Reform and Exploration of Environmental Engineering Specialty Practical Teaching Cultivating System and Teaching Method

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Abstract: Aiming at existing problems in practical teaching of Environmental Engineering specialty at present, the contradiction between the professional comprehensive quality of the students and the employing demands of the enterprise, to improve the students' innovative thinking and engineering application ability, combining with the special features of the school and the advantage of the environmental engineering training base, we construct practical teaching system of environmental engineering specialty and put forward reform measures of the "three combination", "four module" and "five platform", reforming and exploring the teachers’ teaching methods and students' cultivating system under the new background of engineering practical teaching system.

In recent years, with the development of ecological civilization construction in depth, People's requirements on environmental protection and environmental quality become more and more sensitive. Therefore, the environmental engineering professionals face with more opportunities and greater challenges. How to make students not only have a solid basic knowledge but also have some practical experience in engineering to meet the times' urgent needs for high-quality environmental engineering talent, which is undoubtedly an extremely significant research topic.

This study analyzes the existing problems in the practical teaching links of environmental engineering at present and tries to reform and explore it from multi-angle such as the teaching cultivating system, teaching method and cultivating mode.

Problems in Practical Teaching Link of Environmental Engineering Specialty

The current environmental engineering specialty practical teaching aspects mainly has following problems.\textsuperscript{1}

\textbf{Practice Links Are Not Valued By Students, the Effect Has Greatly Reduced}

Some students lack enthusiasm and positivity for the practice. They have some biased thoughts. Therefore, some students' attitude in the practice of the process is perfunctory. Attitude determines the results. Student’s observation ability, thinking ability, innovative thinking cannot get the basic exercise if they do experiments passively and mechanically, which is not conducive for students

\textsuperscript{1} Course topics source: Teaching Reform Course Topics of Hubei Provincial Education Department(2016236)

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through the practice to improve the engineering ability and cannot cultivate students' innovation ability [1]. At the same time, some teachers do not pay enough attention to practice links, arbitrarily shortening the time of practice links and reducing the content of practice links. Therefore, it is difficult to achieve the desired effect of practice links [2].

**The Content of Experiment Is Single and Lack of Exploration**

The traditional educational model pays more attention to theoretical teaching. Practical teachings only deepen students' understanding of theoretical knowledge. Therefore, the setup of the content of practical teaching is often single, it is basically set up aiming at a knowledge point. The result of the experiment is definite and the content is single. Although in recent years the traditional experiments have been gradually transformed into the open experiments and comprehensive experiments, it is basically integrated within a course and does not break the boundaries of the curriculum, it lacks of overall planning, comprehensive, systematic, and exploratory.

**Field Practice Locations Are Difficult To Implement, the Practice Effect Doesn't Guarantee With Difficulty**

With the increasing number of students in school, field practice locations are difficult to implement. With the development of technology, the demand of on-site operation and technicians becomes less, the enterprise equips per post with fewer staffs. A large number of interns are difficult to enter the internship unit. That a large number of students enter into the enterprise internship even has affected the normal work of the unit. Therefore, more and more counterparts units do not want students to practice here, it's difficult to find a fixed place to practice. In addition, the lack of funds in practice is also a major factor that restricting the smooth implementation of the practical teaching. Specially in some local undergraduate colleges of our country, the practice fund has been seriously shrunken and the teaching plan is difficult to complete [3].

**Construction of a New Practice Teaching System for Environmental Engineering Specialty**

**The Basic Ideas of Building a New Practical Teaching System**

The basic function of the practical teaching link of environmental engineering lies in strengthening the mastery of basic knowledge and the improvement of technical skills through practice. The basic idea of practical teaching reform is to explore a new practical teaching model, cultivating practical talents with solid theoretical knowledge, and to integrate knowledge impart, cultivation ability and improving innovation consciousness into one.

**Construction of the New Practical Teaching System**

According to the subjects characteristics of our university and the requirement of society's demand for talented people, it is necessary to cultivate the applied talents with innovative ability and engineering consciousness, to highlight the importance of practice teaching in the whole teaching process, and to put the practice teaching through in the whole theoretical teaching. According to the principle of "one center, four modules", our school divides the practical teaching into four modules: basic experiment, professional training, engineering training and comprehensive innovative training. Specific practical teaching cultivating system as shown in Figure 1.
Around Improving the Engineering Application Ability, Highlighting the Practical Ability Cultivation

The formulation and improvement of the practical teaching system have always centered on "market-oriented, train engineering application ability." In the development of the objectives of the training program also strengthened the engineering applications ability and the comprehensive quality cultivation. It can be seen from Figure 1 that the culture system adopts the level design, which is divided into four modules. The first module is the basic experiments. The basic experiments are based upon the basic knowledge's master and basic skills' cultivation, and to cultivate a kind of professional basic quality. The second module is the professional training, mainly through the design, and application and simulation of small-scale case, to strengthen student’s theoretical knowledge mastery and to apply professional knowledge into practice. The
third module is engineering training, which includes cognitive internships, production internships and graduation internships. The content settings seem as if the same as other colleges. Because of the largest campus training base of nationwide in our school, the internship effect of our school can make up for the defects of watching the structure of the detailed construction and run changes, and improves the practical effect. The fourth module is a comprehensive innovative training, which is based on innovative thinking and engineering application ability training. the training of the first three modules has cultivated students’ basic practical skills and solid professional knowledge, this stage mainly combines the school training base, teacher's scientific research and school science and technology innovation activities, achieving "theory and practice, training on campus and scene integration outside school”, to strengthen engineering awareness and enhance problem-solving ability.

**Optimize the Experimental Content, Make Full Use of School Training Base**

(1) The experimental content breaks the course boundaries, the professional unification designs experimental content

The ascertain of environmental engineering specialty experiment in our academy is not determined by the specialty teachers themselves, but all the professional teachers come up with a plan according to the professional requirements, making every effort to make professional experiments not only meet the requirements of this course, but also considering the application of previous knowledge and the combination of other courses, which can improve students' the comprehensive application ability of professional knowledge, so that the having learned knowledge is no longer fragment. It can guide students to cascade the knowledge that they have learned.

(2) Make full use of the school's training base

In the early construction of our school’s new campus, all the waste-water generated by the school need to be treated, and the treated waste-water should reach the standard before emission, so our school built an inside school sewage treatment station, whose daily processing capacity is 400 m³/d. With the improvement of municipal pipe network, the sewage from our school is discharged into the municipal pipe network, then our school's sewage treatment station became the environmental engineering professional training base, which provided the place and convenience for environmental engineering students’ internships and scientific research. Our school’s environmental engineering specialty makes full use of the practice training base, building modular experimental model, which provides professional experiments and professional watching and learning for students.

(3) Build a perfect professional practice platform

According to the requirements of environmental engineering talents training, combined the metallurgical characteristics of our school, based on the environmental engineering training base of Wuhan University of Science and Technology, building up corresponding with the requirements of the times and school characteristics five professional training sub-platforms: the industrial waste water pollution control and utilization technology innovation sub-platform, industrial mining and metallurgy flue gas treatment and resource engineering innovation sub-platform, an innovation sub-platform for studying the mechanism of soil remediation by exogenous microorganisms, environmental disaster monitoring and early warning technology system sub-platform, environmental functional materials and biotechnology sub-platform.

**Practice Teaching Ways' Reform Practice**

**Basic Experiment Link**

Basic experiment link mainly highlights the common cultivation of professional basis and professional experiment. At this stage, it is necessary to pay attention to students' basic skills of the cultivation, to cultivate basic experimental skills and technical methods, to develop good experiment habits, but also it is the best stage to stimulate students’ experiment interest.
This stage of teaching ways should focus on guidance and interaction. Guiding students to cultivate scientific thinking and good thinking habits, to cultivate students' all-round consideration and multi-faceted thinking habits, thus enhancing the mastery and application of knowledge points.

**Professional Training Link**

Professional training link should pay attention to theory combined with practice. Practice contents' settings and teaching methods should start from the following aspects:

1. Combine theory with practice. We can combine with the professional courses and set in the curriculum content some the issues with engineering concerned, with the actual relevance. For example: To determine the water quality monitoring program for the school on the edge of the Yangtze River. Based on the monitoring purposes, students need to develop their own monitoring program, to determine monitoring factors and determine the sampling points, monitoring standards, monitoring methods, evaluation and so on. The thinking of this series of problems will combine environmental monitoring, pollution control and environmental assessment, is not only mastered the professional knowledge, but also closely integrated with practice. The enthusiasm of the students has been fully mobilized.

2. Production and research combined. Professional subject’s teachers bear a lot of research projects. Research projects can promote teaching. Teachers can guide students to participate in scientific research and participate in from plan formulation, plan implementation and problem analysis and so on scientific research of the whole process, both for the students to provide scientific research soil, but also to assist teachers with completing scientific research topic, two birds with stone. That students participating in research projects can broaden their horizons.

3. Strengthen the professional design link. Professional training aims at the nature of the course and the requirements of students' engineering ability training. It can enhance students' engineering design ability. According to the professional training requirements, the classroom teaching is the main line. According to the basic requirements of engineering practice, we put forward the task and technical requirements, giving students the opportunity to apply the theory into practice and comprehensively apply the knowledge they have learned. It can take the way of “dispersion guide” and change the past one class one question teaching model which is guiding the same course of curriculum design by several teachers, each guiding teacher's questions are not same, and this can avoid the phenomenon of students of plagiarism. The teacher can also have more sufficient vigor to audit of each design program and process.

**Comprehensive Innovation Training**

Comprehensive innovation training includes open practice, innovative skills training, graduation design (Thesis).

Open practice and innovation skills training is mainly aimed at the students who have enough vigor and who are interested in the research. School lets the guiding teachers arrange innovative practice according to the teacher's scientific research. From the class time distribution, the proportion of innovative practice is increased. It is stipulated that students who must attain enough innovation credits only can meet graduation requirements. The graduation design (thesis) is to cultivate the engineering practice ability and comprehensive application of knowledge, also is the important link of practice teaching in colleges and universities. In order to let the graduation design (thesis) truly play a role in cultivating students' innovation ability and engineering practice ability, the school should strengthen the management of the graduation design (thesis), these following measures can be taken:

1. Examining strictly the selected title of the graduation design (thesis). The evaluation committee is established by the department head, professor and the backbone teacher. The title of the graduation design (thesis) is strictly control. The design (thesis) titles should be combined with the practice and accord with the development trend of professional. It has the certain research value and application value, and it is mainly used in scientific research or engineering practical. And it is commanded to be "a people a question".
(2) Take the "target" cultivation mode. In the design and thesis selection, the two-way choice can be taken. The students who want to be a postgraduate are usually recommended to do graduation thesis. Students enter into the research process in advance and can be familiar with basic procedures for research. This can be a certain foundation to graduate students. The students that directly take part in employment can be recommended to do graduate design. The title of the design can take targeted proposition according to the requirements of the enterprise, which is equivalent to taking the department professional training for the enterprise in advance, and shorten the adaptation period of students on the job. In short it can meet the different needs as far as possible. It can be connected with the next stage of students learning and working.

(3) Strengthen the process management of the graduation design (thesis) link. The graduation design (thesis) is divided into three stages. The first stage is looking up literature, writing the opening report and design (thesis); the second stage is the specific design (experimental study); The third stage is drawing (writing research report). According to the three stages, taking the stage inspection. Only one stage has been completed only can the next stage be taken. At the same time the reply should be strict and the reply achievements should take the academic repeating detection. Repetition rate cannot exceed a certain proportion. The thesis in the reply is required must be standardized.

Implementation Effects and Summary

Practical teaching plays an important role in the cultivation program of environmental engineering specialty, and it is an important way to help students form a complete professional knowledge system and cultivate excellent engineers. In the new employment situation, schools should cultivate innovation and engineering ability talents to meet the requirements of employing units. Our school has adopted a new teaching cultivation system and training mode to make full use of the school internship training base and professional internship training sub-platform, combining the theory with practice, combining on-campus internship training with off-campus on-site, combining practice operation with simulation. All-round improvement of students' practical ability to innovate and achieved remarkable effects.

References


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