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# Discussion on the Teaching Model of Engineering Practice Based on the Deep Cooperation between Universities and Enterprises

**--------Take the major of environmental science and engineering in yancheng normal university as an example**

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**Abstract**
With the transformation of the concept of engineering and the concept of the culture, and the transformation of the culture, the school's cooperation has driven the innovation of the environmental science and engineering professional practical teaching model. Under the strong driving force of the current school enterprise depth cooperation, Yancheng Teachers University is based on the "deep expansion" of the school enterprise cooperation, through realizing the whole program of practical teaching, the development of the enterprise cooperation of the enterprise, the innovation and enterprise cooperation of the teaching curriculum system, the construction of practice teaching resources, the guarantee measures of strengthening the teaching innovation of practice teaching, etc., and try to explore the teaching mode of environment science and engineering professional practice.
**Keywords**: Deep cooperation between universities and enterprises, Environmental science and engineering, Innovation of practical teaching model

## 1. Introduction

For a long time, the training pattern of heavy theory and practice in colleges and universities has caused the talent training to be out of line with the needs of socio-economic development [1-2]. In recent years, with the transformation of the idea of an engineering application type, the practical teaching model based on "school enterprise cooperation" has been a bridge between the schools and the enterprises, so as to enable the university to construct the platform for engineering application type talent training, and enhance the talent reserve of the enterprise, which is a win-win mode for both colleges and enterprises. As a major with strong specialty, applicability and operability, environmental science and engineering major, under the strong drive of the current in-depth cooperation between universities and enterprises, how to realize the innovation of practical teaching mode based on the in-depth cooperation between universities and enterprises is an important subject that needs to be solved urgently. In recent years, the institute of environmental sciences and engineering of yancheng normal school, in order to develop the important supporting role of the school enterprise cooperation in the training course of talents to meet the needs of the scientific and technical applications needed by the economic and social development, strive to promote the cooperation of the school enterprise to promote the innovation of environmental science and engineering professional practice teaching mode. Especially in the aspect of industry-university-research cooperation in educating people, bold attempts have been made to run schools.

## 2. A practical teaching program for environmental science and engineering majors is built jointly

It include cooperation, cooperation, cooperation, cooperation, development of cooperation, cooperation and teaching resource, and that enterprise is involved in the whole process of cultivation of the application type talents in the college and universities[3]. In this case, the environmental science and engineering program of the salt city teachers college has been built on the basis of the school partnership. In 2008, through the demonstration of "three segments and six steps", fully absorbed the opinions of the various school enterprise cooperation units, in accordance with the requirements of the enterprises on the realistic needs of environmental science and engineering talents, the environmental science and engineering professional practice teaching program was formulated in accordance with the requirements of the engineering application talents with high quality and strong skills. In this process, considering not only the training objectives and specifications of environment science and engineering category, but also the relevant issues such as practice teaching base support, practical teaching course setting, practical teaching management and teaching staff construction in practice, the teaching program of environment science and engineering professional practice is developed which is more realistic and has more operability.

 

**3. The teaching base and platform of environmental science and engineering specialized practice are built jointly**

The environmental science and engineering speciality of yancheng normal school seriously emphasizes and strives to implement the production and research cooperation education, and adopts various measures to overcome the short leg of the production and study cooperation of education, which strives to improve the quality of engineering and the ability of serving society. For building stable practice platform, we establish cooperated relations with Yancheng Jianbang Water Affairs Co., Ltd., Jianhu Eastern Sewage Treatment Plant, Yancheng Eastern Sewage Treatment Plant, Yancheng Environmental Monitoring Center Station, Tinghu Environmental Monitoring Station, Dongtai Environmental Monitoring Station and so on. We put the knowledge and ability training for professional jobs into professional teaching system with mutual penetration of the humanities social and technical education, establishing professional course system of work-integrated learning. The establishment of the bases builds better environment for students' practice and provides important guarantee of academic disciplines and quality of teachers for training talents [4].

**4. A practical teaching system for environmental science and engineering majors is constructed**

In the environment science and engineering professional talent training program, the practical teaching curriculum system occupies a very large proportion[5-6]. Among them, the practice teaching courses based on school-enterprise cooperation account for nearly 70% of the total practice teaching courses of all majors. The main forms include: independent enterprise courses, graduations, graduation papers, practical week courses, students' extracurricular creative activities, industry professional talks, skills courses, apprenticeship and social practice activities. Currently, jointly run with the yancheng environmental technology and engineering research institute of Nanjing University, it holds a training workshop on the personnel of the municipal wastewater treatment factory (station and workshop) of Lianyun Gang chemical industry park and education college, to train the application talents for lianyun port and the salt city environmental protection industry. The courses include industrial wastewater treatment technology, environmental monitoring and testing skills, and waste gas treatment and so on. In this way, that cooperative mode of the construction of the teaching course will combine the practice teaching base and employment base, and will have good effect.

**5. A practical teaching resources for environmental science and engineering majors is built jointly**

On the one hand, we invite industry experts to participate in all aspects of the course, directing environmental science and engineering, including participating in practical teaching solutions, teaching programs, teaching students senior thesis, directing student interns, industry experts to participate in laboratory and experimental courses, and industry experts to guide teachers in the field; On the other hand, the cooperation between the schools and the enterprise in the construction of the network teaching resources, namely, the enterprise is aimed to open the real database resources to the schools in a specific way, and the students are able to master the real database of the enterprise through the network in the course of completing open experimental courses, graduations, graduation papers and professional simulation experiments, and the practical teaching effect is more realistic and effective.

**6. The training of engineering application ability is highlighted in the "in-depth development" of strengthening cooperation**

With the aim of serving the needs of local economic and social development, with the aim of supporting the development of pillar industries and strategic emerging industries in jiangsu province, with the "in-depth development" of cooperation between universities and enterprises in environmental science and engineering as the basis, the main line of engineering application ability training should be highlighted. External experts can be invited to participate in the demonstration of environmental science and engineering talent training programs, the construction of campus practice bases, the horizontal research of school-enterprise projects, the construction of laboratories, the compilation of school-based teaching materials, and the training of teachers. They can undertake professional core courses, embedded practical courses, practical training, innovation and quality development activities, teachers' basic research and training, and jointly develop practical teaching resources for environmental science and engineering majors, and further deepen the cooperation between school-enterprise. To strengthen the development of applied enterprise courses and skills courses; To take full advantage of the role of the off-campus industry expert, to participate in the development of the curriculum, the development of the base, the development of teaching resources, the development of the two types of teachers; To fully implement the role of the school's cooperation platform, to conduct all-round practical teaching; Through the limitations of the existing thought, there will be a great breakthrough in the cooperation of school enterprises, the cooperation between school enterprises, the study of the degree of cooperation between school and enterprises, and the contractual cooperation.

 

**7. A school-enterprise cooperative practical teaching system for science and engineering majors is innovated.**

Around the engineering applied environmental science and the new target of personnel training, focusing on innovative ability training to construct new practical courses system[7]. ①Embedded practice courses: the embedding of industry expert talks in classroom teaching, or the hiring of professional skills courses to be taught independently by industry experts; ②Laboratory course: in experimental course teach, that real database provided by the cooperative enterprise is obtain through the network, so that the experimental results are more realistic and effective, the experimental courses of individual links can also be recruit by industry experts. ③Thesis of graduation: it is required that the two mentoring rates should not be less than 25%, which is mainly the subject of a graduation project or a real subject; ④Graduation practice: more than 70% of students are required to enter education cooperation base for internship, and actively create conditions for employment. The enterprise is equipped with special internship instructors to cooperate with the work of school team teachers. ⑤Enterprise course: the enterprise shall set the curriculum content according to the needs of the talent training, and the enterprise shall be assigned experienced industry experts to teach, the students will then enter into the enterprise for the graduation internship, and some students will leave the employment, so that the practice courses, practice and employment organic shall be combined together, and the actual operation effect is good; ⑥Practice week course: students will enter into the cooperation base according to the selection to conduct a subject investigation and study to complete the task of the practice week; ⑦Activities of social practice, including the practice of after-school innovation courses, as well as other practical activities; ⑧Transversal cooperation: students shall undertake the transversal tasks of enterprises under the guidance of teachers, and improve the students' social investigation and scientific research ability.

**8. The resources of the practical teaching reference room is built jointly**

We signed an agreement with the school-enterprise cooperation unit, donated books and materials, and jointly built the laboratory. In consultation with the school-enterprise cooperation unit, we will jointly build a comprehensive practical training program for science and engineering majors of "invite enterprises to campus", and promote the construction of a campus practice base. We will write a textbook, and we will write a textbook in the course of applied enterprises, which is a course of expertise, and we will build an industry expert resource. In accordance with the needs of professional construction and adjustment, we expand the range of industry experts, establish an expert resource pool, and we need to hire experts on the basis of practical teaching.

**9. The practice teaching mode innovation development is supported**

In 3-5 years, we will cultivate a group of "double-teacher" science and engineering teachers with practical experience. According to the characteristics of science and engineering, taking a long-term engagement and a short-term basis, we invite entrepreneurs, experienced executives, well-known alumni, economic research specialists to lecture or lecture. At the same time, it is through the form of corporate employment, apprenticeship, part-time waiting to improve the practical teaching capacity of young teachers, inspiring young teachers to participate in the industry qualification exam and obtain the industry qualification certificates; Through the planned introduction of dual-teacher teachers, the scale of double-teacher, double-ability and double-certificate teachers will be rapidly improved. Lead that teacher to conduct investigation and research on the situation of science and engineer in the area and increase the students' perceptual knowledge and concern about local enterprise science and engineer.

In conclusion, practical teaching is an important teaching link which is indispensable to culture environment science and engineering professionals. The main purpose of environmental practical teaching is to improve the students' ability to understand problems and solve problems, to stimulate innovative thinking, to explore and innovate knowledge, to cultivate high quality environmental protection talents for economic construction.

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