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Discussion on the Teaching Reform of Hydraulic Structure in Water Conservancy and Hydropower Engineering Major

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Abstract

This article first analyzes the characteristics of the hydraulic structure course, and then points out the problems in the teaching of the hydraulic structure course for applied undergraduate water conservancy and hydropower engineering majors. On this basis, the corresponding teaching reform strategies are put forward, including reform the teaching staff, reform the construction of teaching materials, reform the course content, reform teaching methods and reform the assessment method.

Keywords

Hydraulic structure; Applied undergraduate; Teaching reform.

1. Introduction

In accordance with the requirements of the Outline of the National Medium - and Long-term Education Reform and Development Plan (2010-2020), we will promote the transformation and development of some local regular undergraduate institutions of higher learning, and clarify the reform direction of gradually transforming 50% of the total number of regular undergraduate institutions of higher learning into applied technology universities. Therefore, strengthening teaching reforms and cultivating applied talents with strong practical abilities is the only way for the development of local undergraduate colleges [1].

Hydraulic structure is a required course of water conservancy and hydro power engineering major in Nanchang Institute of Technology, which plays a very important role in personnel training. Hydraulic structure covers a wide range of areas, with rich engineering practices and a large number of unsolved problems. Many aspects have adopted advanced methods, but many design theories are still at the empirical stage. Therefore, it is not only different from the basic courses, but also different from other professional courses, with strong theoretical, practical, comprehensive, and direct service engineering practical characteristics.

2. Problems in the Teaching of Hydraulic Structure

2.1. The Teaching Team Lacks Practical Experience

Taking Nanchang Institute of Technology as an example, there are 5 teachers in the course of hydraulic structure, including 2 professors, 1 associate professor and 2 lecturers, most of which are mainly academic research. The young teachers introduced in recent years are all engaged in teaching work directly after graduation from universities. They have no working experience in water conservancy and hydropower engineering design, construction management, project supervision and project management, and lack practical experience.

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2.2. The Course Material Lacks Applicability

The hydraulic and Hydropower Engineering major of Nanchang Institute of Technology chooses the Sixth Edition of Hydraulic Structure edited by Lin Jiyong of Tianjin University. The textbook is organized and reviewed by the Teaching Steering Committee of Hydraulic Engineering in Colleges and universities, and is the national planning textbook of the tenth Five-year Plan for colleges and the thirteenth Five-Year Plan for the national water conservancy industry. The teaching material has strong theoretical properties, but lacks practical application. There are no supporting application exercises and thinking questions for each chapter. The current teaching method is based on the teaching concept of self-study and teacher guidance, which makes it difficult for students to apply theoretical knowledge to practical projects. In addition, with the rapid development of society, various new theories, new materials, and new technologies have been continuously applied to practical engineering, but the content of textbooks has lagging behind. For example, the rock-fill concrete dam technology invented by the Department of Water Resources of Tsinghua University in 2005 is currently widely used in engineering, but it is not introduced in the textbook [2].

2.3. Course Content Does Not Correspond to the Teaching Period

The teaching content of the hydraulic structure course involves introduction, overview of Hydraulic Structure design, gravity dams on rock foundations, arch dams, earth-rock dams, sluices, bank spillways, hydraulic tunnels, gates, dam buildings, canals Head and canal buildings and river improvement buildings, water conservancy project design, Hydraulic Structure management. The knowledge system is huge, the knowledge points are complicated, and it is difficult to learn and understand. With the progress of teaching reform, the teaching hours of professional courses are getting shorter and shorter. Taking Nanchang Institute of Technology as an example, the theoretical teaching hours of this course are only 68 hours, and teachers need to complete the teaching tasks within the specified class time. Therefore, teachers have no time to carry out detailed and in-depth discussions with students on specific knowledge points, let alone discuss the frontier fields and development direction of their major with students [3].

2.4. The Teaching Method Lacks Applicability

Hydraulic structure course teaching, most teachers' teaching habits to choose the traditional teaching mode, with teacher's unidirectional teaching is given priority to the entire "cramming education", plus the multifarious knowledge points, students lack the space of free play, especially it is hard to imagine building detail structure from the abstract concept, which can lead to loss of interest in learning, learning motivation. For example, the very important transverse joints and copper water stop in a gravity dam are difficult for students to understand by reading a book.

2.5. The Assessment Method Lacks Applicability

A common course assessment method is "30% of usual grades + 70% of final grades = course grades", and most of the usual grades are based on comprehensive consideration of attendance and homework. The final examination basically adopts the form of closed-book examination, and the questions are mostly fill-in-the-blank questions, multiple choice questions, judgment questions, short answer questions and calculation questions. The review of students is mainly based on memory and recitation. For highly comprehensive and practical courses, the closed-book assessment method is far from reflecting the students' practical level, which limits the development of students' comprehensive analysis and problem-solving skills [4].

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3. Teaching Reform Strategy of Hydraulic Structure for Water Conservancy and Hydropower Engineering Major

3.1. Reform the Teaching Staff

The teaching activities of this major are closely related to engineering practice. Therefore, the accumulation of teachers' engineering experience and the improvement of engineering practice ability should be particularly emphasized when forming the teaching talent team. For newly-introduced young teachers who have no work experience in water conservancy and hydropower engineering design, construction management, project supervision and project management, they must go deep into relevant enterprises to carry out temporary training and enhance their engineering practice capabilities. In addition, young teachers are required to undertake cognitive practice or production practice and other practical teaching tasks in the first few years after entering the school, so that young teachers' engineering experience and engineering practice ability can be constantly improved [5].

3.2. Reform the Construction of Teaching Materials

The following aspects should be paid attention to when compiling the hydraulic structure textbook for applied undergraduate water conservancy and hydropower engineering majors:①On the basis of traditional textbooks, three-dimensional resources such as actual engineering pictures and engineering video textbooks closely related to the content of the textbooks need to be added. Students can obtain them by scanning the QR code on the book.② The derivation of the difficult formula in the textbook can be appropriately reduced, such as the relevant formula in the calculation method of arch dam stress.③ Considering that there are two sets of codes for water conservancy and electricity in the water conservancy and hydropower industry, it is suggested to introduce the related background and main differences of the two codes in the design review. In the later introduction of specific buildings, only the latest codes for water conservancy industry are described, so that students can better master when learning.④Combined with professional practice, appropriately introduce new construction techniques and the latest developments in science and technology, so that students can better keep up with the pace of scientific and technological progress.⑤ After each chapter is finished, leave some thought questions and exercises after class for students to analyze and solve.

3.3. Reform the Course Content

Through the study of hydraulic structure course, it is impossible to require students to master the design methods of various hydraulic buildings. It is necessary to select some buildings for detailed teaching according to the current water conservancy development situation and local regional characteristics. For example, Jiangxi province, as a large province of water conservancy, has obvious regional characteristics in water conservancy project construction, and there are many earth-rock dams, embankments and sluices. In order to meet the needs of jiangxi hydraulic engineering development and construction, we need to reform the curriculum content, the teaching content may lay emphasis on earth and rock dams, sluice.

3.4. Reform Teaching Methods

Small classes (less than 40 students) are taught. Taking Nanchang Institute of Technology as an example, the hydraulic teaching class of Yaohu University (less than 30 students) and the ordinary hydraulic teaching class (generally about 80 students), through the examination results and student feedback, the hydraulic teaching class of Yaohu University is obviously better than the ordinary hydraulic teaching class.

Carry out a variety of online and offline hybrid teaching methods based on Chinese University MOOC and Tencent Classroom. Through the interaction between teachers and students, such

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as question and answer, questioning, discussion, debate, etc., students' interest in learning, self-learning enthusiasm and ability can be enhanced [6].

3.5. Reform the Assessment Method

Considering that Hydraulic Structure is a theoretical, practical and comprehensive professional course, the traditional closed-book examination based on memorization and recitation cannot truly reflect students' mastery of knowledge. The final examination can refer to the registered hydraulic Structure professional case examination and adopt the open-book examination. Students can bring Hydraulic Structure textbooks and core specifications for examination. The question type is a single-choice question, but the answering process needs to be written. The number of questions is about 10 questions (2 easy questions, 6 medium-difficult questions, 2 difficult questions), and the questions need to be based on understanding concepts for answers, most of the questions have a certain amount of calculation.

4. Conclusion

Applied undergraduate water conservancy and hydropower major hydraulic structure is a professional course with strong theoretical, practical and comprehensive nature. In view of the problems of traditional teaching, corresponding course teaching reform strategies are proposed. Through a comprehensive and systematic teaching reform, students' enthusiasm, initiative and creativity can be improved, and a solid foundation for students to engage in professional and technical work in the future can be laid.

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