

# The Curriculum of the "Water Treatment Engineering Technology" Development Design and Implementation based on the Professional Ability

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**ABSTRACT:** According to the curriculum development based on professional ability oriented thought, this paper was aim to improve the construction of higher vocational course "water treatment engineering and technology" on teaching contents, teaching organization, teaching mode, teaching method and means. To formed a new curriculum "water treatment engineering" by the learning areas, project learning, learning tasks, learning situation and learning tools, learning methods, learning requirements, etc, which met the requirements of professional post professional ability.

**KEYWORD:** Vocational ability oriented; Teaching content; Teaching method and means; Curriculum reform

## 1 GENERAL INSTRUCTIONS

"Water Treatment Engineering Technology" is one of the major professional skills courses of Water Supply and Drainage Engineering Technology in architectural vocational colleges. By learning the curriculum, so that students mastered the basic knowledge of the operation of water treatment facilities management and maintenance with water treatment equipment operation management and maintenance capabilities to meet the water supply and sewage treatment plant (station) runs technician job requirements. Before the development of new curriculum design, the curriculum was curriculum-based knowledge system, which emphasized professional theory and with outdated teaching materials, teaching means was single. The content and structure of the course did not meet the professional competence of the professional positions technician running water requirements. Therefore, it is necessary to improve the course content, teaching methods, teaching methods, teaching evaluation reform of the curriculum, to form the "Water Treatment Engineering

Technology" course based on "professional competence-oriented" getting started.

## 2 CURRICULUM DEVELOPMENT AND DESIGN GUIDELINES

Closely to the typical drainage Water Supply and Drainage Engineering Technology jobs which were analyzed by the supply and drainage industry companies, a clear core competencies and specific job requirements, in accordance with the curriculum building "to learn what to do, fill up what we lack, to hand out what was demanded" requirements. According to the course construction ideas "Professional Career Job Analysis of Professional Competence → Quality Analysis → Knowledge Structure Analysis", professional development was designed to meet the training objectives of the course modules and builder core competency training curriculum which meet the job requirements. Career Services jobs programs, ability and knowledge of professional positions analysis were shown in Table 1.

Table 1 Course professional positions corresponding for the ability and knowledge analysis

Occupational status	Professional core competencies	The main areas of knowledge
Water companies Operation Management Technician	1. Water treatment project management 2. Collected data 3. Technological innovation and technological innovation 4. Communication skills	1. Engineering drawing principles and reading methods 2. Sewer basic principles and methods of engineering 3. Water treatment methods and processes 4. Computer Application Technology 5. Humanities and social science

### 3 THE REFORM OF TEACHING CONTENT

Accordance with the "professional competence oriented" curriculum development and design guidelines, reconstructed the contents of the original course. Then selected the course content was based on the analysis and the ability to post jobs on the basis of standards. Professional attitude and quality of content should be carefully designed and throughout knowledge and ability to learn throughout the entire training process. As a study in the field of water treatment engineering, water plant was run by technicians and sewage treatment plants was run technician career job learning areas would be divided into two study programs: water treatment technologies and wastewater treatment technologies, and then to divide the working process of learning professional positions unit. Namely water plant and sewage treatment plant processes each processing unit as a learning unit. Each unit of study was based on professional competence to determine the occupational status of learning tasks. Each learning unit was independent and could be used alone to complete the learning task each learning unit. A unit of learning could proceed after learning the task was completed before next unit study. Complete a study unit after learning tasks students could have individual professional capacity to complete the learning task all students after learning units required to have professional positions comprehensive vocational ability to meet the requirements of professional positions.

For example, learning the grill unit, learning tasks was given according to the sewage treatment project and design treatment process, selected the appropriate grille. This task include the work process equipment manufacturers and other technical, economic analysis of samples collected and screened grille, process calculations, model selection and between different models, which was the true reflection of the actual work. Students learned to choose specific projects under the grill while the grill master role, type, knowledge of performance parameters and operation management, to made the "doing" and "learning to do" the effective combination.

### 4 THE TEACHING MODE REFORM

Based on three parts replacement, integrated theory with practice, field practice teaching mode, and this reform highlighted the positions and the cultivation of vocational ability.

Theory + experiment period: Priority with theoretical study. The experimental teaching was complementary, done by professional teachers teaching. Through learning that the technology of

water treatment project in different projects, different tasks of treatment process, structure, function, structure, operation, management knowledge learning, doing high school, learning by doing. Students were able to perform simple water treatment process design, to grasp the operation of the small and medium-sized water treatment station management experience.

With post training session: Students were into the water supply and drainage operation units, in the form of study group to the teacher, help, take the way of study on operating experience, technology of water treatment project in different projects, different tasks of treatment process, structure, function, structure, operation, management knowledge learning, doing high school, learning by doing. Able to perform simple water treatment process design, to grasp the operation of the small and medium-sized water treatment station management experience.

Field training stage: Arranged students to participate in the organization's qualification examination, professional qualification appraisal center for water quality inspection work, water purification, sewage treatment, sludge treatment, such as qualification certificate, in the hillock training into the field on the basis of field work, and learning and vocational qualification certificate courses, for students' field practice and employment created good conditions.

### 5 THE TEACHING METHOD AND MEANS REFORM

In accordance with the characteristics of vocational teaching methods of vocational education, for the purpose of training highly skilled personnel application-oriented, actively explored new teaching methods of reform initiatives, such as the use of multimedia digital teaching, online teaching, project teaching method, experimental training synchronous teaching, new technical seminars teaching, research study teaching, flexible traditional teaching methods, which gave new meaning to the traditional teaching.

#### 5.1 *Multimedia digital teaching*

The course of "Water Treatment Engineering Technology" involved a lot of process principles, theoretical analysis, system installation and commissioning of the construction process, structures and process equipment operation, which were difficult to use traditional teaching manifested. So that used multimedia assisted teaching demonstration system, teaching maps, text, sound illustrated. Showed some of the structures of the type, structure through some animation process

could increase teaching intuitive and vivid so that students had a sense of integration of engineering practice, to stimulate student interest and initiative.

### 5.2 *The experiment and teaching practice synchrony*

In line with the program's implementation, used experimental training synchronous approach, which was site visits, laboratory tests, training inside and outside the field of small cope with the completion of the task of teaching in a certain part of the contents of lectures, for combining theoretical lectures and practical teaching closely. Enhance students' understanding of the content of the classroom through the practice of teaching to consolidate what they had learned in the teaching content. Used a lot of practicing teaching for content-rich teaching, deepen teaching effectiveness. Students were trained to analyze problems and improve problem-solving abilities. For example, when mentioned coagulation theory, supporting the students to the coagulation laboratory experiments; mentioned in the sludge treatment, arranged students for visiting the nearby sewage treatment plant sludge treatment equipment, on-site teaching so that students had learned the course with a deeper impression.

### 5.3 *Project teaching*

Courses were in different ways or treating method for the teaching unit. Using the project approach to raise an issue for students around the ways and means and solve the problem analysis, so as to achieve the purpose of teaching. Teachers introduced the project examples to students for judging the technical and economic conditions which could achieve a very good effect. In the aspects of course design used of the project approach, the students could be into the process of completion of project tasks. Mobilized student initiative greatly, participation and the spirit of exploration, made them thinking independently, unity, cooperation, imagination and creativity, exercise effectively and improved their professional skills.

### 5.4 *New technology lecture teaching*

Modern water treatment technology developed rapidly and the new process of various kinds were springing up constantly. At the forefront of teaching with drainage treatment industry professionals, water treatment plants (station) operation experts imparted skillful craftsman to school teaching. Through on-site interaction, students put forward questions for experts and field personnel to answer.

### 5.5 *Teaching Evaluation Reform*

Improved the form and the purpose of students' homework, the intent was to understand and master the teaching, content, and use. The job could be in the form of a question in class, the machine operation was complete CAD drawing graphics and processes. Homework was no longer confined to reflection questions and exercises on the books, but let students participate in training content to the actual research project title solutions to the problem, with the theme of teacher research projects into laboratory experiments analyzing the data, and so on. Took the exam question bank, randomly selected by the College Dean, there was no change in the exam form, but focus on the content of the examination to grasp the basic concepts of the field of water treatment engineering and the ability to solve practical problems. Increase the content of the examination experimental training aspects, emphasizing the abilities of students. Final exam was scored only 70% of the total, usually synchronous experimental training, operations accounted for 30%, in order to highlight the learning process usually practical engineering experiment and training, operations courses, researched study issues such as participation, discovery site practical issues, problem-solving abilities.

## 6 CONCLUSION

The curriculum is the core of vocational education and teaching reform, based on the "professional competence-oriented" curriculum development, designed to meet the trend of vocational education curriculum reform and development. The original curriculum reform of "Water Treatment Engineering Technology" course strengthened the ability of students in vocational teaching content, teaching mode, teaching methods, teaching evaluation, through study courses, students mastered the management and operation of water treatment facilities basic knowledge of maintenance, had the ability to management and operation of water treatment equipment maintain and met water supply and sewage treatment plant (station) technician requirements.

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