

Exploration and Practice of Ideological and Political Teaching Reform in Civil Engineering Professional Courses: Experiences from Design Principle of Concrete Structures

Pu Shuang^{1,a}, Huang Chuanteng^{1,b,*}, Cai Jilun^{1,c}, Chen Fangzhou^{1,d}

¹*School of Engineering, Zunyi Normal University, Zunyi, China*

^a*pushuang1122@163.com*, ^b*huangct@yeah.net*, ^c*1589315815@qq.com*, ^d*425201303@qq.com*

^{*}*Corresponding author*

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Abstract: The specialty courses of Civil Engineering account for a large proportion of credits and are the basic carrier of ideological and political education. The design of ideological and political education in courses is the key to achieving collaborative education between professional courses and ideological and political courses. Taking the course of Design Principle of Concrete Structures as an example, this paper analyzes the course content and characteristics, explores the problems existing in ideological and political education in courses, clarifies the principles of ideological and political education teaching design in courses, proposes the path and method of ideological and political education construction based on the OBE concept, introduces the channels for the construction of ideological and political education resources in courses, and summarizes the assessment methods of ideological and political education in courses. This paper attempts to solve the problem of "two skins" between professional education and ideological and political education, and provides a demonstration and reference for the construction of other professional courses.

1. Introduction

The National Conference on Ideological and Political Work in Colleges and Universities stressed that "we should make good use of classroom teaching as the main channel, and ideological and political theory courses should be strengthened in the process of improvement, so as to enhance the affinity and pertinence of ideological and political education and meet the needs and expectations of students growth and development. Other courses should also guard their own sections and cultivate their own fields, so that all kinds of courses can move forward in the same direction as ideological and political theory courses and form a synergistic effect"^[1]. The "Guidelines for Ideological and Political Education in Higher Education Courses" clearly state that ideological and political education should be integrated into the talent training system, comprehensively promote the construction of ideological and political courses in colleges and universities, give full play to the

educational role of each course, and improve the quality of talent training in colleges and universities^[2].

2. Course content and characteristics

The "Guide to Undergraduate Civil Engineering Majors in Colleges and Universities" clearly states that "students should master the selection, construction, design principles and design methods of engineering structures"^[3]. Concrete structure is the most common and basic engineering structure. The course "Design Principle of Concrete Structures" is one of the 22 core courses specified in the Guide. It is also the basis for subsequent courses such as High-rise Building Structure Design, Composite Structure Design, Civil Engineering Construction and Graduation Design. It occupies an extremely important position in the course system of Civil Engineering. The course content mainly includes the physical and mechanical properties of concrete structural materials, the bending bearing capacity of the normal section and the inclined section of the bending member, the cross-sectional bearing capacity of the compression member, the cross-sectional bearing capacity of the tension member, the twisting cross-sectional bearing capacity of the torsion member, deformation, cracks, ductility and durability, prestressed concrete members, etc. This course has the characteristics of strong engineering background, strong practicality, many formulas, many coefficients, many condition restrictions, and obvious international characteristics^[4].

3. Problems in ideological and political education in courses

At present, professional course teachers generally have the problem of "light ideological and political education and heavy professional education", which leads to the "two skins" between ideological and political courses and professional courses, and it is difficult for various courses to form a joint force for educating people. It is mainly manifested in:

(1) The curriculum content is excessively monotonous, with unclear cultivation goals. When formulating the curriculum outline for professional courses, instructors have not carefully considered the connections between course contents or integrated them modularly. There is almost no exploration of the value objectives of the course content, resulting in students feeling bored and lacking the desire to learn. This failure to stimulate students' interest in learning the course content leads to less than ideal teaching efficiency.

(2) The teaching mode is overly monotonous, with the integration of values lacking or forced. The characteristic of the course "Design Principle of Concrete Structures" is its solid theoretical foundation and prominent practical engineering aspects. However, instructors fail to start from the students' actual situations and the characteristics of the course. They continue to use traditional teaching methods, simply delivering textbook content to students in a monotonous and traditional manner. The effect of building core values in professional courses is not apparent, and the intrinsic values are not effectively distilled from the knowledge in professional courses.

(3) The assessment and evaluation is biased towards the professional aspects, deviating from the "integration of ideological and political education" assessment. Currently, the assessment of the Design Principle of Concrete Structures course is mostly divided into two parts: formative assessment (such as attendance, homework, questioning, tests and the classroom performance, etc.) and summative assessment. Some students believe that as long as their usual performance meets the requirements and they pass the final exam, they will not fail the course, resulting in a lack of pressure in their course study. Meanwhile, the formative and summative assessments do not include the ideological and political education assessment, leading to incomplete evaluation of the quality of students' professional courses and flaws in the evaluation mechanism for teachers.

4. Principles of ideological and political course design

The "Guidelines for Ideological and Political Education in Higher Education Courses" point out that for courses in the fields of science and engineering, it is necessary to integrate the education of Marxist stance, viewpoint, and methodology with the cultivation of the scientific spirit in course teaching. This aims to improve students' abilities to correctly understand, analyze, and solve problems. For engineering courses, emphasis should be placed on strengthening students' education in engineering ethics, fostering the spirit of excellence and craftsmanship, and inspiring a sense of national pride and mission in serving the country through science and technology^[2]. Specifically, in professional course teaching, the knowledge points of the Design Principle of Concrete Structures course should be broken down. Each lesson should be designed with flexibility, naturalness, and interest in mind to integrate ideological and political elements behind the professional knowledge, achieving an organic unity of professional and ideological education. In the early stages of professional learning, focus on uncovering the history of the profession, notable figures, and excellent cases to guide students' interest in learning. In the mid-term of professional learning, emphasize the combination of theory and practice to help students understand the essence of professional knowledge more vividly. In the later stages of professional learning, conduct comprehensive application exercises through holistic cases, engage in the design of reinforced concrete structures, and, with a basic engineering background, guide students in an ideological storm^[5].

5. Curriculum Ideological and Political Teaching Design Based on OBE Concept

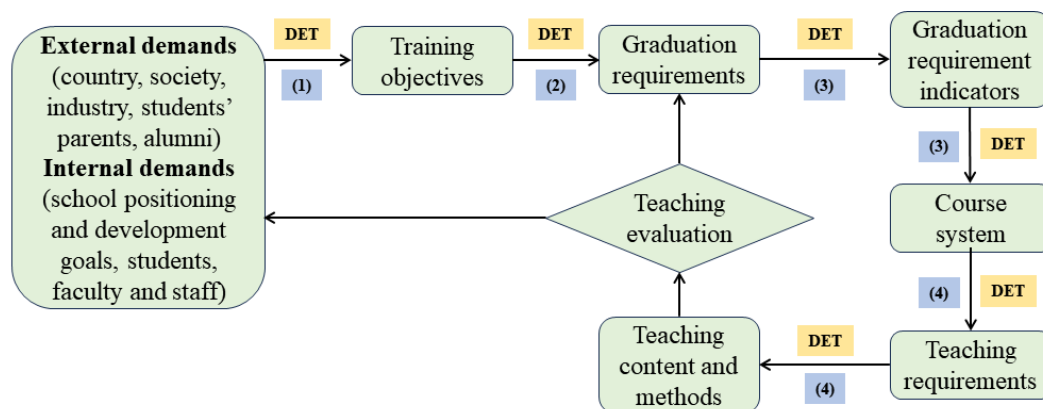


Figure 1: Teaching design based on OBE concept.

OBE stands for "Outcome-Based Education," which is one of the three core concepts of engineering education accreditation. As show in Figure 1, the focus of outcome-oriented teaching design is to determine four corresponding relationships^[6]:

- (1) The correspondence between internal and external needs and training objectives;
- (2) The correspondence between training objectives and graduation requirements;
- (3) The correspondence between graduation requirements and the curriculum system;
- (4) The correspondence between graduation requirements and teaching content.

Accordingly, the curriculum ideological and political teaching design is based on the OBE concept should also meet five progressive relationships:

- (1) Teachers determine training objectives based on the competence and quality requirements of the main employment positions for Civil Engineering graduates;
- (2) Teachers determine political ideology and professional norms based on training objectives;
- (3) Teachers implement specific courses through a matrix of courses and graduation

requirements;

(4) Teachers clearly define the ideological and political education objectives to be achieved in the new version of the course syllabus;

(5) Teachers take corresponding measures in classroom teaching to achieve ideological and political education objectives.

Through the study of this course, students should achieve the following goals:

(1) Course Objective 1 (Knowledge Objective): Let the students master the characteristics of the research objects and research fields of the principles of concrete structure design. Let the students master the material composition characteristics and force characteristics of various components of concrete structures, and let the students be able to abstract and simplify the component calculation problems into mechanical models.

(2) Course Objective 2 (Ability Objective): The students initially learn to use the basic analysis methods of concrete structure design to analyze structural components, select component sections, and perform reinforcement design calculations, and solve concrete structure problems in practical engineering.

(3) Course Objective 3 (Ideological and Political Objective): The teachers combine the characteristics of the Civil Engineering to cultivate students' sense of hard work, frugality, diligent study, love for the country, and sense of mission. The teachers strengthen students' education in engineering ethics and professional ethics, and cultivate students' scientific spirit and professional qualities of excellence and meticulousness.

6. Construction of Ideological and Political Education Resources for Courses

Ideological and political education resources are at the core of curriculum ideological and political education. Without rich, closely related course content that can spark students' interest, ideological and political education in courses cannot be effectively implemented. Therefore, the key to achieving the goals of ideological and political education in courses is to explore ideological and political elements and build a resource and case library[7]. Specifically, the construction of ideological and political education resources for courses can be carried out in the following aspects:

(1) Typical Figures: The teachers select the representative and outstanding figures or national craftsmen who have made significant contributions to relevant theories or technologies in connection with the course content. Collect and organize the materials from the aspects of ideals and beliefs, scientific research thinking, technological breakthroughs, and professional spirit.

(2) Major Projects: The teachers collect the materials on significant concrete structure projects through online searches, on-site surveys, and photography, forming a database of typical major projects.

(3) Typical Accidents: The teachers gather the information on typical engineering accidents that occurred due to the failure to design or construction according to standard requirements in connection with the course content, and incorporate these into the classroom teaching design.

(4) Classic Theories: The teachers summarize the development processes of methods such as the internal force envelope diagram method, the moment redistribution method, the elastic internal force calculation method for continuous multi-span slabs, the yield line method, the shear stiffness distribution method, and the D-value method. Emphasize the spirit of scientific research that pursues excellence and perfection.

(5) Technological Frontiers: For those chapters or knowledge points in the course that are still under research or need improvement, as well as extended knowledge closely related to the course content, the teachers organize the latest research results from both domestic and international sources to form supplementary materials for classroom teaching content.

7. Assessment Methods for Ideological and Political Education in Courses

The effectiveness of the ideological and political education reform in courses cannot be measured without the reasonable establishment of assessment methods. The teaching of ideological and political education in courses is characterized by diversity and variety. The assessment is not about the mechanical memorization of knowledge but integrates the evaluation of the effectiveness of ideological and political education into the formative and summative assessment of professional courses^[8].

Specifically, the course assessment combined with the ideological and political education reform can use the following comprehensive evaluation methods:

(1) The teachers use students' actual performance in classroom questioning as part of their regular grades.

(2) The teachers assess students' critical thinking performance in specific ideological and political education discussions as another component of their regular grades.

(3) The teachers evaluate the ideological and political education effects in the classroom teaching process through tasks such as course papers or documentary reviews based on students' writing performance.

(4) The teachers appropriately add open-ended questions related to ideological and political education in the final exam papers.

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