

Discussion on Hydraulics Teaching Mode of Water Conservancy and Hydropower Engineering under the Background of New Engineering Construction

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Abstract

The construction of new engineering is an important measure for China to lead the reform of higher education, cope with the new round of industrial revolution and cultivate talents in emerging industries. In this process, the fundamental purpose of talent training is to cultivate high-quality applied talents with patriotism, engineering practice ability and innovative thinking ability to meet the needs of industry development. Taking the hydraulics course of water conservancy and hydropower engineering as an example, this paper discusses the problems existing in the current teaching, and discusses the teaching scheme and practical teaching method of hydraulics course under the background of new engineering, in order to further improve the teaching quality of hydraulics and provide reference for the construction and reform of related professional courses.

Keywords

Hydraulics; New engineering; Teaching mode.

1. Introduction

The goal of new engineering construction puts forward higher requirements for talent training. The construction of water conservancy and hydropower engineering should accurately grasp the demand for water conservancy talent training in the new era, and actively respond to the transformation of engineering water conservancy to resource water conservancy and ecological water conservancy, and the transformation of traditional water conservancy to modern water conservancy and sustainable development water conservancy. In the construction of new engineering, a new talent training mode should be constructed to improve students' innovative thinking ability and craftsman spirit.

In recent years, domestic and foreign universities have applied the concept of new engineering construction to professional construction and curriculum teaching. For example, Professor Lin Jian, Institute of Education, Tsinghua University, has put forward four principles that should be adhered to in the transformation and upgrading of traditional engineering majors [1]. Sichuan University reformed the curriculum system and teaching content according to the requirements of new engineering construction [2]. Yin Jiabo of Wuhan University took the new engineering construction of water conservancy engineering specialty as an example, and put forward the improvement space and countermeasures for the development of new engineering construction [3]. Hohai University actively responds to the new engineering teaching concept, explores and practices the new practical teaching mode, and improves the teaching quality [4].

Qiu Danping discussed the connotation and practical value of the curriculum process evaluation and multiple assessment mechanism under the new engineering education system [5].

2. Problems Existing in The Teaching of Hydraulics Course

Compared with the requirements of new engineering construction, there are some deficiencies in the teaching of hydraulics course in the following aspects:

1. Curriculum objectives do not match the requirements of new engineering construction. According to the requirements of new engineering construction, the existing curriculum objectives are biased towards the cultivation of basic knowledge and the ability to solve basic problems, and the improvement of innovative thinking ability is slightly weak.
2. The content of the course is traditional and classic, which is out of touch with the frontier of disciplines, new engineering problems and new technology development, and the integration of disciplines is not enough. The theory and technology of modern water conservancy projects are developing rapidly. However, the teaching content is relatively lagging behind, the integration of disciplines is insufficient, and it does not match the demand for talents in industrial upgrading.
3. The system of curriculum ideological and political education is not enough, the design of curriculum ideological and political cases needs to be further optimized, and the way of integrating ideological and political elements into the teaching process needs to be further expanded.
4. Practice teaching and ability training are not matched. The experimental and practical teaching links of this course are all confirmatory experiments. Students' creativity and subjective initiative cannot be brought into play. Knowledge, practice, innovation and ability training lack deep integration, cannot effectively promote the transformation of knowledge to innovation ability, and does not meet the requirements of practical ability training in new engineering.

Based on the above problems, the hydraulics course urgently needs to combine the requirements of new engineering construction, based on social needs, reconstruct the training objectives of the course, effectively solve the problem of matching teaching and demand, improve the high-level, creative, innovative and challenging degree of course teaching, and cultivate hydropower talents with both ability and political integrity.

3. Exploration on The Teaching Mode of Hydraulics Course Under The Background of New Engineering

3.1. Curriculum Organization and Design

1. Based on the concept of new engineering construction, the research group considers the requirements of water conservancy development in this region for talents and the needs of relevant enterprises and institutions in the water conservancy industry for graduates' ability and literacy, sorts out the connotation and path of construction, and reconstructs the teaching objectives of "Hydraulics" course of water conservancy and hydropower engineering specialty, which are formulated as three levels of teaching objectives, namely, knowledge objectives, ability objectives and innovative thinking objectives.
2. In order to highlight the link role of "Hydraulics" course in basic courses and professional courses, and help students to solidify basic knowledge, the subject adopts the way of mind mapping to summarize the teaching content. Combined with the teaching objectives of "Hydraulics" course and the characteristics of the course itself, the modular construction of the course is carried out. The three modules are: hydrostatics, hydrodynamics, similarity theory and dimensional analysis. The three modules are expressed in the form of three main lines of

teaching, which not only helps students have a clear understanding of the level and structure of the whole course content, but also cultivates students' logical thinking ability.

3. In terms of network resources, increase the micro-videos of the research group teachers to guide students to participate in water conservancy innovation and entrepreneurship competitions. Organize students to watch micro-videos of innovation and entrepreneurship competitions, analyze and discuss the industry pain points solved by the entries, and analyze the hydraulics knowledge applied in the entries.

In addition, test questions and assignments in the course integration are added, such as the calculation of water hammer related to the "Hydropower Station" course, the calculation of water pressure in the "Hydraulic Structure" course, and the calculation of weir dam flow capacity in the "Engineering Hydrology and Water Conservancy Calculation" course.

Hydraulics knowledge has been widely used in farmland water conservancy, hydropower, shipping, transportation, construction, petroleum, chemical, mining, metallurgy and other departments. The research group introduces the classic, cutting-edge, logo, latest water-related engineering cases and scientific and technological achievements in the domestic and foreign water-related industries into the course. For example, in the domestic aspect, Jiangxi Province is implementing the comprehensive improvement project of 'six dams jointly built' in the tail of Ganfu and the construction of the ecological Poyang Lake basin; on the foreign side, the Rhine River Basin Management and the Danube Water Environment Treatment Project in Vienna, Austria are introduced into the classroom to broaden students' international vision, understand the current water conservancy development situation, and realize the cross-integration of curriculum knowledge and related majors.

3.2. Construction of Multi-level Teaching Experiment Platform

Hydraulics experiment can make students understand and recognize some basic concepts and theories from vivid and subjective experiments, make up for the deficiency of theoretical teaching, deepen students' perceptual knowledge, and cultivate students' practical ability and experimental operation ability.

The existing hydraulic experiment is 16 hours, involving a total of 8 groups of confirmatory experiments. There are too many confirmatory experiments, which lack deep integration of students' innovative thinking and ability training, and cannot effectively promote the transformation of knowledge to innovation ability. Therefore, on the basis of the necessary confirmatory experiments, the subject adds comprehensive, designed and innovative experiments, and gradually develops into the main part of the experimental course teaching, so that the experimental classroom teaching content presents the characteristics of 'gender and one degree'. While improving the innovative practical ability of teachers and students at different levels and stages, it provides support for students to participate in innovative competitions and entrepreneurial projects, and promotes innovative projects.

3.3. Course Assessment

Previously, the scores of hydraulics courses were composed of online and offline scores. Online scores accounted for 15 %, offline scores accounted for 85 % (usual scores accounted for 15 %, final exam scores accounted for 70 %), and the sum of online scores and offline usual scores was the total usual scores (30 %).

Table 1. Teaching evaluation mode

Examination mode	Formative evaluation (40%)			Final examination
	Pre-class	In class	After class	
On line	5%	10%	5%	
Offline		10%	10%	60%
Content of examination	Knowledge point video, online group discussion, basic knowledge test, online virtual experiment, etc.	In-class practice, answering questions, online topic discussion, grouping tasks, students ' PPT explanation, experimental operation and explanation, etc.	After-class homework, project design report, experimental report, group discussion report, project group mutual evaluation, etc.	

3.4. Implementation Effect

Taking the opportunity of new engineering construction, the water conservancy and hydropower engineering specialty of our university has carried out the teaching reform and teaching practice of the hydraulics course according to the training objectives of the specialty. The implementation effect is summarized as follows:

1. Pay attention to the integration of disciplines and improve students ' ability to solve comprehensive problems. It pays attention to the integration of disciplines, optimizes the teaching content, constructs the knowledge framework system, adopts multiple teaching methods, combines the process evaluation with the final examination, and innovates the teaching methods and teaching strategies in an all-round way. It embodies the educational orientation of comprehensive education and comprehensive education, and further improves the students ' ability to use knowledge to solve comprehensive problems in real situations.

2. The construction of multi-level teaching experiment platform has improved students ' innovative thinking and practical ability. On the basis of retaining the classic confirmatory experiments, a comprehensive, designed and innovative experimental project with the purpose of improving ability is added to form a multi-level teaching experiment platform to cultivate students ' innovative thinking and practical ability at different levels and stages.

3. Improve the curriculum ideological and political system, and realize the same frequency resonance of knowledge imparting and value shaping. The organic integration of ideological and political elements into professional courses gives the course the function of educating people as a whole, organically combines professional knowledge, value concept and spiritual pursuit, and cultivates outstanding engineers with more patriotic feelings and social responsibilities.

4. Promoting the development of teachers ' professional ability: the construction of new engineering focuses on the cultivation of students ' higher-order thinking ability, and also requires teachers to have interdisciplinary knowledge and skills. Teachers need to constantly learn and update their knowledge, improve the teaching level; through participation in projects and practical activities, professional quality has been improved.

4. Conclusion

This paper takes the hydraulics course of water conservancy and hydropower engineering specialty as the research object, and discusses the application of new teaching mode in course teaching under the background of new engineering construction. Practice has proved that this

teaching mode is conducive to improving students ' ability to solve comprehensive problems and enhancing students ' patriotic feelings and social responsibility. In the future teaching reform, it should be widely promoted and applied to improve the quality of personnel training in water conservancy and hydropower engineering and other majors.

Acknowledgments

This work was financially supported by Jiangxi Provincial Department of Education Teaching Reform Research (JXJG-23-18-11).

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