

Reform and Research on the Combination of Production and Education in Plant Protection under the Background of Transformation and Development

Qiaoyun Weng[†], Yinghui Liu[†], Huijing Guo, Junhai Yuan, Jincheng Yuan, Jiang Guo*

College of Agriculture and Forestry Science and Technology, Hebei North University, Zhangjiakou 075000, China

[†]These authors contributed equally to this work

*Corresponding author: Jiang Guo, nkxgj@163.com

Copyright: © 2022 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: Plant Protection is an agricultural discipline with strong theoretical and practical significance. In order to adapt to the development direction of the society during the transition period and the need for professional talents, the researchers have discussed the teaching mode of the plant protection major from various perspectives of the teaching practice. Through the integration of teaching content and knowledge the overall structure of the course is being made clearer and reasonable; The use of different teaching methods has stimulated the initiative of students and achieved remarkable teaching results; The creativity and practical ability of students have been significantly improved; And the examination and evaluation system has been improved, thereby students' performance can be truly reflected. Through the reform and research of plant protection industry-academia and practical teaching, a feasible way is proposed for the combination of industry-academia and the cultivation of practical talents.

Keywords: Transformation development; Plant protection; Practical teaching

Online publication: October 27, 2022

1. Introduction

Plant Conservation is a scientific method that comprehensively uses a variety of disciplines to protect the ecosystem of wild animals and plants in an economical and scientific way to ensure the sustainable development of agriculture^[1]. In order to serve the local economy better, and to adapt to the development of disciplines such as plant cultivation and identification of pests and diseases, it is essential to break through the traditional teaching mode, while integrate existing teaching content, improve teaching methods, strengthen practical training and practice, and reform examination methods. These can cultivate students with high comprehensive quality, strong practicality, and high professional basic knowledge and skill level.

2. Problems in the practical teaching of plant protection

2.1. Practical teaching is relatively simple

At present, the mode of plant conservation experiment and practical course in local undergraduate colleges in author's country is relatively simple, which violates the purpose of cultivating application and practicality, resulting in large workload of teachers' experiments and practice, difficult practice, strong

practicality, and poor practicality ^[2-5]. The problem restricts the cultivation of technical talents in local higher vocational colleges. Plant protection experiments, including verification experiments, comprehensive experiments, and self-designed experiments ^[6]. Due to the geographical location, the experimental teaching is relatively simple, even the conducted experiments are just some simple verification experiments, and there are only few independent experiments. Therefore, the experimental teaching mode in local universities, mainly includes teachers teaching, demonstration, students practical simulation based on the teaching procedures, and completion of the experimental report. In the practice of plant protection, there are also similar problems, where before the internship starts, the students were given the internship manual, and the teacher explains the practical operation and precautions of plant protection to the students, and gives the students a simple practice operate. Additionally, students are divided into classes, and teachers guide the students to conduct experiments in the fields, collect, and identify samples of harmful animals, and submit practice reports, while the teachers provide the training results to the interns. These types of practice mode caused most of the students to have low awareness of knowledge and technology. Doing practical work and going to the field is just a transition, and the practice activity is like an outing, collecting, and identifying specimens of dangerous animals, and letting teachers to do the experiments.

2.2. The teaching content of practical training is backward and lacks pertinence

At present, the practical teaching content of plant protection majors in colleges and universities is backward, lacking in pertinence, and could no longer meet the needs of modern scientific and technological application-oriented skilled talents ^[7]. The Plant Protection Experiment manual edited by Ding Aiyun was published in 2004 ^[6], although this manual has played a great role in practical teaching, but with the continuous development of new plant protection concepts, new technologies, and new plant protection equipment, the original course of plant protection can no longer meet the requirements of modernization. Secondly, the original experiments and practices of plant protection are mainly to confirm the knowledge and principles of protection. A large part of this practice involved a little research and internships, which leads to a disconnect between the practical teaching and local industrial structure. The main goal of local universities is to serve local professional and technical talents, and the content of practical teaching should conform the local economic conditions and have a local regional characteristics and features in order to stimulate students' interest and to serve the local education cause well ^[8]. Therefore, in the practical teaching of plant protection, there are some outdated and lack of pertinence problems.

3. Exploration and practice of a new model of plant protection practice teaching based on the combination of production and education under the background of transformation and development

3.1. Integrate and optimize teaching content

Plant protection includes two parts: pathology and insects, and is divided into general and monographs ^[9]. The general parts are taught based on certain principles: (1) The basic theory is sufficient, and the necessary knowledge points are retained; (2) The case-focused explanations are integrated together, thereby students may become impressed; And (3) Combined with the frontier knowledge of the subject, thereby students can broaden their horizons. The disease part of general content is mainly symptoms-pathogen-occurrence law; the pest part is mainly on insect biological characteristics, insect classification, and environmental influence on the insect. The intersection part of insect pests is mainly about diagnosis, treatment, and prevention of plant diseases, and involved investigation and statistical methods, diagnosis and treatment, and prevention mechanism and scheme. The unified form of the content of the monograph is the main section where plant insect pests are introduced according to their characteristics, and the main plant damage classification is introduced according to the characteristics of the infested plants. Finally, through the above

methods, the content of the plant protection subject is reasonably selected, and the relevant content is integrated, thereby the students can think clearly, reduced the unnecessary complexity, and greatly improve the teaching effect [10-13].

3.2. In terms of teaching methods and means, students are the main body

In university classrooms, teachers should not only have the final say, but also should be student-centered with the teacher's leads the interaction, and stimulate students' enthusiasm for learning to achieve the purpose of activating the classroom atmosphere and improving the quality of teaching. Therefore, in the teaching of the general part, the way of introducing a background of a story can be adopted, and the content of the course can be explained using diagrams to improve students understanding on the topics, in turn in order to enable students to concentrate and stimulate students' interest, Heuristic, comparative and case-based methods can be adopted, and the key knowledge into each chapter can be integrated, repeatedly emphasize, and draw inferences from one case to another to strengthen the impression and highlight the key points. In addition, teachers can also ask questions in classroom, or take it as part of the exam, to let the key knowledge of each class to be memorized thoroughly, laying a solid foundation for future study. The study method of the monograph mainly adopts the method of group discussion. By understanding the basic knowledge of the monograph, students can make power points slides (PPT) to explain plant diseases and pests. For example, make a group of 5 people, and each person has to discuss their own disease types. The group discussion method should be fully prepared for a week, followed by the teacher's role like reviewing the materials, making courseware, explaining, etc., and taking it as a usual test score. The discussion should contain information on disease location and symptoms, pathogenic bacteria species, taxonomic status, main morphological and biological characteristics of pathogenic bacteria, and the pathogenicity rules should clarify the state location, infection mode, transmission mode, onset conditions, and onset time of pathogens, including the effective control methods, which are simple and practical. Under the teacher's explanation, the teacher and the students can ask and answer the questions together, and then make a summary. Firstly, through reading, sorting, and making PPT, the ability to write and summarize among students can be improved, the ability to express and explain can be enhanced, and the confidence level in students can be increased. In the arrangement of courses, it is necessary to ensure that every class is taught once, the teaching materials are complete, the efficiency and effectiveness of teaching are very good, and the purpose of teaching is achieved. At the end of each class, the main pests and diseases should be classified according to the types of occurrences and methods such as primary and secondary analysis, and field lectures are used to provide scientific control measures for production. According to the syllabus of Plant Protection, multimedia courseware with rich content and images is produced, and videos related to the course should be collected at the same time, in order to break the traditional teaching method and to make the classroom atmosphere more vivid. Due to the strong practicality of the course, during the teaching process, the trainees can be shown the physical specimens of plant diseases and insect pests in a real form. In addition, with the help of new media technology, such as Xuexitong and other modern information technology, a new communication channel can be established with students to solve problems encountered by students in learning in a timely manner.

3.3. Improve the evaluation system

A scientific and standardized evaluation system is an important way to cultivate students' attention to learning [14]. With the deepening of the reform of colleges and universities, plant protection, as an independent discipline, should have its own evaluation method. The academic performance of the experimental course includes: 10% attendance, 20% experimental performance, 30% experimental operation, and 40% experimental report. In the process of the experiment, the teacher should guide the

students, observe, and judge their performance and operation, focus on their grades, and record their grades. It is necessary to pick one or two experimental items to test and record the results. The test report should be authentic and credible, further the test results should be analyzed to prevent plagiarism. It improves students' practical ability, and strengthens the training of students' practical ability and comprehensive quality.

3.4. Break the traditional teaching experiment and training mode

In order to meet the needs of local economic production, it is necessary to cultivate students' understanding of plant protection, master the basic control techniques of plant protection, and use the learned techniques to solve problems encountered in actual production. To reform the traditional experimental teaching method, it is important to monitor and prevent major diseases in different regions according to the local economic development. Experimental teaching is an important link for students to digest and understand in real ^[15]. In classroom teaching, teacher's explanation plays a great role in students' teaching ^[16]. The content, reasons, and methods of the experimental course should be briefly explained. The operation method and details should be demonstrated, while the safety and precautions should not be ignored. The experimental teaching in the past was restricted by seasonal factors, and often failed to achieve the desired effect ^[17]. The new teaching method is based on the actual situation in the field, and the experimental time is fixed in the time period when pests and diseases are most likely to occur. Some experimental practice time can be used, and with flexible control, it is possible to observe and master the symptoms and occurrence rules of natural pests and diseases in the actual field ^[18]. It is essential to strengthen the construction of laboratories and other bases, introduce instruments and equipment such as ultra-clean workbenches and light incubators, and invest in new botanical gardens to ensure the smooth development of richly designed and comprehensive experiments, which will help students to understand better, and master the Plant protection expertise ^[19]. A large number of plants were planted in the botanical garden, which provided new materials for practice with supplemented and updated test samples. Teachers' scientific literacy is also the basic condition for cultivating high-quality students' practical skills and in developing creative and entrepreneurial projects ^[20]. In recent years, the scientific research project of the Jilin Academy of Agricultural Sciences has been greatly improved in quantity and quality, which also reflects the reform effect on plant protection experimental teaching.

4. Conclusion

After years of practice and the practical of the course group, although some results have been achieved, but there are still many problems to be improved. It is necessary to strengthen the update of training teaching materials. At present, plant protection in the author's country only has a set of simple experimental guidelines, which are lacking in comprehensive and experiments due to the constraints of regions, seasons and other factors, where some experimental arrangements could not be conducted. Under the new teaching mode, scientific, and practical experimental teaching materials should be compiled according to the new teaching objectives, so that students can understand better and master the content of the experiment. It is necessary to strengthen the construction of specimen resource libraries in experimental teaching. At present, the existing pest and disease specimens in plant protection rooms have been preserved for a long time, the numbers of preserved specimens are smaller and darker in color, the number of permanent glass specimens is very small and most of them are not suitable for pest testing. Additionally, there are molds, which make the characteristics of the test not obvious and there are no typical features, which may prevent students from observing and identifying the morphology and characteristics of the pathogens. Therefore, the quantity and quality of preserved samples should be further improved. It is essential to strengthen the construction of the Plant Protection MOOC, expand the online teaching resources, establish a student-centered sharing

platform, realize independent learning, and improve the quality of personnel training. The talent training mode of “school-enterprise cooperation” is discussed, and the teaching method of “combination of work and learning” is used as a breakthrough. Through the professional positions provided by the enterprise, comprehensive production practice is conducted, thereby it can adapt better to the new working environment and lay a good foundation for future career development.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Liu T, Zhang R, Tan L, 2019, Research on the Problems and Countermeasures Facing the Transformation and Development of Local Colleges and Universities. *Science and Technology Entrepreneurship Monthly*, 28(9): 84–86.
- [2] Lu B, Liang C, Luo X, 2018, Problems and Countermeasures of Practical Teaching of Plant Protection Specialty in Agricultural Colleges and Universities in China. *Higher Agricultural Education*, 2018(1): 66–68.
- [3] Ministry of Education, National Development and Reform Commission, Ministry of Finance. *Guiding Opinions on Guiding Some Local Ordinary Undergraduate Universities to Transform to Application-oriented*, Jiao Fa, 2015.
- [4] Wu P, 2019, Strategic Thinking on Building First-Class Universities in Underdeveloped Areas. *Journal of Northwest A&F University (Social Science Edition)*, 19(1): 1–6.
- [5] Ye G, 2017, *Plant Protection*, Zhejiang University Press, Hangzhou.
- [6] Ding A, 2017, *Plant Protection Experiment*, Higher Education Press, Beijing.
- [7] Shen D, He C, Yuan S, et al., 2019, Teaching Reform and Practice of “General Plant Protection Experiment” in Local Undergraduate Colleges. *Anhui Agricultural Science Bulletin*, 22(4): 143–144.
- [8] Qi H, 2017, Exploration and Practice of Improving the Teaching Quality of Garden Plant Protection. *Journal of Hebei Vocational and Technical Teachers College*, 15(1): 49–51.
- [9] Ji C, Ling B, Pan R, et al., 2017, *Plant Protection, Teaching Optimization, and Practice*. *Journal of Hebei Agricultural University (Agriculture and Forestry Education Edition)*, 19(1): 84–87.
- [10] Zhang H, Wang L, Zhao C, et al., 2018, Discussion on the Experimental Teaching Reform of Insect Pests in Horticultural Plant Protection. *Anhui Agricultural Science Bulletin*, 19(7): 162–163.
- [11] Li R, 2020, Talking About the Application of PBL Teaching Mode in Plant Protection Teaching. *Education And Teaching Forum*, 2020(27): 190–191.
- [12] Liu T, Hou J, Zuo Y, 2018, Practice and Exploration of Bilingual Teaching of Garden Plant Protection. *Education in Heilongjiang: Higher Education Research and Evaluation*, 2018(2): 19–20.
- [13] Qin X, 2019, The Full Utilization of Campus Plant Resources in Agricultural Colleges and Universities in Teaching Practice: Taking South China Agricultural University as an Example. *Journal of Southwest Normal University (Natural Science Edition)*, 39(11): 229–233.
- [14] Hua L, 2017, *Plant Protection*, Science Press, Beijing.
- [15] Fan S, 2017, *Research on the Cultivation of Higher Agricultural Undergraduate Talents Under the Background of Modern Agricultural Development*, thesis, Yangzhou University.
- [16] Sun Z, Zhou C, Lu H, et al., 2018, *Research on Teaching Reform of General Plant Pathology Course*.

Anhui Agricultural Sciences, 2018(27): 17093–17094.

- [17] Li P, 2017, Garden Plant Protection Teaching Mode Reform and Practice. *Education Modernization*, 2017(52): 64–68.
- [18] Ji C, 2017, Plant Protection Teaching Optimization and Practice. *Journal of Hebei Agricultural University*, 19(01): 84–87.
- [19] Mao J, 2016, Exploration and Thinking on the Teaching Reform of Garden Plant Protection. *Modern Horticulture*, 2016(01): 209.
- [20] Yang R, Tie B, Guo Z, et al., 2017, Teaching Reform and Practice of Environmental Engineering Specialty in Agricultural Colleges and Universities. *Journal of Hunan Agricultural University: Social Sciences Edition*, 5(2): 50–52.

Publisher's note

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