

# *An Analysis on the Teaching Elements and Mechanism of Water Resources Planning and Utilization Course based on Work Orientation*

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**Abstract:** With the increasing requirements of planning, utilization, management and protection of water resources, students majoring in water conservancy and hydropower engineering need to have deeper knowledge and practical application ability of water resources utilization. This paper aims to deeply discuss how to construct a course of water resources planning and utilization based on work orientation, improve students' understanding and application ability of water resources development, utilization, conservation and protection, so as to enhance students' comprehensive quality and career competitiveness. This paper first introduces the job-oriented teaching method and analyzes its applicability in the course of water resources utilization. Then, the key elements of water resources planning and utilization course are discussed in detail, including course objectives, case analysis, course content updating, and corresponding teaching mechanism. Finally, how to effectively apply these elements and mechanisms to the water resources planning and utilization courses of water conservancy and hydropower engineering majors is proposed to provide students with a more forward-looking and practical educational experience.

## 1. Introduction

With the increasing shortage of water resources and frequent water crises, the importance of water resources planning and utilization has become increasingly prominent. In order to meet the social demand for water resources talents, the work-based water resources planning and utilization course came into being. This teaching mode aims to combine theoretical knowledge with practical skills to improve students' practical operation ability and problem-solving ability. This paper will explore the teaching elements and mechanism of the work-based water resources planning and

utilization course.

The course of water resources planning and utilization is an important professional course for water conservancy majors. This course aims to help students broaden their professional knowledge, build a complete knowledge structure system, and strengthen the ability to combine theory with practice. Through the study of this course, students can systematically master the basic concepts of water resources utilization and water conservancy planning, basic principles of planning and related analysis and calculation methods. Therefore, how to develop, utilize, save and protect water resources is very important for students majoring in water conservancy and hydropower engineering, and knowledge related to water resources planning and utilization is essential [1-2].

## 2. Work Oriented Teaching Methods

The job-oriented teaching method focuses on the combination of theoretical knowledge and practical work scenarios, so as to better cultivate students' practical application ability and make students more confident and competitive in facing future learning and work challenges [3]. Work-based water resource planning and use courses can be taught in the following ways:

(1) Case teaching method: For specific water resources planning and utilization projects, select actual cases for analysis and discussion. This method can help students combine theoretical knowledge with practical application, improve students' analytical ability and problem-solving ability. The case can involve many aspects such as profit calculation, flood control calculation, water energy calculation and reservoir optimization operation.

(2) Project-driven method: Teachers or student teams can undertake actual water resources planning and utilization projects, and drive teaching through the implementation process of the project. Under the guidance of teachers, students can participate in the planning, design, implementation and management of the project, so as to fully master the practical skills of water resources planning and utilization.

(3) Role-playing method: simulate the actual working environment of water resources planning and utilization, and let students play different roles, such as planners, engineers, managers, etc., to make simulated decisions and operations. This method can help students better understand the actual operation process of water resources planning and utilization, and improve the ability of teamwork.

(4) Field study method: Organize students to visit the actual water resources planning and utilization project site to understand the implementation and operation effect of the project. Through field visits, students can more intuitively understand the actual operation process of water resources planning and utilization, and deepen their understanding of the course content.

(5) Online learning and communication: the use of modern information technology, such as online courses, online forums, etc., to provide students with a variety of learning resources and communication platforms. Students can learn the course content online, and have real-time communication and discussion with teachers and classmates to improve learning results.

These teaching methods can be used alone or in combination to achieve the best teaching results. At the same time, teachers should flexibly adjust teaching methods and strategies according to the actual situation and needs of students to ensure the quality and effect of teaching.

The strength of the work-oriented approach is that it combines theoretical learning with practice, enabling students to better understand and respond to complex water management challenges. In this way, students not only gain theoretical knowledge, but also accumulate practical work experience and improve their competitiveness in the professional field. This educational method helps to mold hydraulic and hydropower engineering professionals with comprehensive qualities and lay a solid foundation for their future successful careers [4].

### 3. Teaching Elements of Job-Oriented Water Resources Planning and Utilization Courses

The teaching elements of job-oriented water resources planning and utilization course mainly include teaching objectives, teaching contents, teaching methods, teaching evaluation, teaching resources and teachers. These elements are interrelated and interact with each other to form a complete teaching system [5].

**Teaching goal:** The teaching goal should be clearly defined in the work-oriented teaching mode, that is, to cultivate students' practical ability, problem-solving ability and teamwork spirit. Through the course study, students can master the basic theory and practical skills of water resources planning and utilization, and have the ability to independently complete water resources planning and utilization projects.

**Teaching content:** The teaching content should be closely combined with the actual work needs, including water resources assessment, water resources planning, water resources management, water resources protection and other aspects of knowledge and skills. At the same time, we should pay attention to the combination of theory and practice, through case analysis, practical operation and other ways, so that students can better understand and apply the knowledge.

**Teaching methods:** A combination of various teaching methods, such as teaching, discussion, case analysis, practical operation, etc. Through a variety of teaching methods, stimulate students' learning interest and enthusiasm, improve students' participation and learning effect.

**Teaching evaluation:** Teaching evaluation should be based on work orientation and pay attention to the evaluation of students' practical ability and problem solving ability. Project assessment, practical operation assessment and other methods can be used to comprehensively evaluate students' learning results.

*Table 1. Teaching elements of job-oriented water resources planning and utilization courses*

Teaching element	Description
Curriculum objectives and learning outcomes	The knowledge and skills that students should have at the end of the course are clearly expounded, including the comprehensive utilization of water resources, the calculation of reservoir profit regulation, the calculation of flood control regulation, the calculation of water energy and the optimal operation of reservoir groups
Course content and module division	The content of the course is divided into different modules or units, each module is developed around a specific subject or water-related issue, and there is coherence between the modules to help students build a body of knowledge
Teaching materials and resources	Choose materials that are practical, diverse and up-to-date. Use case base, case study, expert lectures and other auxiliary teaching resources

## 4. Teaching Mechanism

### 4.1 Industry-University-Research Cooperation Mechanism

Establish an industry-university-research cooperation mechanism, and cooperate with enterprises and scientific research institutions to carry out the teaching of water resources planning and utilization courses. Industry-university-research cooperation mechanism plays an important role in the teaching of water resources planning and utilization. It can combine theoretical knowledge with

practical experience, provide students with a real and vivid learning environment, and help to cultivate students' practical ability and innovative spirit. There are several specific ways:

(1) Establish a framework for cooperation

First of all, the university should establish a clear cooperation framework with relevant enterprises and research institutions, and clarify the goals, contents and methods of cooperation. The cooperation framework can include many aspects, such as joint research and development projects, student internship and practical training, and faculty research cooperation.

(2) Enterprise practice training

The school can arrange students to conduct practical training in cooperative enterprises, so that students can personally participate in the actual work of water resources planning and utilization. Enterprises can provide students with practical opportunities and guidance to help students apply their knowledge to practical work. At the same time, schools can work with enterprises to develop internship and training plans to ensure the quality and effect of internship and training [6].

(3) Joint research and development projects

The school can jointly carry out research and development projects in the field of water resources planning and utilization with enterprises and research institutions. Through the implementation of the project, the school can understand the latest technological trends and market demands, and provide strong support for teaching. At the same time, students can also participate in the research work of the project to improve the research ability and practical experience.

(4) Faculty research cooperation

Schools may encourage teachers to conduct scientific research cooperation with experts from enterprises and research institutions, and jointly carry out research in the field of water resources planning and utilization. Through research collaboration, teachers can learn about the latest research results and technological developments, providing new content and perspectives for teaching. At the same time, scientific research cooperation can also promote the contact and exchange between teachers and enterprises and research institutions, and lay a good foundation for industry-university-research cooperation.

(5) Establish an information sharing platform

The university can jointly establish an information sharing platform with enterprises and research institutions to share the latest research results, technological developments and market information in the field of water resources planning and utilization. Through the information sharing platform, schools can timely understand the development trend of the industry and market demand, and provide strong support for teaching. At the same time, students can also learn about the latest technological developments and market demands through the information sharing platform to prepare for future career development.

(6) Evaluation and feedback

Establish an evaluation and feedback system of industry-university-research cooperation mechanism, regularly evaluate the effect of cooperation, and adjust and optimize according to the evaluation results. At the same time, students and teachers are encouraged to provide feedback on the industry-university-research cooperation mechanism in order to continuously improve and improve.

Through the above measures, an effective industry-university-research cooperation mechanism can be constructed to provide strong support for the teaching of water resources planning and utilization. This mechanism can not only improve students' practical ability and innovative spirit, but also promote the contact and communication between schools and enterprises and research institutions, and promote the development of water resources planning and utilization.

## 4.2 Practical Teaching Mechanism

The establishment of practical teaching mechanism, through practical operation, practice and training, so that students can apply the knowledge in practical work, aimed at helping students to combine theoretical knowledge with practical application, improve their practical ability and problem-solving ability. At the same time, strengthen the supervision and management of practical teaching links to ensure the quality of practical teaching. This can be done in the following ways:

### (1) Clarify practical teaching objectives

Practical teaching should make clear the teaching objectives and ensure that it complements the theoretical teaching content of the course. These goals can include cultivating students' practical operation ability, problem solving ability, teamwork spirit and comprehensive management ability of practical projects.

### (2) Design practical teaching content

The content of practical teaching should be closely related to the actual needs in the field of water resources planning and utilization, including field investigation, experimental operation, project design, simulation and other forms. For example, students can be arranged to visit reservoirs, hydropower stations and other practical projects to understand the actual operation process of water resources planning and utilization; Or through simulation software for water resources planning and utilization simulation experiments, so that students can personally experience the whole process of project planning and management.

### (3) Establish a practical teaching base

The school may cooperate with relevant enterprises and research institutions to establish practical teaching bases. These bases can provide students with a real practical environment, allowing them to participate in the planning, design, implementation and management of real projects. At the same time, the practical teaching base can also provide students with stable practical opportunities and guidance.

### (4) Strengthen the construction of practical teaching teachers

Practical teaching requires a team of teachers with rich practical experience and teaching ability. Schools can introduce teachers or experts with practical work experience, or organize existing teachers to conduct practical training to improve their practical teaching ability.

### (5) Improve the practical teaching evaluation system

Practice teaching evaluation is an important means to ensure the quality of practice teaching. The school should establish a perfect practical teaching evaluation system to comprehensively evaluate the students' practical achievements. The evaluation can include many aspects, such as the standardization of practical operation, the ability to solve problems, and the performance of team cooperation. At the same time, we can also introduce external evaluation subjects such as enterprises and research institutions to objectively evaluate the quality of practical teaching.

### (6) Strengthen the combination of practical teaching and theoretical teaching

Practice teaching and theory teaching should connect and promote each other. Teachers can introduce practical cases and practical problems in theoretical teaching to stimulate students' learning interest and motivation; At the same time, the theoretical knowledge can also be consolidated and applied in practice teaching.

### (7) Encourage students to participate in research projects and practical activities

Students are encouraged to participate in scientific research projects and practical activities in the field of water resources planning and utilization, such as participating in academic competitions and scientific and technological innovation projects. These activities can help students broaden their horizons, improve their practical ability, and lay a good foundation for their future career development.

Through the above measures, an effective practical teaching mechanism can be constructed to provide strong support for the teaching of water resources planning and utilization. This mechanism can not only improve students' practical ability and problem-solving ability, but also promote the contact and communication between schools, enterprises and research institutions, and promote the development of water resources planning and utilization [7].

### 4.3 Teaching Team Construction Mechanism

Strengthen the construction of teachers, improve their professional quality and practical ability. Through the introduction of outstanding talents, training and other ways, to build a team of teachers with rich practical experience and teaching ability.

### 4.4 Course Updating Mechanism

The course of water resources planning and utilization is a dynamic field, and the technologies, methods and concepts involved are constantly evolving with the progress of The Times and the development of practice. It is necessary to timely adjust and update the course content according to the latest development and demand in the field of water resources planning and utilization, and strengthen the cross-integration with other disciplines to expand the horizon and depth of the course. Therefore, establishing an effective course updating mechanism is very important to ensure the timeliness and practicability of the course content. This can be done in the following ways:

#### (1) Evaluate course content regularly

The course content is regularly evaluated to identify parts that are outdated or no longer applicable. This can be done through discussions within the faculty team, student feedback, review by industry experts, etc. The evaluation results will be an important basis for course updating.

#### (2) Track industry development and technological progress

Keep an eye on the latest developments in water planning and use, including technological developments, policy changes, and market trends. By attending academic conferences, reading professional journals, paying attention to industry organizations, etc., we can obtain the latest industry information in a timely manner and integrate it into the course teaching.

#### (3) Introduce new teaching methods and means

With the continuous development of educational technology, new teaching methods and means continue to emerge. Curriculum updating mechanism should encourage teachers to try and introduce these new teaching methods and means, such as online teaching, blended teaching, project-based learning, etc., in order to improve teaching effect and learning experience.

#### (4) Student needs and feedback

Students' needs and feedback are an indispensable part of the curriculum updating mechanism. By collecting students' opinions and suggestions on a regular basis, understand their expectations and satisfaction with the course content, and adjust and improve accordingly based on this feedback.

#### (5) Set up a course update group

Set up a dedicated curriculum renewal team responsible for collecting, collating and evaluating new teaching content and teaching methods. The group can meet regularly to discuss course update plans, ensuring that course content is always up to date.

#### (6) Maintain close contact with industry partners

Liaise closely with industry partners (e.g., enterprises, research institutes, etc.) to work together on course updates. These partners can provide the latest practical experience and case studies to provide strong support for course renewal.

#### (7) Make course renewal plans

Develop a specific course update plan based on course evaluation results, industry developments, and student needs. The plan should include the content, schedule and implementation of the update to ensure the orderly progress of the curriculum update.

(8) Continuously monitor and evaluate the effect of curriculum update

Continuous monitoring and evaluation of the teaching effect after curriculum update to ensure the quality and practicality of the updated content. If the update effect is not satisfactory, the update strategy should be adjusted and improved in time.

Through the above measures, an effective water resources planning and utilization course updating mechanism can be built to ensure the timeliness and practicability of the course content, improve the teaching quality and students' learning effect.

## 5. Conclusion

It is of great significance to explore the teaching elements and mechanism of work-oriented water resources planning and utilization courses for improving the training quality of water conservancy personnel. By clarifying teaching objectives, optimizing teaching contents, innovating teaching methods and improving teaching evaluation, the paper constructs the teaching model of water resources planning and utilization based on work orientation. At the same time, strengthen the mechanism construction of industry-university-research cooperation, practical teaching, teacher team construction and curriculum update, so as to provide a strong guarantee for training water conservancy talents with practical operation ability and problem solving ability.

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## Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

## Conflict of Interest

The author states that this article has no conflict of interest.

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