

The Reform and Practice of the Teaching Model about the Postgraduates Course of “Introduction to Modern Environmental Science”

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Abstract. “Introduction to Modern Environmental Science” is a core degree course for environmental science postgraduates at Jiangsu University. Based on the concept of cultivating innovative talents and the demand for knowledge and ability of postgraduates of this major, the reform and practice of the teaching model about the postgraduates course of "Introduction to Modern Environmental Science" were carried out. Through several years of efforts, a new theory teaching content system was constructed, various teaching methods were introduced, a comprehensive assessment method of students' learning was employed, and a teaching team with reasonable age and knowledge structure was built up.

1. Introduction

Environmental science is the field of science that studies the interactions between humans and the environment and its regulation. It is an emerging comprehensive interdisciplinary subject based on traditional natural sciences, technical sciences and humanities and social sciences [1-3]. Relying on the scientific research platform of environmental science and engineering first-level doctoral degree authorization center and postdoctoral mobile research station, the related knowledge was integrated and optimized into “Introduction to Modern Environmental Science” with the guidance of the professional demand of basic knowledge, ability and talent cultivation target. Also, the reform and practice of curriculum theory teaching contents and teaching methods have been carried out with remarkable results.

2. The Importance and Necessity of Opening “Introduction to Modern Environmental Science”

Environmental science is characterized by wide knowledge and strong theory. The knowledge that should be grasped by the postgraduates of this major covers the basic knowledge of environmental sciences, as well as the frontier progress and development trend of the subject [4]. The contents are very large and complicated. So it is important and necessary to construct a new curriculum of “Introduction to Modern Environmental Science” after optimizing and integrating the related knowledge and theory. The teaching purpose of this course is to make students understand the main theoretical knowledge, cutting-edge progress, and development trend of modern environmental science, and consolidate or supplement the basic professional knowledge; expand students' scientific research ideas, enlighten innovative thinking, improve innovative ability, and lay a good foundation for scientific research and future work.

3. To Make Reforms in the Teaching Contents and Construct the Novel Theoretical Teaching System of “Introduction to Modern Environmental Science”

3.1. To optimize and integrate the basic knowledge of environmental science and construct the new theoretical teaching system of “Introduction to Modern Environmental Science” with the guidance of the professional demand of basic knowledge

There are many branches in environmental science, such as environmental chemistry, environmental biology, environmental physics, environmental engineering, environmental medicine, environmental management and so forth. Among them, environmental chemistry and environmental biology are the core and important foundation. The most important foundation of environmental chemistry is modern environmental analytical technology because the principles and operation skills of modern instruments and many pretreatment technologies for environmental samples are indispensable to their future research. It should also be noted that environmental toxicology is the key contents of environmental biology. In fact, the knowledge of environmental toxicology became much more desirable than ever because of the growing concern of the relationship between environmental pollution and human health in recent years. So mainly based on the environmental pollutants, the content of the new course that contains the environmental behavior of pollutants’ transition and transformation in environment and the subsequent biological effect and toxicology in biosphere are selected with emphasis on modern environmental analysis technology, chemical and biological effects of environmental pollutants, and environmental toxicology (Figure 1). There are fourteen chapters in the theory contents of “Introduction to Modern Environmental Science”, these include 1. Introduction to Modern Environmental Science; 2. Introduction to Modern Environmental Chemistry; 3. Lecture of Environmental Analysis Chemistry Frontier; 4. Environmental Sample Pretreatment Technology; 5. GC/MS and Its Application in Environmental Analysis; 6. LC/MS and Its Application in Environmental Analysis; 7. Bioanalytical Technology and Its Application in Environmental Analysis; 8. Chemical Effect of Environmental Pollutants; 9. Introduction to Modern Environmental Biology; 10. Biological Effect of Environmental Pollutants; 11. Lecture of Environmental Toxicology Frontier; 12. The Foundation of Toxicology; 13. Basic Principles of Environmental Toxicology; 14. Toxicity Assessment Methods of Environmental Pollutant; 15. Toxicological Mechanism of Environmental Pollutants.

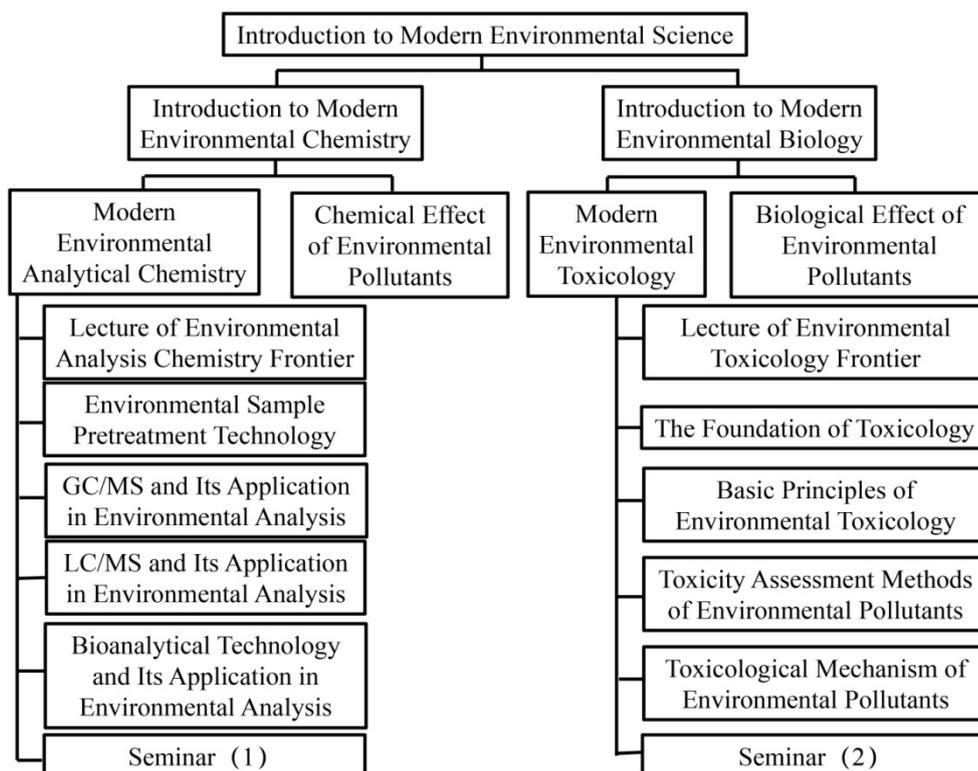


Figure 1. Teaching contents of the new “Introduction to Modern Environmental Science”

3.2. To recommend high-quality English literature and discuss them in the group in order to promote the ability of teamwork and reading comprehension

Postgraduates of this major should have a comprehensive knowledge of environmental science including its history and tendency, and be able to track the hot spots and frontier issues. They also should propose a new plan to solve the specific issue based on the literature that they have read before and communicated with others without difficulty in academy exchanges [5]. To gain this goal, some related classical and newest literature were chosen and discussed in groups.

Two seminars with the topics of modern environmental analysis technology and environmental toxicology were scheduled, respectively (Figure 1). Three related English papers or more were read and prepared into PPT by each student. Three graduates are divided into one group. The randomly selected one gives a lecture and the two others in the same group can fill up the omission. Also, students from the other groups can question the views of the group reported before or give an addition. So every student has been effectively involved in seminars which caused a strong repercussion in the hearts of students.

3.3. To introduce various teaching methods with the guidance of the achievement of the talent cultivation objective

There are advantages to both traditional teaching methods and multimedia teaching methods [6]. The former shows more superiority in sharing feelings and communicating between teachers and students, the latter can give more information though texts, audios, images, animations, videos and interactive contents. By a combination of traditional teaching methods and multimedia presentations will get twice the result with half the effort. For example, writing the derivation of formulas in blackboard step by step will be better. However, visualizing the principle, operation and internal structure of scientific instruments is the advantage of multimedia.

As mentioned above, the contents of environmental science are broad and profound, but class hours are limited. To solve this problem, a course website was established. In the website, the course introduction, syllabus, teaching videos were uploaded, discussion, quizzes and homework assignments module were set, and the reference materials, frontier and newly literature were replenished and renewed. It also provided a platform for teacher-student interaction online. The course website is the stretch and expansion of the classroom which can improve the teaching quality and effect and achieve the result of the teaching-learning promoting each other.

3.4 To reform the assessment methods of students' learning, strengthen the check of the whole process of learning

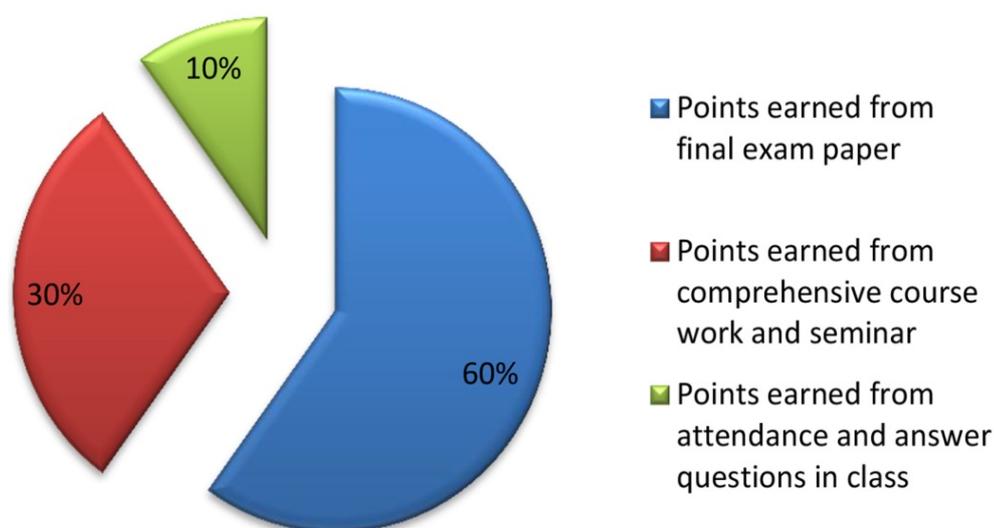


Figure 2. Assessment contents of students learning effect in “Introduction to Modern Environmental Science”

The final scores of graduate students should be evaluated in a variety of forms rather than a final test paper. Attendance, classroom participation including discussion and questions, comprehensive

course work and seminar, and final exam were all employed to assess the learning ability (Figure 2). Also, the final exam papers abandoned the examination of the basic knowledge of the course in the undergraduate examination papers, focusing on the students' ability to read and understand the latest English literature and use the knowledge to analyze the problem comprehensively. Among them, the examination papers accounted for 60%, the course comprehensive operation and reporting accounted for 30%, and the attendance and classroom questions accounted for 10%.

4. The Reform Effectiveness of “Introduction to Modern Environmental Science”

With several years of continuous efforts, the expected goals and good results have been achieved and listed as follows:

(1) A new teaching content system for "Introduction to Modern Environmental Science" has been formed, which enables students to master the main theoretical knowledge of modern environmental science, the latest research progress and development trends of the discipline, expand the research ideas of graduate students, and improve their innovation ability;

(2) A high-level teaching team based on young teachers has been constructed, which effectively ensured the promotion of the continuous improvement of the quality of the course teaching;

(3) A course learning website containing a syllabus, PPT and other resources has been built, which provided an online interactive platform for teachers and students;

(4) A scientific and reasonable assessment method has been carried out.

5. Conclusions

In summary, we constructed a new theoretical teaching system of “Introduction to Modern Environmental Science”, introduced various teaching methods containing seminar, reformed the assessment methods and built up a high-level teaching team. The reform and practice is effective and fully affirmed by students which ensures the quality of personnel training for environmental science graduate students.

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