



Research and Practice on the Building Equipment Course Based on Ideology and Politics Education

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Abstract. In the context of higher education reform in the new era, the development of Course-based ideological and political education has emerged as a pivotal strategy to achieve the fundamental goal of moral and intellectual cultivation. Using the Building Equipment course as a case, analyzes the problems and challenges encountered in integrating ideological and political elements into applied undergraduate education, and explores the effective methods to realize the deep combination of ideological and political education and vocational training. Through curriculum restructuring, systematic identification of ideological elements, innovative instructional design, and optimize assessment mechanisms, a tripartite pedagogical framework encompassing "knowledge transmission, competency development, and value formation" has been established. This model facilitates the organic incorporation of ideological-political components into specialized instruction, ultimately cultivating innovative complex talents for the new era who possess comprehensive understanding in four dimensions: disciplinary knowledge, methodological expertise, social awareness, and developmental perspective. Meanwhile, in practical application, this instructional approach has demonstrated significant pedagogical efficacy.

Keywords: Building equipment, Ideology and politics education , Teaching design.

1 Introduction

Higher education reform in the new era has positioned Ideology and Politics Education as a core strategy for promoting moral development. *Guidelines for curricula of ideological and political construction in colleges and universities* emphasize its critical role in enhancing the quality of talent cultivation^[1]. While, the growth of new engineering disciplines emphasizes the need for interdisciplinary integration and innovative practical training^[2]. The Building Equipment course, a key component of engineering education, aims to develop both students' technical expertise and their ethical values^[3-6]. However, challenges persist, including prioritizing knowledge over values, insufficient integration of ideological and technical content, and inadequate evaluation methods. This study investigates the Building Equipment course to explore effective strategies,

proposing a tripartite model of "knowledge, skills, and values" to inform engineering education reform.

2 Current Challenges in the Building Equipment Course Pedagogy

2.1 "Filling" Teaching Ignores the Status of Students

The Building Equipment course faces challenges due to its intricate content, extensive course, and constrained teaching hours. Current teaching relies on textbook-based, teacher-centered methods, ensuring systematic theory delivery but with key limitations: 1) neglecting individual learning differences, 2) a misalignment between course content and the cognitive developmental needs of students, and 3) limited classroom engagement and an uninspiring learning atmosphere^[7-8]. These issues hinder students' intrinsic motivation, self-directed learning skills, and innovative thinking, failing to meet the demands for cultivating innovative engineering professionals.

2.2 Ideological and Political Education Formalized

Course-based ideological education in higher education has progressed significantly due to key policies like *the Comprehensive Implementation Plan and Guidelines for Course-based Ideological and Political Construction*. Despite faculty efforts to integrate ideological elements, challenges remain: 1) using simple lecture or case piling, lack of interaction and inspiration, 2) the integration of ideological and political elements and professional knowledge is not systematic and coherent, and 3) rigid and formulaic implantation of ideological content, like "labeling" style^[9]. These issues hinder the internalization of ideological education, failing to achieve efficient outcomes and risking student resistance or cognitive dissonance.

2.3 There are Limitations in Result-oriented Evaluation

The current assessment framework for the building equipment courses remains predominantly outcome-focused, typically structured as "procedural assessment (40%) +final examination (60%)". Procedural assessment often relies on superficial indicators, such as attendance and assignment completion, while final examinations heavily on standardized written tests. This conventional approach may undermine the accuracy and comprehensiveness of evaluating students' learning outcomes.

3 Course Ideology-based Educational Objectives

The course of Building Equipment is a basic course of architectural engineering major within Kunming University of Science and Technology Oxbridge College, offered in the second semester of the sophomore year. It consists of four core modules: 1) Water

Supply and Drainage, 2) Heating and Gas, 3) Ventilation and Air Conditioning, and 4) Electrical. It covers system overviews, design principles, construction standards, and the interpretation of engineering drawings, characterized by dense knowledge content, advanced technical requirements, and high professional complexity. In alignment with the principles of the new engineering education framework and curriculum development guidelines, this study constructs a teaching objective system for the Building Equipment course to meet the evolving needs of application-oriented undergraduate education.

3.1 Knowledge Objectives

The course aims to equip students with: 1) comprehensive understanding of fundamental concepts, system configurations, and spatial organization principles in water supply and drainage, HVAC, and electricity, including their integration with structural elements, 2) technical proficiency in evaluating equipment specifications, material properties, and component selection criteria across various systems, and 3) advanced competency in interpreting and applying engineering drawing standards, enabling accurate representation and analysis of building service systems.

3.2 Capability Objectives

The course aims to develop: 1) advanced skills in interpreting technical drawings for various building service systems, and 2) practical design abilities, enabling students to conduct basic system design and optimization based on construction documentation and relevant technical specifications.

3.3 Essential-qualities-oriented Objectives

The course is designed to achieve the following objectives: 1) cultivating industry-aligned values and career perspectives, 2) instilling environmental awareness and principles of sustainable development, and 3) fostering a spirit of craftsmanship, innovative thinking, teamwork, and social responsibility, while advocating for energy efficiency and sustainability in the construction industry.

4 Framework and Implementation Strategy for Ideology and Politics Education in Building Equipment Course

4.1 Implementation Path for Ideology and Politics Education

Aligned with the Guidelines for Course-based Ideological and Political Construction in Higher Education Institutions, which emphasize "enhancing engineering ethics, fostering craftsmanship, and cultivating national responsibility and scientific patriotism", the Building Equipment course sets its ideological education objectives as: 1) building cultural confidence and national identity, 2) fostering ecological awareness and

community responsibility, and 3) nurturing professional virtues, including engineering ethics, collaboration, and innovation.

The implementation framework adopts a student-centered approach, merging educational goals with professional competency through three strategies: 1) Course restructuring guided by ideological education objectives, 2) systematic integration of ideological elements into professional knowledge, and 3) pedagogical optimization emphasizing affective learning experiences (see Figure 1).

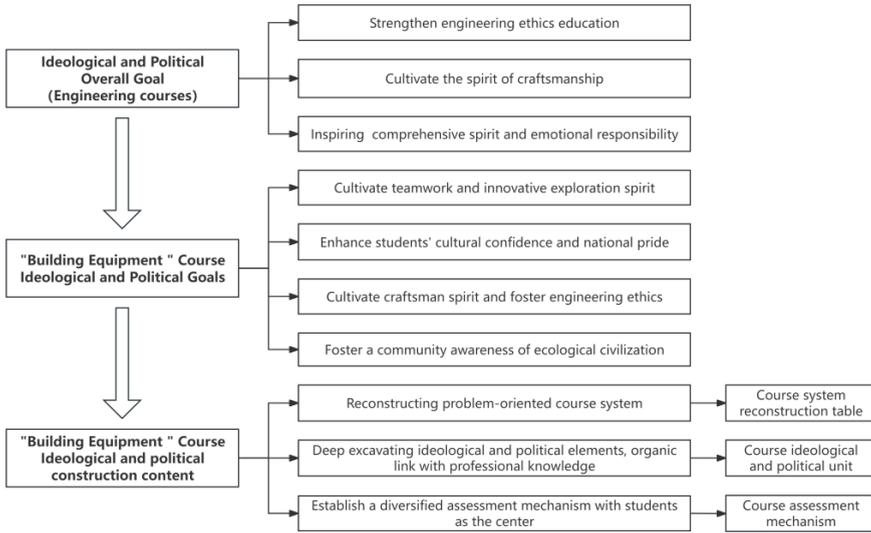


Fig. 1. Ideological and political implementation path for the Building Equipment course.

4.2 Implementation Design

4.2.1 Faculty Development and Team Building

As the cornerstone of educational quality, faculty members serve as primary facilitators in implementing Ideology and Politics Education. Their pedagogical competence and conceptual understanding significantly influence the effectiveness of ideological integration. To enhance faculty engagement and innovation, the following strategies have been implemented: 1) Establishing an expert advisory panel to provide guidance on curriculum development and the integration of ideological elements, 2) Facilitating professional development workshops for faculty to enhance their capacity in identifying and integrating ideological elements, 3) Implementing a continuous feedback mechanism to refine teaching methodologies based on student evaluations.

4.2.2 Problem-Based Course Reconstruction

Given the interdisciplinary nature, technical complexity, and diverse academic backgrounds of students enrolled in the course, and in alignment with national policy documents, the Course has been restructured under the guidance of the Outcome-Based

Education framework. By integrating real-life scenarios and engineering case studies, a problem-oriented Course system has been developed. This pedagogical approach enhances student engagement and promotes the synergistic integration of knowledge acquisition and professional competencies, as detailed in Table 1.

Table 1. Problem-oriented Course system(section).

chapter	Nodule	Problem example
1 Water Supply and Drainage	1.6 Overview of fire water supply system	What impact will IoT technology have on fire water supply systems? Real-time monitoring and remote control of system status?
2 Heating and Gas	2.2 Overview of Heating project	How is heating achieved in winter buildings? What is the form of the system?
3 Ventilation and Air Conditioning	3.1 Overview of Ventilation	Why ventilation and smoke control in buildings?
4 Power Distribution	4.1 Overview of Power Distribution	How is electricity delivered to customers?
5 Electric	5.1 Engineering drawing of Electric	What are the requirements and regulations for threading pipes?
6 Anti-radar earth	6.1 Overview of Anti-radar earth	Why do we need Anti-radar earth? In life, what lightning protection and grounding measures have you seen?
7 Electronic	7.1 Engineering drawing of Security System	What information do you think should be included in the security system engineering drawing?

4.2.3 Integration of Ideological Elements

The course systematically incorporates ideological and political elements by leveraging a wide range of professional resources, such as engineering documentaries, case studies of engineering failures, inspirational narratives from the field, and advancements in civil engineering technologies. This approach combines knowledge delivery, skill development, and value cultivation, emphasizing the discipline's societal impact and significance. It seeks to foster students' professional pride and craftsmanship spirit, while guiding them to address engineering challenges through a "People-oriented" and "Sustainable Development" perspective. The distribution and mapping of ideological and political elements across the course modules are detailed in Table 2.

Table 2. Each chapter of the course ideological and political content (section).

Chapter	Ideological and political elements	Ideological and political integration.
Introduction	Patriotism Craftsmanship spirit	Combined with major strategies such as "South-to-North water diversion", "Belt and

	Responsibility		Road" construction, sharing the historical evolution and development.
	Professional pride		
Water Supply and Drainage	Patriotism		Based on the concept of harmonious coexistence, analyzes the water system of Lijiang Ancient City.
	Responsibility		
Heating and Gas	Professional pride		Guide the students to Analyze different kinds of heat sources and their effects on the environment.
	eco-civilization awareness	aware-	
Power Distribution	Responsibility		Introduce the development history of China's power grid construction and typical cases.
	Patriotism		
	Craftsmanship spirit		
Anti-radar earth	Professional pride		Analyze the Anti-radar earth importance of Jinding lightning strike in Fanjingshan Scenic Area of Guizhou Province.
	Responsibility		

4.2.4 Assessment Framework for Course Ideology Integration

According to societal demands for professional talent and the goal of cultivating interdisciplinary graduates, the Course assessment focuses on learning ability and establishes a diversified evaluation system. Process assessment is emphasized to prioritize skill development. The framework includes four components: attendance (10%), online learning performance (30%), classroom participation (20%), and final examination (40%). The details are shown in Table 3.

Table 3. Course diversification assessment system.

Plate	Weight (%)	Assessment rules
attendance	5	Attendance rate.
Classroom performance	20	1) Actively participate in classroom interaction.
		2) Use course knowledge, Identify and solve the key links of engineering problems.
		3) Ability to read engineering drawings.
Homework score	25	Students' review, understanding and mastery of the knowledge points of each chapter.
Final examination	50	1) Open book test.
		2) Coverall content, objectively reflect the ability to combine theory and practice.
Overall score	100	

Through practice, the Ideology and Politics Education initiative has significantly improved students' academic performance. Their mastery of both theoretical knowledge and practical skills has strengthened, alongside a marked increase in learning motivation and engagement, and fostering students' holistic development.

5 Conclusion

The Building Equipment course, under the Ideology and Politics Education initiative, integrates moral and political education into its professional framework to cultivate well-rounded talents. To address current pedagogical challenges, the course adopts Outcome-Based Education, creating a problem-oriented knowledge system. It aligns with the demands of new engineering disciplines by embedding ideological and political elements into the curriculum. Using diverse teaching methods, it seamlessly blends these elements with professional content. Additionally, building a student-centered multi-faceted assessment system to improve student engagement and motivation. This approach ensures students gain not only theoretical knowledge but also an innovative spirit, craftsmanship ethos, and patriotism, achieving the goal of holistic education.

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