

# Environmental Monitoring Curriculum System and Application-Oriented Training

Jing--Ping Wang Xin-Hong Wang

College of Chemical and Environmental Engineering, Yancheng Teachers College ,Jiangsu, 224002, China

E-mail: 289741169@qq.com

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## Abstract

Through building the environmental monitoring curriculum system for application-oriented talents, the comprehensive design and practice were constructed from the syllabus, textbooks, web-based courses, top-quality courses, test paper bank, open laboratory and scientific research etc. The aims are to promote environmental science professional, strengthen the analysis ability, broaden the students' field of vision, optimize the environmental science major teaching, and improve multilevel integrated design and practical analysis, which ultimately cultivate the students capable of solid knowledge, theory and skills in environmental science.

**Keywords** Teaching reform, Environmental monitoring curriculum, Teach methods

## 1. Introduction

Environmental monitoring is a major curriculum, which is permeated into all fields of the whole environmental science, and plays the role of scouts in the field. Aiming at focusing on quality, training ability, enhancing basic, broadening specialty, strengthening management, improving the teaching quality, practical exploration is carried out based on theoretical research, to improve the ability of comprehensive design and practice, analyzing and solving problems.

## 2. Develop personnel training program and syllabus of Environmental Science undergraduate courses

Under the guidance of national professional planning and the reference of thoughts and frames arranged by domestic and foreign relevant institutions for environmental science course system, we developed the personnel training programs (2008 edition, 2009 edition, 2012 edition, 2014 edition and 2015 edition) in 2008-2014 based on our professional basis and advantages, built the teaching system, and planned the environmental science curriculum system. The course system was divided into: common courses, professional basic courses, professional compulsory courses, professional elective courses, vocational education courses, expanding courses. According to the characteristics of traditional environmental monitoring, we extended the course to form a course group of environmental science specialty training, which from 2008 version to 2015 version changed from one course of environmental monitoring including the theory and experiments to two independent courses shown in table 1.

Table 1 Environmental Monitoring Curriculum system of Environment Science

Courses	Personnel training programs	Name of courses	Semeter	Total Hours/weeks	Credits
theory	2008 edition	Environmental monitoring and experiments	5	36	2
	2012 edition -2015 edition	Environmental monitoring	5	32	2
experiments	2008 edition	Environmental monitoring and experiments	5	36	1
	2012 edition - 2015edition	Experiments for Environmental monitoring	5	36	1
practice	2012 edition -2015 edition	Practice for Environmental monitoring	7	2 weeks	2
		Professional practice	7	14 /18 weeks	10/9

In the study of domestic and foreign teaching materials, we combined training objectives and teaching features with the actual situation of the students in our institute, studied teaching content and method, and wrote the outline of "environmental monitoring", "Environmental Monitoring Experiment", "environmental monitoring practice", which paid attention to the training of students' comprehensive qualities, and the cultivation of

students' environmental science way of thinking and realistic scientific attitude.

In the course of practical teaching, we attach importance to environmental protection, as well as advocacy of green chemistry. While improving comprehensive quality and experimental skills, not only students can cultivate attitude of scientific thinking and seeking truth from facts, also we can improve the efficiency of investment and running a school.

### **3. Approach comprehensive, three-dimensional and multi-perspective teaching mode**

With the help of modern educational technology, which can arouse students' enthusiasm and initiative, can broaden the teaching content, can increase the capacity of teaching, and can improve the teaching schedule, our professional teaching team, from the need of theoretical and practical teaching, is now constructing the network course of the "environmental monitoring and experiment", made of web page by Dreamweaver and course-related animation, pictures and procedures through Flash, Authorware, 3DSMAX etc; designs courseware and demonstrates the content by PPT full of images, text and sound; approaches comprehensive, three-dimensional and multi-perspective teaching mode, combining traditional teaching methods (such as board-writing, charts, models, audio-visual resources) with application of multimedia technology and network technology; adopts flexible teaching methods such as discussion, heuristic and case study, to break time and space limit, to provide massive information and open up students thoughts, to improve their learning enthusiasm and initiative and lead to innovative spirit.

### **4. Explore effective scientific assessment methods and establish the core course test paper database of environmental monitoring**

While establishing test paper bank of "environmental monitoring", we focused on high reliability, validity, difficulty, discrimination and coverage, not only to assess the degree of grasping the basic content of the curriculum and measure the flexibility to deal with the problem, but to check the extent to achieve the goal of teaching. As for "environmental monitoring and experiments", we also completed two way details of cognitive teaching (measurement) goals, two-way details of examination paper setting, and 12 sets of papers and scoring criteria. It is claimed that the examination bank not only helps efficient and convenient management, but plays an important role in standardization, automation and efficiency of the work.

### **5. Focus on constructing professional practice base construction, to provide an internship platform for students**

In order to improve the students' practical ability, creation ability, employability and entrepreneurship as the principle, the plant practice and professional practice are key processes of practical course, and relatively stable practice base is an important prerequisite for constructing the curriculum system. Therefore, we established long-term cooperation with Yancheng City Built Water Co., Ltd., Jianhu County East sewage treatment plant, Yancheng Municipal Food and Drug Administration, Dongtai City Environmental Monitoring station and Yancheng Municipal Environmental Monitoring Center station, set up the practice base for the environmental science, and constructed curriculum structure system based on combination of working and learning. Such course system includes knowledge and a skill met by professional posts, and takes into account the mutual infiltration of culture, society and technology education. The establishment of these bases also creates a better environment for the practice of Environmental Science students.

### **6. Build the core professional laboratory, and improve the professional practice ability**

Under the coordination of department leaders, the core professional laboratory was built. It was also called Environmental Monitoring Laboratory: 360 square meters of space, 3 gas control thermostatic shakers, 2 air samplers, 2 sets of electric heating set (COD meter), air condensation and digestion instrument, 2 electrochemical testing instruments, 2 biochemical incubators, and 40 furnaces. The equipments housed within department, like high performance liquid chromatography (Waters), mass spectrometry (LCOadvantage Finnigan) and gas chromatograph (Agilent company, 6890), provide a solid foundation for students of environmental monitoring to improve the practice.

### **7. Carry out scientific research activities associated with productive practice**

Students are organized during the summer vacation to enterprises to participate social practice activities, and during the semester join teachers' scientific research projects. Thus, they can apply the theoretical knowledge in practice, not only to consolidate the professional knowledge, understanding industrial production process, but also to improve the ability of practice and research. In the past 3 years, we have been granted funds from the enterprise commissioned research projects, the Jiangsu Provincial Department of education project and the provincial key construction laboratory project, and published a total of 10 teaching and research papers, more than 20 scientific research articles.

### **8. Pay attention to the training of undergraduate research thinking**

Since environmental monitoring curriculum emphasized in training the skills of analysis and problem-solving from 2012, students have been enrolled as graduates in the Fudan University, Xiamen University, East China Institute of University of technology, Hohai University, Nanjing University of Technology University, Shanghai University, Nanjing Agricultural University, China University of mining and technology, Jiangnan University, Suzhou University and other famous universities.

### **9. Pay attention to the undergraduate experimental skills training, and receiving awards in the competition**

In 2015 Grade 2013 students from our Environmental Science competed in Yancheng City Colleges and universities "Puxi Cup" environmental monitoring skills contest, and won the outstanding achievements: 1 top prize; 1 first prize; 4 second prize, and 4 third prize. Stationmaster Mr. Zhang Yuguo from Yancheng City Environmental Monitoring Station and manager Mr. Zhang Jun from Beijing Purkinje General Co., Ltd. presented the trophies to the top prize winner.

### **10. Establish environmental teaching module, service area service enterprises**

In order to ensure the coordination of regional environmental and economic development, our university run a school together with Nanjing University and Yancheng environmental technology and Engineering Research Institute, to train applied talents for environmental protection industry around Yancheng and Lianyungang, especially for Lianyungang Chemical Industrial Park and coastal environmental protection continue Education College. Four sections have been set up: a workshop for administrator in industrial park; treatment technology of industrial wastewater; skills of environmental monitoring and testing; a core team of waste gas treatment. The aim is to enhance the environmental awareness and the development level of park-in-charger; to improve the professional skills of the employees; to promote the healthy development of the park. In May, August and November 2015, students of class 2012 and 2013 from environmental science participated in training skills of environmental monitoring, and benefited from increasing their visions and strengthening the ability of experimental practice.

In summary, construction of the curriculum system can improve the students' practical ability of environmental monitoring; the creativity of the sample testing; the employment ability of environmental industry; the entrepreneurial ability of environmental, to explore the plausible mode how to cultivate the talents in environmental science.

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