

Research on the Integrated Course System of Engineering Management Based on OBE-CDIO

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Abstract: This article analyzes the current curriculum of engineering management and constructs an OBE-CDIO concept based on the demand for engineering management talents in society. Based on the OBE concept, the expected teaching output is expected, and the teaching curriculum system is designed in reverse. CDIO concept is used to guide the design and practical teaching of professional courses, in order to improve students' professional knowledge and comprehensive quality and meet the industry's required ability level.

Keywords: OBE, CDIO, Engineering management, Curriculum system.

1. Introduction

The engineering construction industry in China is facing multiple cross impacts, including the comprehensive upgrading of construction methods, the transformation of project organization and management models, and the innovation of management technology. This has raised higher standards and requirements for the professional quality and comprehensive ability of professionals in the construction field. In order to enable students to truly learn their abilities and become more talented and practical when entering society and developing their work in the future, it is urgent to reform the curriculum system of the engineering management major, establish an integrated curriculum system that is suitable for the development of the discipline, and enable students to have a comprehensive and systematic understanding of the knowledge of their major.

This article designs an OBE-CDIO based engineering management curriculum system based on the existing problems in the current engineering management curriculum system, in accordance with the certification standards for engineering education and the actual needs of society. Based on the OBE concept, the expected teaching output is expected, and the teaching curriculum system is designed in reverse[1]. The CDIO concept is used to guide the professional curriculum design and practical teaching, to ensure that the students cultivated meet the industry's required ability level.

2. Problems in The Curriculum of Engineering Management Major

Currently, there are many problems in the curriculum of engineering management in most universities.

(1) The teaching methods and content of the course are not suitable for social development. Many teachers' teaching methods still remain at the stage of teacher centered and student passive acceptance, with students lacking the awareness of active exploration and learning. At the same time, teachers tend to overlook the emergence of new knowledge related to engineering management laws, technology, information, and other aspects in the construction industry during the teaching process, and cannot make progress with the times, update their professional knowledge

reserves in a timely manner, and broaden students' knowledge.

(2) The curriculum is not reasonable. The curriculum of engineering colleges often tends to be too biased towards engineering and technology courses, while the curriculum of financial colleges may be too biased towards economic and management courses. The curriculum is incomplete, and students cannot establish an integrated knowledge system through teaching activities.

(3) The curriculum teaching lacks integrity. The engineering management major, as an interdisciplinary field that combines technology, information, management, economics, and law, is often completed with the cooperation of teachers from multiple fields in the talent cultivation process, which is conducive to ensuring the quality of explanations in various parts. However, it overlooks the overall nature of teaching, which can easily lead to repetition or omission of knowledge points in teaching.

(4) Curriculum teaching emphasizes theory over practice. Traditional teaching focuses solely on imparting theoretical knowledge, without emphasizing the cultivation of students' overall abilities, interpersonal skills, and engineering construction process management abilities. While ensuring the quality of theoretical teaching, it is necessary to actively carry out practical teaching, strengthen students' mastery of knowledge points through engineering practical training projects, exercise students' engineering practical abilities, and cultivate their professional comprehensive qualities.

3. Characteristics of OBE-CDIO Concept

The OBE concept focuses on students' learning outcomes as the focus of teaching, and also serves as the object of research and analysis. It reverses the entire process of education based on established training objectives, organizes and implements various aspects of education, and designs corresponding evaluation mechanisms to ensure that students can achieve talent cultivation goals through teaching, and teaching outcomes focus on effectiveness. The OBE education philosophy strives to achieve a fundamental transformation from "content based theoretical knowledge" to "student based comprehensive abilities".

CDIO is a teaching mode that emphasizes "learning by

doing" and "project-based education and learning". CDIO teaching runs through the entire life cycle of the project, and its core teaching mode is to guide students to actively learn by approaching practical engineering projects, integrating theory, practice, and innovation in the teaching process, and enhancing students' professional knowledge and practical abilities through project training. CDIO emphasizes design and implementation, and the key lies in how to cultivate students' creativity and execution ability. Compared to traditional classroom teaching, CDIO emphasizes the full lifecycle of engineering projects throughout teaching practice[2].

Accurately grasp the connotation and characteristics of OBE-CDIO education philosophy; Based on the employment field and professional ability needs of graduates, this study analyzes the practical ability structure of engineering management students based on the OBE-CDIO education concept, and designs a practical teaching curriculum system for engineering management based on the OBE-CDIO education concept.

4. Principles for Constructing an Integrated Course of Engineering Management Based on OBE-CDIO

(1) Based on the actual situation of our school, starting from the advantages of the discipline, we focus on highlighting the characteristics of the engineering management major. When setting up engineering management majors, each university should fully consider its disciplinary advantages, student source status, and teaching staff characteristics. Schools with engineering backgrounds can highlight their advantages in engineering technology, while financial and economic colleges should focus on their advantages in economic management.

(2) Emphasize the integrity of the knowledge system and strengthen the advantages of interdisciplinary approaches. Using engineering management as a carrier, we organically combine multiple disciplines such as technology, economics, management, information, and law, emphasizing the cultivation of students' cross disciplinary thinking and abilities.

(3) Pay attention to the development of practical courses,

allocate practical and theoretical class hours reasonably, and continuously increase the proportion of practical class hours in the total subject class hours to provide sufficient class hours for the effective implementation of practical teaching.

(4) Integrate theoretical learning and practical learning organically. In the course teaching, practical teaching is added. By participating in various subject competitions (such as college student mechanics competition, advanced mapping technology competition, bidding simulation competition, etc.), students are organized to intern in construction enterprises (real estate companies, design units, construction units, engineering consulting units, etc.), effectively stimulating students' driving force for professional learning, developing their professional practical abilities, and enabling the knowledge learned to be effectively combined with practice, Can truly solve practical engineering problems[3].

5. Design of An Integrated Course System for Engineering Management Based on OBE-CDIO

Based on the existing problems in the current curriculum system of engineering management, and in accordance with the actual needs of society, from the characteristics of CDIO education, OBE education philosophy, and the teaching requirements of engineering courses, a curriculum system for engineering management based on OBE-CDIO is designed to help students understand and master the basic knowledge of engineering management courses, deepen their understanding of engineering management, enhance their knowledge and practical skills, and ultimately enhance their innovation skills, Promote the control ability in the organizational management process of engineering projects.

Design an integrated course system for the engineering management major based on four complementary course groups. The practical training project adopts a design implementation structure, and uses the course group as the carrier to integrate professional skills, interpersonal communication skills, as well as organizational and management abilities during the engineering construction process. Conduct practical training to achieve integrated teaching.

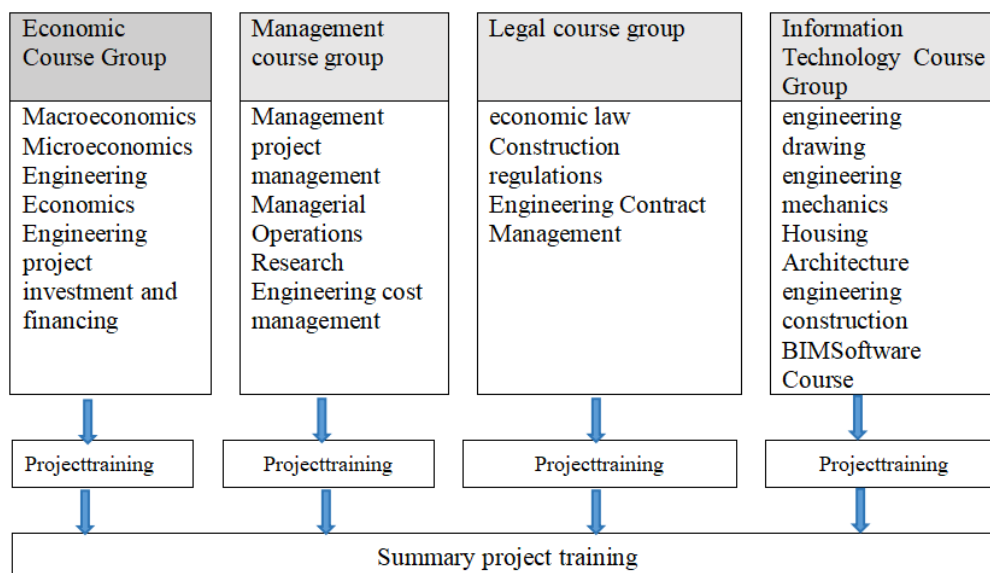


Figure 1. Integrated Course System of Engineering Management

(1) Based on the design principle of the OBE CDIO integrated course and the characteristics of the engineering management major, the professional courses are divided into four course groups: economics, management, law, and information technology. The course group adopts a correlation merge structure, where the courses within a course group are taught separately by teachers and combined at a certain time to organize teaching through project training. Based on the four course groups set up, each course group should have corresponding project training, designing different teaching contexts, role identities, and teaching objectives for students, and clarifying the final evaluation criteria for teaching outcomes. Taking the management course group as an example, a sandbox simulation is introduced. Based on the characteristics of the selected project, teams are divided first. Each team is an independent engineering project management department, and team members hold different job positions in the project. The group simulates the entire process of engineering project management, and the teacher evaluates and scores the final results. Through the sand table simulation operation mode, we strengthen the learning of engineering cost, cost control, engineering quality management, and risk management knowledge, connect the knowledge points related to engineering project management, exercise students' interpersonal communication and coordination abilities, make professional theoretical knowledge specific, and stimulate students' motivation for research and learning. The legal course group can also adopt situational design and role-playing methods to carry out teaching activities. The group is divided into roles such as the tenderer, bidder, and evaluator. The situational settings include the bidding process, construction process, and maintenance claim process, effectively simulating the actual process of construction projects, which is conducive to the exchange and in-depth understanding of knowledge among different students[4][5].

(2) Integrating the CDIO education model throughout the entire teaching process, selecting one or more engineering construction projects each year, dividing students into various teams, such as the owner team, design team, construction team, consulting team, and supply team, to jointly complete the entire process management of engineering projects, and vigorously cultivate students' communication, coordination, cooperation, and leadership innovation abilities. As the academic year increases, the scale and difficulty of projects increase year by year, and the roles in each team can be rotated to ensure that every student has the opportunity to comprehensively exercise their engineering practical skills. This type of open engineering management training program can enable students to actively explore professional

knowledge.

(3) Each course group adopts a similar teaching method, and finally integrates and extracts knowledge from different course groups through summarizing experience projects. Summarizing experience projects, utilizing the information platform of enterprises and universities to carry out. This platform allows students to simulate and experience the entire process of engineering project implementation in the context of enterprises and society, supporting individuals and projects to carry out engineering conception, design, construction, and operation. It enables students to use modern tools for engineering project construction and management. This platform supports the real-time transmission of information during the construction process of engineering projects, allowing students to promptly understand the problems that exist in the project management process. Student learning research is centered around practical engineering problems, and teaching is no longer limited by time and space, which can effectively meet the learning needs of students at different levels[5].

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