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Improvement and Exploration of Teaching Methods for General Entomology in Agriculture and Forestry Colleges and Universities

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Abstract According to characteristics of General Entomology and existing problems in teaching process, it came up with methods and countermeasures for improving teaching General Entomology, including improving practical ability of students through enhancing all links of practice teaching, and stimulating learning interest of students through improving methods of course examination.

Key words General Entomology, Teaching methods, Practice teaching, Reform

1 Introduction

General Entomology is the science studying basic laws of life activities of insects. It is an elementary course of Entomology for undergraduates of plant protection discipline in agriculture and forestry colleges and universities, and also an important specialized course of the plant protection discipline ^[1-2]. General Entomology mainly includes Insect Morphology, Anatomical Structure and Physiology of Insect, Insect Biology, Insect Taxonomy, and Insect Ecology ^[1]. This course features extensive basic theories, high practicality, and strong specialization. In actual teaching process, students have little interest, they may get high score in examination but their ability is low, and it is difficult for them to learn ^[2-7]. To improve teaching quality, stimulate learning interest of students, and improve practical ability of students, we made improvement and exploration of teaching methods of General Entomology and came up with methods and countermeasures for reforming theory teaching, including improving practical ability of students through enhancing all links of practice teaching, and stimulating learning interest of students through improving methods of course examination. It is expected to stimulate interest and subjective initiative of students and bring into full play subject position of students in learning.

2 Reform of teaching methods

2.1 Introducing modernized teaching means and methods to classroom with the aid of multi-media General Entomology is a highly practical course. It contains much knowledge and information. It is highly visual and often needs a lot of pictures to supplement weakness of text description. Traditional teaching means lack vivid sensory experience, pure blackboard writing is easy to make students lose interest, so it is already unable to meet requirement of modernized teaching. Introduction of modernized multimedia technology covers the shortage of traditional teaching method. Multimedia courseware can use a lot of charts and clear

pictures to make morphology vivid, visual and real, and easy to understand. Besides, it can make real object projection and record play according to teaching content, to make students feel knowledge in vision and hearing, deepen their understanding of teaching content, enrich teaching information, optimize teaching structure, greatly stimulate learning interest of students, and improve teaching quality.

In addition, it is recommended to introduce academic opinions to students to cultivate discerning ability of students, incorporate state-of-the-art researches into classroom, raise and foster learning initiative of students, as useful supplement and improvement of content in books.

2.2 Adjusting course system and optimizing teaching content General Entomology is a basic course of plant protection discipline and involves extensive content. To avoid or reduce repetition of course content with subsequent courses, it is required to make proper adjustment of the course system for General Entomology, make clear key and difficult points of General Entomology in limited class hours, consider integrity of teaching content, and also keep smooth connection between courses. For example, Insect Taxonomy involves much content, so it is impossible to teach the whole content. In this situation, we selected 9 orders closely connected with agriculture and forestry to teach. The rest parts are left to students for self-learning. For Insect Ecology, there is certain repetition with the elective course set in the second semester in the third grade. In General Entomology, we will mainly introduce individual ecology, and teach little about population ecology, community ecology, and ecosystem. In the Anatomical Structure and Physiology of Insect, we omit ultramicrostructure and physiological and biochemical mechanism, to make teaching system of General Taxonomy more reasonable and avoid unnecessary repetition.

2.3 Changing traditional cramming method to interactive teaching Traditional teaching mode is called cramming method of teaching (or spoon-feed teaching). In such mode, students are passive to accept knowledge. To change such mode, we have made certain effort. Firstly, using video and voice teaching to

stimulate learning interest of students, change passive listening to active learning, and help students set up subject awareness in learning. Secondly, asking more questions in classroom to attract attention of students to the maximum extent. Thirdly, using classroom discussion to ask students to make free speeches, exercise their verbal skills and thinking, stimulate their interest in learning Entomology, and enhance the emotional connection between teachers and students.

3 Enhancing links of practical teaching

Organic combination of theoretical and practical teaching is the key to learn this course well. Experimental teaching of General Entomology is oriented as consolidating and deepening basic concepts of Entomology, enhancing operating and manipulative ability, setting up scientific attitude, cultivating initiative spirit, and improving comprehensive quality. Practical teaching mainly includes experiment and practice.

3.1 Teaching experiment Traditional experiment class is often to make students complete given experiments under the guidance of a teacher. Thus, the teacher always plays a leading role in the whole experiment, while students will imitate all the time. As a result, it fails to bring into full play subjective initiative of students. To bring into full play subjective initiative of students and improve operating ability and practical ability of students, we have made following exploration in teaching experiment of General Entomology.

3.1.1 Meticulously designing experimental scheme and properly selecting experiment items. Since General Entomology involves much content and the experiment lessons are limited (only 32 lessons), how to design and arrange experiment items properly becomes particularly important. For the whole course, we have a total of 22 experiment schemes for selection of students, including 10 for anatomical structure and physiology of Insect, 8 for morphological classification, and 2 for insect biology and 2 for insect ecology respectively. In the arrangement of experiment content, we made effort to avoid overlapping with other related courses, for example, separately 2 experiments for insect biology and ecology, the content is relatively little, and the related experiment is included into Forest Entomology and Insect Ecology courses. On the basis of satisfying basic experiment content, we also add comprehensive and highly difficult experiment for students' selection according to their interest. Apart from indoor experiment, we often take students to field to find out major pests during holidays, to make up limitation and shortage of classroom teaching.

3.1.2 Students participating in preparation and explanation of experiment materials. In the process of selection and preparation of experiment materials, we ask students to participate, so as to bring into full play their subjective initiative. Asking excellent students to participate in preparation of experiment can improve their operating ability, enhance their sense of responsibility, and fully reflect student-oriented philosophy. Besides, it is also able to make them realize the hardship and much thought of teachers,

promote them to focus on hard work of teachers, and complete experiment in a better way. In the process of experiment, we care more about cultivating students' independent thinking ability, encourage them to raise questions, express different opinions, arouse their curiosity, enhance their interest in insect experiment, and stimulate their innovative thinking and subjective initiative.

3.1.3 Carefully writing experiment report. Writing experiment report is the summary of experiment process and results. Thus, it is required to ask students to independently write and submit experiment reports. Experiment report generally includes experiment purpose, significance, materials and methods, steps, results, and analysis. On this basis, we add "items to be improved in this experiment" to find out problems encountered in the experiment and further improve experiment content and design scheme. For experiment reports submitted by students, we make careful correction and find out problems and make proper correction at next class, to avoid reoccurrence of such problems.

3.2 Teaching practice Teaching practice is an important part in practical teaching. Through teaching practice, students can not only directly observe morphology, structure, and biological features of insects and identify insect classification, but also can deeply understand habitat of different insects. Thus, it is an important approach to further solidify rudimentary knowledge, enhance basic operating skills, and cultivating manipulative ability. To ensure and improve quality of teaching practice, we have made following efforts.

3.2.1 Properly adjusting time of teaching practice. This course is arranged at the first semester of the third grade, and the teaching practice is arranged in December after the completion of this course. However, it is winter and cold at this time, so the practice will be greatly influenced. In this situation, to guarantee smooth implementation of teaching practice and not influence normal teaching section, we adjust the practice time to September to October when there are lots of insects. Besides, at this time, it is more suitable to organize students to carry out field survey and collect insect specimens, make students know and find out more habits and characteristics of insects, and collect more insect specimens. Two years of test have proved that it has considerable effect.

3.2.2 Attaching importance to various parts of teaching practice and improving quality of teaching practice. Before the start of teaching practice, we explain precautions and key points of operation in detail, lay down specific tasks and requirements of each section, and make students have an overall consideration of the teaching practice.

(1) Strictly formulating assessment standards on the basis of satisfying syllabus of teaching practice. Teaching practice is an important practical course, so its assessment standard should be different from that of theoretical teaching and it should not adopt the "examination" practice report as the sole assessment standard. Therefore, we make comprehensive assessment according to attitude adopted in field survey, quantity and quality of specimens

collected, identification results, accuracy rate and standardization of practice report.

(2) Making of insect specimens. We ask students to take insect specimens collected in field to laboratory, make necessary treatment (such as sterilization) in time. Then, with the aid of proper tools (such as insect pins, pinning blocks, and making board) according to characteristics of various specimens, we make different types of specimens. After insect specimens are dried naturally, we put them to boxes for long time storage, for use of teaching and scientific research. The entire making process is completed under the guidance of teachers, to standardize operating skills of students.

(3) Identification of insect specimens. Identification of insect specimens is an important task of teaching practice, and also an arduous task for beginners. Firstly, we classify insect specimens to different orders and families on the basis of grasping theoretical knowledge. After determining orders and families, it is able to identify species according to monographs and academic papers published recently, and identify common types of certain orders and families with the aid of these monographs and academic papers. Specifically, check specimens against the search table, and check against description of corresponding species. If there is an illustration, it is recommended to make comparison with specimen, and check it against record of geographic distribution. In this way, it is able to identify some known species.

4 Changing methods of the course examination

The course examination is an important form reflecting teaching effect, so the design of examination method is particularly important. In the past, one examination would determine the whole course of events. In other words, after completion of the course, teachers will set questions according to syllabus and determine achievement of students according to their score in close-book examination. Such examination method generally neglects cultivation of students' comprehensive quality and leads to a lot of students who achieve high score but have low ability. To change such situation, we have made reform of examination method. Specifically, on the precondition that examination questions meet requirement of syllabus and scope and difficulty of questions are reasonable, we reduce content that should memorize mechanically and increase content needing flexible learning and use and connecting theories and practice. In addition, we increase the proportion of experiment lesion in the examination, bring the proportion of experiment and usual homework in the total score to 40%, and take experiment process and writing of experiment report as basic basis for assessment. Teaching practice is implemented with the team as unit. After completion of practice, we assess students independently through examination of skills. The examination will be completed in a laboratory. For example, for Insect Taxonomy, we mainly assess students in preparation and identification methods of insect

specimens, and making of glass specimens; for Anatomical Structure and Physiology of Insect, we focus on anatomical methods and skills of different insect specimens and the grasp of corresponding plotting skills. Such comprehensive assessment method not only emphasizes theoretical knowledge, but also enhances practical skills, so it significantly improves comprehensive ability of students.

5 Conclusions

General Entomology is an elementary course of Entomology for undergraduates of plant protection discipline, forest protection discipline, and plant quarantine discipline. Through three years of teaching practice, we have made improvement and exploration of teaching methods of General Entomology and came up with methods and countermeasures for reforming theory teaching, including improving practical ability of students through enhancing all links of practice teaching, and stimulating learning interest of students through improving methods of course examination. These have improved their independent thinking and operating ability and laid excellent foundation for learning of subsequent courses. However, there are still some weak points. For example, in the process of teaching, it is required to introduce new opinions and research direction related to General Entomology as supplement of this course; there are few group discussions, so verbal expression ability of students is still not significantly improved. Furthermore, there are still many more works to be further improved in the close connection of teaching and scientific research. In conclusion, in future work, we should continue to enhance the cooperation between teaching and scientific research, strengthen reform of teaching content and innovation of teaching means, and ensure high starting point, high level and high quality of teaching of General Entomology.

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