]. The entire microbiology experimental course is centered on microorganisms within a laboratory setting, where both teaching and learning involve significant human interaction ^[10]. This includes addressing biosecurity issues that are closely related to human concerns, both in terms of the knowledge system and practical skills, as well as the job requirements that students will face in their future careers.

Veterinary Microbiology Experimental Technology is a core compulsory course for the Animal Medicine program, focusing on training students in fundamental microbiological operations and skills. The course is designed with clinical relevance in mind, offering modules on bacterial and viral pathogens. Students learn to make accurate and efficient diagnoses of microbial pathogens by applying various separation, purification, and diagnostic methods suited to different microorganisms. This approach not only enhances students’ ability to analyze and solve problems but also fosters interdisciplinary knowledge and scientific thinking. Through laboratory exercises and hands-on practice, students deepen their understanding of theoretical knowledge and acquire essential skills for microbiological diagnosis. They are trained to accurately record, process, and analyze experimental data, cultivating a scientific attitude of honesty, seriousness, and meticulousness. This foundation is crucial for future careers in veterinary medicine. Given the highly technical nature of the course, the ideological and political elements may not be immediately apparent, with many ideological and political resources embedded within the professional knowledge ^[10]. The challenge lies in subtly integrating ideological

and political education into the course without deviating from its primary focus, making it an important research topic for the course.

2. Ideological and political objectives and ideas of the Veterinary Microbiology Experimental Technology

The effective implementation of curriculum-based ideological and political education requires a strong ideological and political teaching team that regularly engages in educational research activities. This team should focus on exploring ideological and political case studies, gathering relevant materials, and discussing appropriate teaching methods and techniques^[1]. In alignment with the university's talent cultivation goals and the specific objectives of the Animal Medicine program, the team emphasizes the integration of ideological guidance, knowledge transmission, and skill development. At the core of this approach is the principle of fostering moral integrity and character development. The curriculum places significant emphasis on guiding students' knowledge, enhancing their skills, and nurturing their emotions, attitudes, and values. To achieve these aims, the course design incorporates "knowledge, skills, and character formation" into the talent cultivation plan. The teaching syllabus has been revised to highlight the ideological and political objectives, leading to the establishment of the following course teaching goals.

2.1. Ideological and political objectives of the course

- (1) Knowledge objectives: To review the morphology and biochemical characteristics of common microorganisms such as bacteria and fungi, briefly describe methods for bacterial isolation and virus detection, design procedures for bacterial and viral microbiological testing, and explain the conventional methods for virus inoculation.
- (2) Skill objective: To develop an awareness of aseptic techniques, use an optical microscope to observe bacterial morphology, review the biochemical characteristics of bacteria and fungi as well as methods to differentiate similar microorganisms, apply virus detection methods to identify suspected pathogens, and use virus inoculation techniques to inoculate common viruses in chicken embryos.
- (3) Emotional objective: To establish and practice the concepts of "Green Waters and Lush Mountains" and a "Great Nation's Commitment to Agriculture"; train in teamwork, peer learning, and skill application; develop the ability to integrate learning with practice, unify knowledge with action, enhance the ability to distinguish right from wrong, and improve professional ethics.
- (4) Value-shaping objective: Grounded in the discipline and industry, to cultivate students' scientific ethics, and inspire their sense of patriotism and mission; instill a sense of duty and responsibility to serve the modernization of agriculture and rural areas, and to support the comprehensive revitalization of the countryside; foster cultural confidence and national pride, and deeply embed a strong sense of patriotism.

2.2. Ideological and political construction ideas of the course

Veterinary Microbiology Experimental Technology mainly teaches and trains the following modules: (1) Microscopic observation of bacterial morphology and structure; (2) Preparation of bacterial smears and gram staining; (3) Bacterial isolation, inoculation techniques, and culture methods; (4) Growth performance of bacteria in culture medium and biochemical tests of bacteria; (5) Identification of *Staphylococcus* and *Streptococcus*, *Escherichia coli* and *Salmonella*, *Actinobacillus pleuropneumoniae* and *Haemophilus parasuis*; (6) Microbiological examination and diagnosis procedures of bacterial diseases; (7) Inoculation and culture

of viral chicken embryos, etc. The mining of ideological and political elements in the curriculum focuses on the development of ideological and political teaching material systems and the development of ideological and political case databases. The in-depth development of ideological and political teaching materials focuses on the development of ideological and political elements in the teaching materials, including audio and visual materials, such as promotional videos of animal medicine majors, professional education lectures, school history hall, school-enterprise practice base and auxiliary reading materials and extension data development. The development of an ideological and political case library involves storytelling to extract meaningful content: narrate stories about the history of microbiology to highlight the civilization of the Chinese nation; tell the stories of microbiologists from modern history; share stories about the pioneers in agricultural science or veterinary medicine at the institution; discuss the responsibilities of veterinary roles through theoretical content; use negative events to illustrate the bottom lines of teaching, research, and clinical work; convey humane stories about animal welfare; share personal life stories of the educators; and explain professional standards and practices related to animal husbandry and waste disposal through experimental operation norms.

3. Ideological and political elements in Veterinary Microbiology Experimental Technology

The team of educators carefully organized the teaching content, focusing on the integration of classroom teaching, social practice, and online courses. In veterinary microbiology experimental techniques, they organically incorporate ideological and political elements from stories with professional knowledge and operational skills, enhancing the relevance and effectiveness of ideological and political education in the experimental course.

3.1. Cultivating a sense of “love for agriculture, knowledge of agriculture, and service to agriculture”

In the experimental course of microbiology at agricultural colleges, foundational microbiology knowledge is central, with an increased emphasis on relevant real-life cases that connect theory to practice. The teaching team integrates the latest research developments into the course content, especially cases and studies on the application of microbiological theories and techniques in modern agriculture. For example, students are engaged in meaningful learning experiences through labor education at industry-academia-research teaching practice bases. During practical activities, teachers incorporate ideological and political education, encouraging students to promote microbiological knowledge, such as the rational use of antibiotics, and to participate in public science activities related to microbiology. For instance, in discussing *Mycobacterium tuberculosis*, which ties into World Tuberculosis Day, students are encouraged to actively participate in public welfare efforts to combat tuberculosis, fostering innovative agricultural talents with a strong commitment to agriculture.

3.2. Telling the stories of scientists to enhance national pride and patriotic spirit

We need to integrate stories about Chinese scientists and scientific research into experimental teaching, highlighting high-level research achievements from the past and present in China. This approach helps students appreciate the patriotic, innovative, pragmatic, dedicated, collaborative, and educational spirit of scientists. By using examples of older generations of scientists who demonstrated national pride and a willingness to contribute, such as Pasteur, Koch, and Marshall’s “self-experimentation” with *Helicobacter pylori*, as well as Chinese microbiologists like Feifan Tang, Fanglan Dai, and Qingsheng Fan, students are guided and inspired to embrace their spirit of perseverance, exploration, and rigorous scholarship. The story of Youyou Tu’s discovery

of artemisinin, which earned her a Nobel Prize, motivates students to feel a sense of mission in developing innovative drugs. By studying the research experiences and significant contributions of outstanding Chinese scientists in their field, students gain an understanding of the scientific spirit of Chinese scientists, enhancing their cultural confidence and sense of identity.

3.3. Respecting scientific research ethics and integrating professional ethics and morals

Teachers integrate professional ethics and moral education into their teaching, guiding students towards correct values to enhance their moral quality and emotional intelligence. For example, in the context of biochemical weapons, which contradict the themes of world peace and development and violate international law and bioethics, students are warned that science and technology are a “double-edged sword.” Our responsibility is to harness the positive aspects of technology to benefit humanity. Many aspects of veterinary microbiology are closely related to human health. For instance, zoonotic pathogens and normal flora play crucial roles for both humans and animals, but excessive use of antibiotics can lead to metabolic disorders and secondary infections. By analyzing zoonotic diseases like COVID-19 with students, including virus characteristics, controlling sources of infection, cutting off transmission routes, and protecting susceptible animals, students are guided to apply their knowledge to critically analyze problems, connect theory with practice, and use professional knowledge and a correct worldview to focus on personal and public health.

3.4. Strengthening ecological civilization

The microbiology experimental course plays a crucial role in cultivating students’ understanding of laboratory biosafety, proper use of microorganisms, and the safe development of microbial resources. It is foundational in shaping students’ legal awareness and thinking regarding biosafety. Biosafety refers to the strategic and comprehensive measures to prevent and control the real or potential hazards posed by biological factors—both anthropogenic and non-anthropogenic—to society, the economy, public health, and the ecological environment ^[12]. For instance, incidents like the Lanzhou Institute of Veterinary Medicine’s use of expired disinfectants and sterilization failures, or the brucellosis infections at a university in Northeast China, serve as reminders for students to adhere to operational procedures, professional ethics, and responsibility. Therefore, integrating biosafety elements into the microbiology curriculum is both professional and timely, aligning with the needs of modern professional course education. Given that biosafety encompasses the prevention and control of human and animal diseases, as well as handling laboratory biological hazards, it is directly related to microbiology. Thus, integrating the concept of “Green Water and Green Mountains are Gold Mountains and Silver Mountains” into microbiology education enhances students’ awareness of environmental protection and preservation ^[13].

3.5. Leading by example and spreading microbiology knowledge through scientific communication

Teachers focus on the multidimensional integration of ideological and political education through “in-class experiments and out-of-class practice.” They use university students’ summer “three rural activities” to bring microbiology knowledge from the classroom into the community, creating promotional materials to educate the public about pathogen characteristics and transmission routes, contributing to a harmonious society. The teaching team actively participates in activities like agricultural technology advancement and community service, such as serving as experts in agricultural and rural technology development strategies or rural technology commissioners in Guangdong Province. They encourage students to engage in nationwide volunteer activities during the summer, including cultural, technological, and health-related social practices, as well as party-building and social welfare services.

4. Conclusion

The teaching team should not only enhance the ideological and political elements within Veterinary Microbiology Experimental Technology but also integrate common and unique aspects across different professional experimental courses to advance ideological and political reform. They should use various professional and experimental courses in the animal medicine field as platforms for implementing ideological and political reform, distilling aspects like “professional ethics, learning ethics, core values, cultural genes, and legal awareness” embedded in the Animal Medicine curriculum. Emphasizing the guidance of socialist core values, they aim to create a “subtle” ideological and political learning environment. Professional course teachers need to cultivate an ideological and political environment and atmosphere, stimulate students’ interest, and employ methods such as heuristic, inquiry-based, and discussion-oriented teaching to effectively carry out ideological and political education. This approach ensures that ideological and political teaching is impactful. Integrating ideological and political elements deeply into the curriculum, like adding “salt” to the educational “soup,” is a fundamental requirement and responsibility for all courses, achieving the effect of making the content more meaningful and engaging.

Funding

- (1) Guangdong Provincial Department of Education, Provincial First-Class Undergraduate Courses (Guangdong Higher Education Letter [2023] No. 33)
- (2) Foshan University Curriculum Ideological and Political Teaching Reform and Practice Demonstration Project in 2023
- (3) Foshan Philosophy and Social Science Planning Project in 2024 (2024-GJ037)
- (4) Education Research and Reform Project of the Online Open Course Alliance in the Guangdong-Hong Kong-Macao Greater Bay Area in 2023 (WGKM2023158)
- (5) Demonstration Project of Ideological and Political Reform of Guangdong Education Department (Guangdong Higher Education Letter [2021] No. 21)
- (6) Innovation Project of Guangdong Graduate Education (2022JGXM129, 2022JGXM128, 2023ANLK-080)
- (7) Research Topic of the Online Open Curriculum Steering Committee of Guangdong Province in 2022 (2022ZXKC462)

Disclosure statement

The author declares no conflict of interest.

References

- [1] Zhang J, Liu C, Wang W, et al., 2020, The Course of “Microbiology Experiment” Introduces the Exploration of Ideological and Political Education. *Microbiology Notification*, 47(04): 1186–1190.
- [2] Wei K, Lu F, Chen L, et al., 2022, Practice and Thinking on Ideological and Political Reform in Medical Microbiology Curriculum. *Microbiology Notification*, 49(04): 1426–1433.
- [3] Zhang S, Liu Y, Li Y, et al., 2024, Research on the Ideological and Political Teaching Mode and Evaluation System Reconstruction of Microbiology Curriculum. *Chemical Design Communications*, 50(4): 70–73.

- [4] Liu X, Li Y, Lv H, et al., 2018, Exploration of the Teaching Reform of “Microbiology Experiment” Oriented by Active Learning. *Microbiology Notification*, 45(10): 2280–2284.
- [5] Deng Y, Lou Q, Zhang X, 2020, Integrate Ideological and Political Education into the Teaching Exploration of “Microbiology Experiment” Course. *Guangdong Chemical Industry*, 47(22): 196–197.
- [6] Guo L, Yin X, Zhang Y, et al., 2024, Exploration of the Integration of Ideological and Political Elements in the Food Microbiology Experiment Course. *Chinese food Industry*, 2024(02): 146–148.
- [7] Zhou T, Peng Y, Wang Y, et al., 2024, Ideological and Political Exploration of the Dynamic-Oriented Medical Microbiology Experiment Course. *Campus*, 2024(1): 122–125.
- [8] Jia K, Li J, Mi S, et al., 2022, Ideological Exploration and Practice. *Microbiology Notification*, 49(01): 383–391.
- [9] Zhou D, 2023, Design and Practice of Microbiology in the Context of Biosecurity. *Anhui Agricultural Science*, 51(6): 275–279.
- [10] Liu Y, Hu J, Zhang S, 2020, Exploration of Ideological and Political Teaching in Natural Science Curriculum—Take Microbiology as an Example. *Microbiology Notification*, 47(4): 1168–1177.
- [11] Liao J, Huang L, Liu H, et al., 2020, Exploration of Ideological and Political Teaching in “Lide” Course of Veterinary Microbiology. *Education and Teaching Forum*, 2020(40): 44–45.
- [12] Wang X, 2020, Biosecurity Era: New Biotechnology Change and National Security Governance. *International Security Studies*, 2020(4): 109–135.
- [13] Liang F, Guo F, Zhan F, et al., 2023, Course Ideological and Political Integration into Food Microbiology and Experimental Technology—Take “Non-Cellular Microbes” as an Example. *Catering World*, 2023(14): 127–129.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.