

Curriculum Achievement Degree of Irrigation and Drainage Engineering under the Background of Professional Certification

Huiyan Gao, Hongquan Liu, Chunling Chai, Renqiang Chen, Sutao Liang, Rui Zhu

Hebei Agricultural University, Baoding, 071001, China

Abstract

The agricultural water conservancy engineering specialty of Hebei Agricultural University passed the professional certification of engineering education in 2020, and the professional certification of engineering education pays more attention to the evaluation of curriculum quality. Irrigation and drainage engineering is the core compulsory course of agricultural water conservancy engineering specialty, and its teaching quality plays an important role in the cultivation of professional talents. According to the requirements of professional certification, the course teaching of Irrigation and Drainage Engineering and achievement of graduation requirements were analyzed in the past three years, in order to provide the basis for the improvement and construction of the course in the future.

Keywords

Engineering Education Professional Certification; Curriculum Achievement Degree; Irrigation and Drainage Engineering.

1. Introduction

Agricultural water conservancy engineering specialty of Hebei Agricultural University has a long history, is the oldest specialty in the college of urban and rural construction, and is the first department to carry out higher education of water conservancy in Hebei Province. The major originated from the department of farmland water conservancy established in 1931 and formed in the department of agricultural and forestry engineering in 1946. It was renamed the department of farmland water conservancy in 1949. A supporting teaching staff and professional teaching system of the major of farmland water conservancy engineering had basically formed from 1946 to 1955. The disciplines merged into Wuhan Institute of Water Resources and Hydropower in 1955. In 1958, the Department of Farmland Water Conservancy Engineering was reconstructed. The ' Cultural Revolution ' in 1966~1976 forced the teaching work to be interrupted for six years. The worker-peasant-soldier students were enrolled in 1972~1974, and the professional name was still farmland water conservancy engineering. In 1978, the college entrance examination was resumed, in order to meet the needs of the society, the department of farmland water conservancy engineering continuously carried out teaching reform. The teaching plan of farmland water conservancy engineering was revised twice in 1980 and 1985 respectively, which widened the professional scope and enhanced the adaptability of students to social needs. According to the adjustment opinions of the Ministry of Education for undergraduate majors in colleges and universities, the major of farmland water conservancy engineering was changed into agricultural water conservancy engineering in 1999. The major was awarded master's degree in 1984 and doctor's degree in 2006. It was awarded as a key discipline at the school level in 2009. It was awarded as a doctor's degree in the first-level discipline of agricultural engineering in 2011. It was approved as a post-doctoral research flow station in 2012 and successfully passed the professional certification of engineering education in 2020. Irrigation and drainage engineering is the core compulsory course of agricultural water conservancy engineering specialty. Since the establishment of this specialty,

the curriculum construction has accumulated a lot of experience and has been continuously improved [1-2]. Engineering education professional certification puts forward new requirements for curriculum construction. According to the requirements of professional certification, the course teaching of Irrigation and Drainage Engineering and achievement of graduation requirements were analyzed in the past three years, in order to provide the basis for the improvement and construction of the course in the future.

2. General Introduction of Irrigation and Drainage Engineering

2.1. Curriculum Objectives

Irrigation and Drainage Engineering is a science to study the soil moisture in farmland, the variation regularity of regional water conditions and its adjustment measures, eliminate floods and droughts, and use water resources to serve the development of agricultural production [3-4]. The main contents include water situation of farmland and soil moisture movement, crop water requirement and irrigation system, irrigation methods and technologies, irrigation canal system, irrigation water sources and water intake mode, agricultural drainage system and its planning and design, and irrigation and drainage system management. The former part is the theoretical basis, and the latter part is the technical application. Among them, crop water requirement and irrigation system, irrigation methods and technologies, canal system flow calculation and section design, field drainage ditch design are both emphases and difficulties. It is 48 class hours, and 3 credits. The teaching process consists of theory and practice part. Theoretical teaching is the 40 class hours, Experimental course is 8 class hours, including soil infiltration experiment, sprinkler irrigation experiment, micro sprinkler performance test experiment, and drip irrigation experiment.

Students can 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 grasp the new technologies and development trends at home and abroad in the this professional field through the study of this course. Students have the ability to engage in planning, design, construction and management of agricultural water conservancy projects, and can independently undertake the planning, design and management of irrigation and drainage engineering in small and medium-sized irrigation areas.

2.2. The Supporting Relationship between Curriculum Objectives and Graduation Requirements

The curriculum objective effectively supports the graduation requirements in three aspects: quality, knowledge and ability. Water conservancy is the lifeline of agriculture, students understand the history, current situation and trend of water conservancy development in China, and understand relevant policies and laws and regulations. It contributes to stimulate the professional love and learning enthusiasm of students and they are willing to contribute their own strength in the construction of socialist power, realize their own value. Students can master irrigation and drainage related professional knowledge, basic principles and engineering design methods, correctly evaluate and solve related problems in the construction of agricultural water conservancy projects, improve the ability to analyze and solve problems, team cooperation and research ability, and be cultivated innovative consciousness.

Curriculum objectives mainly support graduation requirements index 1-4, index 3-1, index 4-1, index 4-2, index 4-3, index 6-1, index 9-1, and index 10-2. Index 1-4 of graduation requirements need master the professional knowledge of engineering hydrology, building materials, soil and agronomy, water pump and water pump station, irrigation and drainage engineering, etc., which can correctly evaluate and solve the related problems in the construction of agricultural

water conservancy projects. Index 3-1 need master the design method of agricultural water conservancy projects to meet specific needs. Index 4-1 need master the basic principles and methods of engineering experiments in the field of agricultural water conservancy projects, and can carry out scientific experimental design for complex engineering problems. Index 4-2 need determine the required parameters and their accuracy according to the experimental purpose, and can correctly select experimental instruments and equipment for data collection and measurement. Index 4-3 requires having the ability to reasonably analyze and explain the experimental results, and obtain reasonable and effective conclusions through comprehensive analysis of information. Index 6-1 requires understanding the policies, laws and regulations. Index 9-1 requires understanding the importance of team spirit in agricultural water conservancy projects, clarifying the role of individuals in the team, and working together with team members. Index 10-2 requires understanding the development situation and trends of agricultural water conservancy projects and related fields at home and abroad.

3. Curriculum Evaluation Indexes and Achievement Composition

3.1. Implementation and Evaluation of Indexes

The curriculum standard of irrigation and drainage engineering corresponds to the curriculum knowledge, graduation requirements and curriculum objectives. In the process of course, teachers are required to teach 'student-centered' according to the curriculum standards, and the focus is on the effect of school personnel training, that is, not only what the school's teaching, but also what the students' learning. Through soil infiltration experiment, sprinkler irrigation experiment, micro sprinkler performance test experiment, and drip irrigation experiment, students can master the basic principles and methods of engineering experiments of agricultural water conservancy engineering. According to the experimental purpose to determine the required parameters and accuracy, students can correctly select the experimental instruments and equipment, measure experimental data and have the ability to reasonably analyze and explain the test results, and obtain reasonable and effective conclusions through comprehensive analysis of information. Limited by the number of instruments, it is convenient for teachers to guide and carry out the experiment. The experimental grouping is conducive to cultivating students' teamwork ability and clarifying the role of individuals in the team. With the help of WeChat platform, QQ, rain classroom and other modern communication platform and teaching software, the curriculum-related policies, norms, new technologies, new equipment and journal literature are shared with students to understand the new technologies and development trends at home and abroad in the field of irrigation and drainage engineering. Students carry out curriculum design about planning and design of irrigation and drainage system in M irrigation area by using professional acknowledges and fundamental principles and referring to code of irrigation and drainage engineering(GB 50288-2018) and technical specification for drainage engineering(SL-2013) etc.. Students grasp design method of agricultural water conservancy engineering and have the ability to engage in planning, design, construction and management of agricultural water conservancy projects, and can independently undertake the planning, design and management of irrigation and drainage engineering in small and medium-sized irrigation areas by curriculum design.

The evaluation of the indexes is composed of three links, namely, usual grades, experimental scores and final examination scores. Through classroom questioning, group discussion, after-school homework and other ways, teacher can timely grasp the usual "learning" situation of students. The experimental report reflects the students' mastery of the basic principles and methods of engineering experiments in this field, and the collation and analysis of experimental data. The final examination mainly examine the students' mastery of the basic knowledge and basic principles related to irrigation and drainage engineering, and then examine the students'

understanding and application ability of relevant knowledge and principles, so as to try to connect with the actual problems encountered in production. The implementation and evaluation of indexes are shown in Table 1.

Table 1. Implementation and evaluation of indexes

Order number	indexes	Assessment points	Question Types and Scores				usual grades	experimental scores
			fill in the blank questions	Explanation of nouns	Short-answer question	Calculating Questions		
1	1-4	Fundamental Engineering knowledge	9	10	28	10	45	
2	3-1	Design methods of engineering	11	10	14	8	30	
3	4-1	The basic principles and methods of engineering experiments						30
4	4-2	Operate experimental instruments and equipment, data collection and measurement						30
5	4-3	Data collation and analysis						30
6	6-1	Engineering codes and the policies					10	
7	9-1	teamwork					5	10
8	10-2	the development and trends of agricultural water conservancy engineering					10	
total			20	20	42	18	100	100

3.2. Curriculum Achievement Composition

According to the syllabus, course scores include usual grades, experimental grades and final exam. Among them, usual grades account for 20%, experimental grades account for 20%, final examination account for 60%.

4. Analysis and Suggestions on the Achievement Degree of Curriculum Objectives

4.1. Analysis on the Achievement Degree of Curriculum Objectives

The following formula is used to calculate the achievement degree of curriculum objectives

$$p = \frac{m}{n} \times 100\% \quad (1)$$

Where, P is the achievement degree of curriculum objectives; m is the actual average score of curriculum objectives, which is the average score of the overall students; n is the expected score of the curriculum objectives.

Using formula (1), the achievement degree of curriculum objectives of irrigation and drainage engineering for agricultural water conservancy engineering graduates in recent 3 years was calculated, and the results are shown in Figure 1.

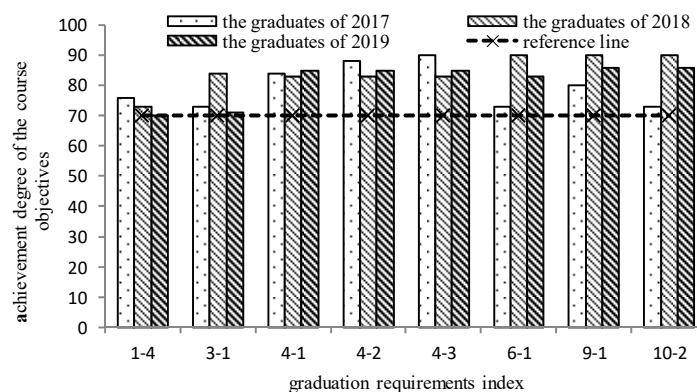


Figure 1. Achievement degree of irrigation and drainage engineering course objectives

Figure 1 shows that the graduation requirements index of irrigation and drainage engineering in the graduates of 2017, 2018 and 2019 for agricultural water conservancy engineering majors are all above 70 and the overall training requirements of curriculum objectives are reached. The number of students from the graduates 2017 to 2019 majoring in agricultural water conservancy engineering is 31, 32 and 33, respectively. The average scores of students are 77.84, 79.7 and 73.1. The highest scores are 92. The lowest scores are 62, 61 and 32. But some students did not reach the graduation requirements. For the students who have not achieved the achievement degree of the curriculum objectives, the school has a system of supplementary examination, re-study and so on, which provides students with the opportunity to achieve the curriculum objectives again, so as to ensure that students meet the graduation requirements before graduation. Teachers will also evaluate course, analyze the reasons for the problems found in the learning and examination process, and put forward effective improvement measures.

4.2. Suggestions on the Achievement Degree of Curriculum Objectives

(1) Take the student as the center and stimulate the student's study enthusiasm

Set up the teaching idea of "student-centered", through the introduction explanation, introduce the relevant policies and norms of irrigation and water conservancy in our country by the way of document guide, understand the demand of the country and society for the professional talents, enhance the students' understanding of the importance of the major and their interest in the course, help students set up clear learning goals, stimulate students to love the major and like the course, and arouse the initiative and enthusiasm of learning.

(2) Improve the proportion of usual grades and pay attention to the curriculum quality of the learning process

Change the study habits of some students who don't learn usually and engage in surprises before exams, gradually increase the ratio of usual grades, and guide students to pay attention to the learning process. The composition of usual grades is diversified. In addition to attendance rate and homework scores, classroom questions, unit quizzes, engineering project completed by team, and report display can also be added. Not only pay attention to acquire professional knowledge, but also cultivate learning ability, teamwork ability, and the ability to communicate with classmates and teachers, etc., which improve the curriculum quality.

(3) Transposition thinking, understand professional knowledge that is not easy for beginners to master and focus on explaining

After teachers have taught the course many times, it is easy to form inertial thinking. They assume that students should master some basic concepts, knowledge, principles, formulas, etc., but the results may be quite deviated. On the one hand, teachers should consider problems from the perspective of beginners, pay attention to communication and interaction with students, and understand the learning situation of students in a timely manner; on the other hand, teachers can also conclude difficult contents for beginners by analyzing the learning and examination conditions of previous students. Difficult contents are explained in a way that students can easily accept, improve the mastery of the key and difficult knowledge of the curriculum, and then improve the curriculum quality and complete the curriculum objectives.

5. Conclusion

According to the requirements of professional certification, the course teaching of Irrigation and Drainage Engineering and achievement degree of graduation requirements of the graduations 2017, 2018 and 2019 were analyzed for agricultural water conservancy engineering. The graduation requirements indexes are all above 70, and all have been achieved training requirements of curriculum objectives. However, in the future, it should establish a "student-centered" teaching concept, pay attention to the introduction explanation, stimulate students' enthusiasm for learning, and improve students' learning initiative; diversify usual grades, increase the proportion of usual grades, pay attention to the curriculum quality of the learning process, and cultivate student' quality and ability. Through the analysis and summary of the course learning situation of the previous students and the communication with the current students, it is found that the knowledge and principles that are not easy to master in the course learning and the key explanations, improve the curriculum quality and complete the curriculum objectives.

References

- [1] H.Y. Gao, L.H. Yang, Z.J. Shi et al. study on the curriculum reform of Irrigation & drainage engineering [J]. Journal of Agricultural University of Hebei (Agriculture & Forestry Education), 2013, 15(2):78-81.
- [2] H.Y. Gao, H.Q. Liu, C.L. Chai, etc. Study on the Curriculum Reform of Irrigation and Drainage Engineering Based on Establishing Emerging Engineering Education [J]. International Journal of Social Science and Education Research, 2020, 3(7):11-18.
- [3] H.B. Shi. Irrigation and drainage engineering [M]. Beijing: China Water & Power Press, 2006.
- [4] Y.Y. Guo. Irrigation and drainage engineering [M]. Beijing: China Water & Power Press, 1997.