

## Applied the experimental teaching model of three phases into the environmental monitoring experiment

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### Abstract

The course of the environmental monitoring experiment is one of the important course in environmental science specialty. And it is also a compositive and practical required course. At present, there are some questions in the practical teaching of this course. Based on these questions, the experimental teaching model of three phases are put forward. That is, the course of the environmental monitoring experiment is divided into three training phases and carried out the teaching models of three phases. It was proved that this teaching model would be fit to develop the teaching quality, strenghtenthe operational ability, shorten the adaptive time at working.

**Index Terms:** environmental monitoring experiment; three phases; teaching model

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### 1. Introduction

The course of the environmental monitoring experiment is one of the important course in environmental science specialty. And it is also a compositive and practical required course. Through mensuration of these factors impacting on the environmental quality, the course aims for obtaining the exact, timely, comprehensive values reflecting the actuality and the change trend in environmental quality, and providing scientific foundation for control and treatment of pollution, environmental mange, environmental layout, and so on[1]. Therefore, the envrionmental monitoring experiment can provide the important foundation and necessary means for job of environmental protection, and will have an important impact on environmental protection. The course of environmental monitoring experiment, acting as one of the practical teaching on the course of environmental monitoring, will benefit to develop the operational ability, scientific research ability and innovative ability[2].

Shaoxing University is a locality and appliance college for the undergraduate course. The practical teaching is important teaching in the daily teaching work. The practical teaching quality will have an important effect on the achievement of the total teaching directly. Moreover, it also affect the development of the appliance students with high ability. In additional, the experimental teaching is an important means for the development f the appliance students with high ability. Therefore, for the course of environmental monitoring experiment,oaccording to these questions consisting in the experimental teaching, it is necessary that the research and innovation of the experimental teaching is carried out in order to develop the achievement of

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teaching.

## **2. Researches on the teaching model of the environmental monitoring experiment**

In order to carry out the teaching model of high person with skill, we founded the teaching system of the environmental monitoring experiment according the social need, and organized the teacher to research on the skill for the environmental monitoring experiment.

In this survey, people working at department of environmental monitoring were chosen as object. The 100 questionnaires were filled in by the informants and 85 questionnaires were effective. The results showed that people working at the department of the environmental monitoring have some requirements about the students which worked at the department of the environmental monitoring in future.

Firstly, students must be able to operate the experiment according to the standard processes of the experiment sternly, and must be familiar with mastering the skill of basic chemical operation. Secondly, students must master every steps of monitoring pollutant which consisted design of experiment, sample of contamination, analysing of sample, dealing with the data, writing out the reports about results and so on. Thirdly, students should persisting in "science, justness, preciseness" for dealing with these datum. They also should master the skill of dealing with these datum with computer. Fourthly, students should not only master the operation of these ordinary apparatus, but also master their principle and master their operation of some large apparatus, such as gas chromatography, Atomic Absorption Spectrometer, Plasma Spectrometer, et al.

## **3. The existent problems in the course of the environmental monitoring experiment now**

According to the characteristic in Shaoxing University, feeding back of the students after school and the investigation for society, it was thought that there are some problems in the course of the environmental monitoring experiment about environmental science speciality. As following are these problems.

### *3.1 Few hours in the experimental course*

The course of environmental monitoring is a practical course and is attached more attention. However, the practical course which is a course of environmental monitoring experiment is arranged for 36 lessons. And this experimental course is consist of much more contents, such as monitoring of atmosphere, monitoring of water, monitoring of soil, monitoring of waste solid pollution, monitoring of biology, and so on. Moreover, it also need the high ability for operation, innovation and understand[3]. Compared with the other courses, the time for the course of environmental monitoring experiment is few. Some experiments are limited for time, so the system of the experimental teaching is not formed.

### *3.2 The experimental teaching is detached from the practical monitoring job*

At the class of the environmental monitoring experiment, the students often determine some indexes of pollution matters which are confected by teacher in the lab. But these samples wich are confected by teacher in the lab are different with ones in the environment. In additional, the operation in the lab are different with ones in work. So, the students could not adapt for the actually monitoring work. Especially for the pretreatment part of water sample in the determination of water and wastewater, some means should be choosed for the pretreatment of sample according to the interfere matters in the actually work[4]. However, in the lab, there are litter interfere matters in the sample and the mostly samples would be determined directly without the pretreatment. The student can not master the operation of setting spot, sampling, pretreatment of sample, and so on. So, the courses of environmental monitoring experiment will detached from the practical monitoring job for some reasons.

### *3.3 Simple teaching means and teaching method*

In the experimental class, the old teaching methods are often adopted. That is, the teacher speaks the process of the total experiment and the proceeding of attention firstly, and then the student does some experiments according to the process of experiment in the experimental instructor and obtains the results. The teaching model is difficult to inspire the interesting experiment of the student and is not benefit to develop the ability for ideation and innovation.

### *3.4 More validation experiment and few compositive and design experiment*

Despite were twelve experiments chosen in the environmental monitoring experiment class, they were validation experiments mostly. For the limitation of the time and condition in the environmental monitoring experiment class, the compositive and design experiments were often not set up. So, the course of environmental monitoring experiment will turn into a course of validating the theory[5-7].

According to the researches on the course of environmental monitoring experiment, the system of the environmental monitoring experiment must be innovated in order to develop the allround experimental skill and adapt for the necessary of analyzer in the environmental monitoring work.

## **4. the teaching model of three phases**

According to some problems in the environmental monitoring experiment class, the teaching model of three phases are put forward. That is, the class of the environmental monitoring experiment are divided into three phases which are the basic training phase, compositive training phase and practical training phase respectively. This teaching model will strengthen the student master knowledge of this class and improve the ability for operation and solving with questions. We will divided the class of environmental monitoring experiment into three phases and carry out the teaching model of three phases.

### *4.1 Basic training phase*

In the basic training phase, all of the reagent, apparatus and so on, are prepared by the experimental teacher, and the teacher teaches students. Students carry out the training of basic skill according to the processes of tests. Under the instruction of the teacher, students can master the methods of analysing the contamination, processes of the experiments and the proceeding of attention in the operation. Furthermore, students can write out the canonical experimental reports and discuss the results in details.

### *4.2 Compositive training phase*

In the compositive training phase, except for these long period and difficult confected reagents confected by the teacher, the others are all confected by students according to the practical condition in the environment. Students project the sample of water, atmosphere and noise in the campus, in the lab, beside the traffic road and so on. They also can sample beside the Fengze River, sewage of school and monitor the pollution status about campus, main traffic road, air pollution indoor and so on. They monitor contaminated status of surface water. From the design of the experiment, collection of sample, confected reagent and processes of analyse to discussion of results, writing out the experimental reports and so on, students all accomplish alone by themselves. Through this training, students can improve the operational skill independently.

### *4.3 Practical training phase*

In the practical training phase, the teacher will leave some time out to let students do some tests according to their interesting and the subject of the environmental monitoring experiment lessons. These students carry

out the experiment according to the instruction of teacher. Through this training, the teaching and the scientific research can be combined each other. It can improve the ability for the independent operation and work alone.

## **5. conclusions**

The teaching of the environmental monitoring experiment is important to develop the ability of independent operation. So, during the process of teaching, we must attach importance to the practical teaching. The class of environmental monitoring experiment is a basic curriculum which is more strong practice. According to the characteristic of this lesson and some main problems existing in this lesson at present, we summarize the teaching model of three phases. This reform of teaching model in the environmental monitoring experiment will be benefit to change students's interesting in the experimental teaching, improve the skill of carrying out the experiments and develop the good habit of study, and so on. It has been proved that this teaching model would be fit to develop the teaching quality, strengthen the operational ability, shorten the adaptive time at working.

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