

# Application of Project-driven Teaching Method in Irrigation and Drainage Engineering

Huiyan Gao, Yijin Ren, Hongquan Liu, Chunling Chai, Renqiang Chen, Sutao Liang

Hebei Agricultural University, Baoding, 071001, China

---

**Abstract:** Irrigation and Drainage Engineering is the core compulsory course of agricultural water conservancy engineering. It is professional and practical, cultivating students' ability of planning and design and practice. The traditional teaching method cannot integrate theory with practice well. Therefore, based on the current situation of agricultural water conservancy project teaching in Hebei Agricultural University, Application of project-driven teaching method for Irrigation and Drainage Engineering was discussed in paper, and the main teaching design process was put forward, which provides reference for further deepening the teaching reform of Irrigation and Drainage Engineering.

**Keywords:** Irrigation and Drainage Engineering, Project-driven teaching method, Teaching reform.

---

## 1. Introduction

Water conservancy is the lifeline of agriculture, the cornerstone of food production, and the decisive factor of agricultural ecological environment and rural economic. A series of measures were taken to improve the backward status of small-scale farmland water conservancy infrastructure in China from 2009. The demand for agricultural water conservancy professionals gradually increase. In order to cultivate applied engineering and technical talents with innovative entrepreneurship and strong practical ability to adapt to social and economic development, with basic theory and knowledge and skills of agricultural water conservancy engineering discipline, based on the current teaching situation of Irrigation and Drainage Engineering, the application of project-driven teaching method was actively explored for irrigation and drainage engineering in paper.

The project-driven teaching method is a typical student-centered teaching method. This method is holistic, comprehensive and exploratory. It is very important for students to exercise their practical ability by using new learning knowledge and skills and learning while doing. Compared with the traditional teaching method of "transfer-acceptance", it can stimulate students' interest in learning, and the theoretical knowledge and practical process of learning can be better combined. While imparting knowledge, it also cultivates students' comprehensive abilities such as self-learning ability, innovation ability, analysis ability and team cooperation [1].

Irrigation and Drainage Engineering is a science that uses Irrigation and Drainage Engineering measures to regulate farmland water status and change, regulate regional water conditions, eliminate flood and drought disasters, rationally and scientifically utilize water resources, and serve the development of agricultural production [2]. In Hebei Agricultural University, Irrigation and Drainage Engineering is usually arranged in the seventh semester, 48 class hours, and 3 credits. Before learning this course, students have mastered the basic courses or professional courses, such as hydraulics, soil mechanics, hydrology, engineering geology and hydrogeology, soil and agriculture, groundwater utilization, water resources planning and management, hydraulic structures and so on, and have a basic understanding

of agricultural water conservancy engineering. It provides sufficient theoretical support for the application of project-driven teaching method in the course of Irrigation and Drainage Engineering.

## 2. Teaching Objective and Problems in Current Teaching

The teaching objective of irrigation and drainage engineering enables students to understand and master the basic principles of irrigation and drainage, the planning and design methods of irrigation and drainage system and the basic knowledge of irrigation and drainage engineering management, and to understand the new technologies and development trends at home and abroad in the field of irrigation and drainage engineering; to enable students to engage in planning, design, construction and management of farmland water conservancy projects, can independently undertake the planning, design and irrigation and drainage management of small and medium-sized irrigation areas. The teaching objectives of the course include three aspects: knowledge, ability and quality. Students should master the basic theories and principles related to irrigation and drainage, such as crop water requirement, irrigation system and water balance principle and so on. In terms of ability, students should have the ability to design, construct and manage irrigation and drainage projects; mentioned quality, students should have professional quality requirements for future work, with physical quality, humanistic quality and scientific literacy and harmonious and sound personality; correct values and analytical judgment ability, strong sense of social responsibility; understand the basic requirements of agricultural water conservancy project for hard work, clear the connotation of basic professional ethics and related laws and regulations, and earnestly abide by in practice[3].

Irrigation and drainage engineering is an interdisciplinary subject of engineering and agriculture. It is comprehensive, covers a wide range, and the teaching content is too trivial. The traditional transfer-accept teaching method is adopted. Through multimedia courseware teaching, students learn specific knowledge points or knowledge fragments, and the learning process is boring [4]. It is the key to solve the problem that teachers motivate students' enthusiasm in class

and let students use the knowledge of other subjects to learn this course without feeling boring. The cognitive process of “from practice to practice” is implemented in teaching, and the fragmented knowledge learned by students is systematized to form a knowledge tree. Through the study on project teaching method, it is applied to the teaching process of irrigation and drainage engineering. It can not only effectively improve students' learning and mastering of irrigation and drainage engineering related knowledge, but also actively promote students' autonomous learning ability, innovation ability, thinking ability, practical ability and other comprehensive ability.

### 3. Application of Project - driven Teaching Method

Project-driven teaching method is a teaching method that the basic knowledge and teaching content of the course form a project to train specific skills, organizes students to practice the project process, and comprehensively evaluates the project results according to the teaching objectives of the course. Among them, the construction of the project is the core of the teaching method. In the process of applying the project-driven teaching method, the traditional thinking should be broken, take the first-line work of irrigation and drainage engineering planning and design and construction management as the guidance, and allocate the relevant theoretical knowledge in the course to each project according to a certain regulation [5]. The selected project is best consistent with the actual project, so that students can understand that the results of engineering design have a certain practical value. According to the students' mastery of knowledge to provide the design content of appropriate difficulty, which can not only make students have a certain enthusiasm, but also won't attack their confidence because the design is too complex. The designed project topics are as simple as possible and easy to understand, such as the design of low-pressure pipeline irrigation project in an irrigation area and the design of sprinkler irrigation project in a certain area. By the actual project, it is beneficial for students to digest theoretical knowledge in practice [6]. The application of project-driven teaching method in irrigation and drainage engineering is divided into the following steps.

#### 3.1. Preparation before Class

Project-driven method is a typical student-centered teaching method. In preparation before class, teachers need to have a full understanding of the basic knowledge of students. Through the theoretical teaching in class, students can understand and master the knowledge of irrigation and drainage, especially the knowledge of definition, principle and planning and design, such as the principle of farmland irrigation, irrigation methods and irrigation technology, and the planning and design of irrigation and drainage system. Students need to have a certain understanding and mastery of the planning and design of irrigation and drainage engineering, especially the understanding and application of formulas. Teachers introduce the current design specifications such as 《Irrigation and Drainage Engineering Design Standards》(GB 50288-2018), 《Water-saving Irrigation Engineering Technical Specifications》(GB/T 50363-2018), 《Sprinkler Engineering Technical Specifications》(GB/T 50085-2007), 《Micro Irrigation Engineering Technical Standards》(GB/T 50485-2020), 《Pipeline Irrigation

Engineering Technical Specifications》(GB/T 20203-2017),etc. So that students establish the design concept of project planning and design based on specifications. Through engineering examples, such as the planning and design schematic diagram, design process and design content of an irrigation area, students can have a general understanding of the planning and design of irrigation and drainage projects, so that students can know what knowledge they need in the actual project planning, and carry out purposeful learning and thinking for the design needed, so as to improve their autonomous learning ability.

#### 3.2. Practice Phase

First of all, randomly divided into groups of 4 to 5 people, each group elected one as the leader, can exercise students' organization, leadership, teamwork and creative ability, and the competition between groups can stimulate the morale of students, so that students can take the initiative to think and learn for the achievement of the team. Secondly, according to the progress of the course, five projects including crop water requirement and irrigation system, lawn sprinkler irrigation engineering design, drip irrigation engineering design, low-pressure pipeline water delivery irrigation engineering design, and irrigation channel planning and layout of M irrigation area were successively released. After each group received the project task, the teacher explained the project task in detail, including the main content of the project; knowledge, theories and reference design specifications needed to complete the project tasks; project implementation steps and submission results [7]. Adopt objective management, project task driven way, improve students' enthusiasm and initiative in learning, listen carefully in class, positive thinking. After class, group cooperation and independent division of labor will further consolidate and review the knowledge and theories learned in class, and independently expand the relevant design specifications for learning, so that students can better grasp the knowledge and form a knowledge tree when completing the project. Discuss with group members, communicate with each other and consult teachers to improve students' ability to communicate with others. In the process of project execution, students' ability to use Word, Excel and other office software and CAD drawing software was improved.

In the process of project implementation, teachers should do a good job of supervision and management, ensure that students carry out the work according to the plan, and ensure that students participate in the project process, so as to deepen the memory and understanding of knowledge. At the same time, teachers should do a good job of guidance, provide detailed answers to the questions raised by students, and combine the contents of other professional courses to form a comprehensive understanding of the whole subject knowledge, and build a professional horizontal and vertical knowledge system.

#### 3.3. Evaluation Phase

It is different between project-driven teaching method evaluation and the traditional result-oriented evaluation, which should not only evaluate students from the project results, but also carry out comprehensive evaluation from the contribution and performance of each student in the implementation of the project, that is, adopt the evaluation method combining the process and result evaluation. In the process of project acceptance, students should provide necessary design drawings and design reports by simulating

the acceptance in the real situation. The total evaluation includes Students' self-evaluation, group evaluation, inter-group evaluation and teacher evaluation, which account 15%, 20%, 20% and 45% respectively [8]. Teachers organize the defense, and each group sends one representative to explain their own engineering design and show their design results, accept questions from teachers and students, and finally determine the final result of each group according to the performance above. Finally, teachers give corresponding evaluation according to the design results of each group, analyze the design advantages and disadvantages of each group and the methods to solve difficult problems in each design stage, help students better understand the essence of the whole project design, and give reasonable suggestions, and give certain praise and reward to the team with good design. Through the project-driven method plus theory assessment, design assessment method, can better mobilize students' interest in learning and independent thinking ability, improve classroom participation, and truly return the classroom to students.

#### 4. Conclusion

The application of project-driven teaching method in the teaching of Irrigation and Drainage Engineering can improve students' interest in learning, enable them to actively explore and acquire knowledge and to apply the knowledge they learn to their future work, to enhance students' teamwork ability and hands-on ability; shorten the distance between students and teachers. Therefore, project-driven teaching method is a teaching method combining theory with practice, which can benefit both teachers and students. It can greatly improve the teaching effect and promote students' mastery of knowledge. It has reference significance for Irrigation and Drainage

Engineering and other courses of agricultural and water conservancy engineering.

#### Acknowledgment

The second batch of first-class undergraduate courses (42) and teaching research project of Hebei Agricultural University (2021sz07) is funded.

#### References

- [1] Bai Yu.2014. Application of project teaching in agricultural curriculum[J]. Time Education. 3-107.
- [2] Shi Haibin. etc. Irrigation and drainage engineering [M]. Beijing: China Water and Power Press, 2006.
- [3] Gao Huiyan, Qian Zhihong, Feng Lijun. etc. 2020. Revision of training objectives of agricultural hydraulic engineering specialty under the background of engineering education specialty certification [J]. Science and Technology Journal (Electronic Edition). 35:7-8+71.
- [4] Hou Huijing. Exploration on Teaching Reform of Irrigation and Drainage Engineering in Agricultural and Forestry Universities[J]. Survey of Education, 2015, (11):107.
- [5] Xu Yingli. Exploration on Project Reform of Irrigation and Drainage Engineering Technology Course [J].Chinese New Technologies and Product,2012,( 17):111.
- [6] Luo Chunyan. Application of Project Teaching Method in Water Saving Irrigation Theory and Technology Teaching [J]. Education Forum, 2016, (17): 175.
- [7] Yu Liming, Zhang Guijin. Application of Project Teaching Method in Teaching of Farmland Water Conservancy [J]. China Education Innovation Herald, 2013, (28):58.
- [8] Hu Yu. Cooperative Teaching Method Based on Action Orientation [J]. The Education, 2015, (4).