

Exploring Strategies for Integrating Ideological and Political Education into Ecological Engineering Courses within the Environmental Ecological Engineering Major

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Abstract Based on the educational objectives of curricula, this paper incorporates value-oriented goals such as "core socialist values", "patriotism", and the "spirit of craftsmanship", and advances ideological and political education through two primary approaches: innovating educational concepts and expanding teaching content. The three guiding principles—"teaching and nurturing students", "student-centeredness", and "continuous improvement"—are rigorously implemented. Basic knowledge is integrated with the frontiers of various disciplines, while professional knowledge is applied to major national and typical regional ecological engineering cases. In the implementation of teaching, it is essential to explore the integration points of ideological and political education into scientific thinking, social responsibility, and professional ethics. Relying on modern information technology, the adoption of BOPPS teaching design and diversified assessment and evaluation methods can facilitate the effective unification of knowledge transmission and value guidance. This approach offers a valuable reference for the development of curriculum-based ideological and political education in the Environmental Ecological Engineering major.

Key words Ecological engineering, Ideological and political education, Educational objective, Teaching content, Teaching method

1 Introduction

The Environmental Ecological Engineering major is designed to address social needs by cultivating applied professionals with professional skills in environmental protection, ecological restoration, and pollution control. With the growing public awareness of environmental protection and the implementation of sustainable development strategies, social concern for environmental issues has steadily increased^[1]. The Environmental Ecological Engineering major has experienced rapid development in China and has garnered increasing attention from academic institutions. At present, many comprehensive universities and colleges specializing in science and engineering have established the major of environmental ecological engineering. According to the *National Standards for Teaching Quality of Undergraduate Programs in Regular Institutions of Higher Education*, issued by the Ministry of Education in 2018, ecological engineering is listed as a core example course for the Environmental Ecological Engineering major. Therefore, many universities offering this major have incorporated ecological engi-

neering as a fundamental and primary course within their curricula. This course plays a crucial role in the curriculum system of the talent cultivation plan for the Environmental Ecological Engineering major. It contributes to the establishment of students' knowledge systems, the enhancement of professional competencies, the advancement of academic qualities, the guidance of career development, and the cultivation of lifelong learning skills. As an applied branch of ecology, ecological engineering aligns closely with contemporary issues, focusing on the analysis and resolution of ecological challenges across diverse ecosystems. This course takes the complex ecosystem of nature, economy and society as its research object, with the objective of promoting sustainable and coordinated development across environmental, economic, and social dimensions. The curriculum typically usually covers the evolution and basic principles of ecological engineering, the planning, evaluation, design and supervision of ecological engineering, as well as ecological engineering of various industrial types, including agricultural, industrial, environmental, forestry, landscape, and urban ecological engineering. Ecological engineering technology is a fundamental approach to addressing various environmental challenges within ecosystems, directly serving the national strategies for "carbon peaking and carbon neutrality", ecological civilization construction and sustainable development objectives. Integrating curriculum-based ideological and political education into ecological engineering curricula not only extends professional training but also serves as a key path of cultivating "ecological person" for the new era. This construction facilitates value guidance, knowledge innovation and practical education by integrating national policies, environmental governance cases, *etc.* It helps students in understanding the social value of ecological engineering, fostering

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the concept of "a shared community of life between humans and nature", enhancing their commitment to participating in the green industry, and cultivating ecological civilization practitioners who possess both professional ability and social responsibility^[2-3]. The construction of curriculum-based ideological and political education in ecological engineering courses can be carried out from several aspects, including the expansion of educational objectives, the innovation of teaching concepts, the enrichment and broadening of course content, and the adoption of diverse methods for implementing curriculum-based ideological and political education.

2 Reconstructing the educational goals of curricula and clarifying the direction of value guidance

The ecological engineering course is designed around the strategic objectives concerning "the type of individuals to be cultivated, the methods of cultivation, and the target beneficiaries". On the basis of the original knowledge and skill-based goals of the curriculum, it places particular emphasis on refining value-oriented objectives and emphasizes the importance of value guidance in the processes of knowledge acquisition and skill development^[4]. To this end, the teaching objectives have been expanded to include specific requirements such as "core socialist values", "comprehensive development in moral, intellectual, physical, aesthetic, and labor capacities", "the cultivation of innovative spirit", and "the sense of responsibility, and patriotism".

Educational objective one: value formation and scientific spirit. Students are trained to apply fundamental knowledge of ecological engineering, integrated with contemporary literature research, to understand that complex engineering problems often have multiple solutions. This objective aims to cultivate a sense of responsibility and mission in students to explore the unknown, pursue truth, and achieve excellence in scientific endeavors, as well as to foster a craftsmanship spirit characterized by dedication to their professional work.

Educational objective two: a sense of patriotism and innovative consciousness. Students are trained to apply advanced methods and technologies in the design of ecological engineering systems across various industrial types, including agricultural, industrial, environmental, forestry, landscape, and urban ecological engineering. They develop a comprehensive understanding of green development principles, strengthen professional pride and confidence in regional development, foster innovative thinking, and enhance production efficiency. Additionally, students are equipped to promote energy conservation and reduce consumption, while cultivating a sense of patriotism and a commitment to serving the nation through scientific and technological advancement.

Educational objective three: ecological ethics and sustainable development perspective. Students are trained to understand that the research object of ecological engineering is the complex eco-

system of nature, society, and the economy. This training enables them to develop an accurate understanding of the relationship between humans and the land, establish the concept of coordinated development among humans, nature, the economy, and the environment, and cultivate an awareness of respecting life and valuing nature. Furthermore, students are encouraged to consider the sustainability of engineering practices from the perspectives of environmental protection and sustainable development, as well as to assess the potential impacts of such practices on both human populations and the environment. This comprehensive approach fosters the development of a well-rounded character, promotes a sound outlook on development, advances the Chinese spirit, and facilitates the inheritance of scientific and cultural knowledge and professional skills.

3 Innovation of educational concepts and expansion of teaching content

3.1 Implementing the "three integrations" to innovate educational concepts

3.1.1 Integrating teaching and nurturing students throughout the entire process of course teaching. The latest advancements in the discipline are incorporated into the teaching of foundational professional knowledge to expand students' knowledge horizons. By integrating the outcomes of major national ecological projects and typical regional ecological project cases, students' sense of national pride and confidence in regional development can be strengthened. When teaching forestry ecological engineering, it is beneficial to present how China's forestry ecological engineering has overcome natural limitations, pursued technological innovation, and broken through technical challenges in afforestation, addressing problems sequentially. This approach aims to cultivate students' patriotic enthusiasm and professional commitment, fostering both lofty aspirations and a pragmatic spirit, thereby translating their patriotic ideals into concrete actions.

3.1.2 Integrating the student-centered concept throughout the entire teaching process. Student-centered teaching starts by considering the students' perspectives, integrating their individual personalities and characteristics, and facilitating true mastery of knowledge and the enhancement of their skills. In classroom teaching, teachers should not only convey knowledge but also encourage students to develop the ability to synthesize and apply what they have learned.

3.1.3 Integrating the concept of continuous improvement throughout all teaching rounds. The discipline should actively and proactively engage in course evaluation activities conducted at all organizational levels. The evaluation process is an ongoing cycle of improvement. By establishing a continuous improvement mechanisms characterized by the repetitive cycle of "evaluation, feedback, and enhancement", teaching activities can be progressively refined, thereby enabling course objectives to more effectively support the indicators of graduation requirements.

3.2 Realizing the "two combinations" to enrich and expand the teaching content

3.2.1 Combining the presentation of basic knowledge with an overview of the discipline's cutting-edge developments. May knowledge points in the ecological engineering course involve multiple disciplines. For example, when teaching the chapter on environmental ecological engineering, the discipline of environmental biology is involved. This interdisciplinary approach allows for the introduction of advanced research and applications in environmental biology, thereby fostering students' sense of mission and responsibility in contemporary society. It also equips them with essential professional skills and competencies, broadens their perspectives, encourages ambitious goals, and ultimately prepares them to contribute to national development in the future.

3.2.2 Combining the presentation of professional knowledge with typical cases of major national projects or regional ecological projects. Ecological engineering technology is widely applied in the field of engineering. For instance, the Three-North Shelter Forest Program in China has established the world-renowned Green Great Wall, indicating that China's ecological engineering construction technology has reached a relatively advanced level. In the instruction of forestry ecological engineering, it can be combined with such major national engineering projects. For example, the ecological restoration project of the Zhanhe River in Pingdingshan City has resulted in unobstructed waterways, clear water, and vibrant vegetation along the riverbanks. When teaching wetland ecological engineering, such typical cases of regional ecological engineering can be combined. Presenting these topics in this manner often evokes students' patriotism, social responsibility, craftsmanship spirit, and confidence in regional development, thereby motivating them to engage more deeply in their studies and establish a solid foundational knowledge.

4 Integration points of curriculum-based ideological and political education in ecological engineering courses and its specific implementation methods

4.1 Key integration points in the organic combination of curriculum-based ideological and political education content with professional knowledge and skills education content

4.1.1 Scientific thinking and craftsmanship spirit. Prominent scholars at home and abroad have continuously engaged in scientific research to advance the discipline of ecological engineering. Effectively conveying the narratives of these scientific figures can foster students' spirit of scientific inquiry and a sense of professional pride^[5]. The niche theory in the principles of ecological engineering emphasizes that each living organism occupies a specific role and position within the ecosystem, contributing to the system's overall stability. Consequently, the principles and content of ecological engineering can be integrated with the spirit of craftsmanship, characterized by dedication, specialization, excellence, pragmatism, diligence, perseverance, and meticulousness.

4.1.2 Sense of patriotism, social responsibility and innovative consciousness. In agricultural ecological engineering, farmland ecosystems face challenges including desertification, salinization, monoculture practices, and low crop yields. To ensure agricultural production, successive generations have persistently strived to address these issues. This discipline can be effectively integrated with the cultivation of students' social responsibility and patriotism. Within industrial ecological engineering, industrial pollution presents significant problems, resulting in severe environmental degradation. This context provides an opportunity to enhance students' environmental awareness, promote the concept of green development, and encourage the exploration of environmentally friendly technologies aimed at serving the nation through scientific and technological advancement. Furthermore, specialized areas such as environmental ecological engineering, forestry ecological engineering, landscape ecological engineering, and urban ecological engineering can be incorporated with ideological and political elements, including patriotism, social responsibility, and innovative consciousness.

4.1.3 Professional ethics and personality development. Ecological engineering planning and evaluation, as well as ecological engineering design and supervision, all emphasize the importance of professional ethics. Practitioners in these roles should demonstrate a profound respect for nature and life, critically consider the sustainability of engineering practices from the perspective of environmental protection and sustainable development, and assess the potential impacts of such practices on both human populations and the environment. Moreover, they should engage in continuous self-cultivation to foster the healthy development of their character. These contents can be effectively integrated with ideological and political education.

4.2 Teaching methods and approaches of curriculum-based ideological and political education in ecological engineering courses

Curriculum-based ideological and political education is an educational concept, a mode of thinking, an educational practice, and a systematic project. Investigating its internal logic and teaching design is a long-term process that requires ongoing research and practical application through diverse teaching methods and approaches^[6]. The integration of curriculum-based ideological and political education within ecological engineering courses can be pursued through three primary dimensions: the application of modern educational technologies, the adoption of innovative teaching methods, and the implementation of effective assessment strategies.

4.2.1 Application of modern educational technology. The ecological engineering course should develop digital teaching resources and innovate the methods of presenting teaching content. Grounded in the concept of "Internet + Education" and driven by informatization, the course should comprehensively integrate ideological and political elements. By applying modern information technologies and using platforms such as Chaoxing and the teach-

ing resource library specific to the Environmental Ecological Engineering major, various materials—including books, literature, MOOCs, and digital textbooks—can be consolidated. This approach aims to create an engaging, multidimensional learning experience accessible via web, PC, and mobile devices. Besides, it seeks to establish a new media integration application model that extends teaching beyond the traditional classroom, overcoming spatial and temporal constraints. This model facilitates comprehensive interaction before, during, and after class, both online and offline, thereby enhancing the overall effectiveness of classroom instruction.

4.2.2 Teaching methods and approaches. The theoretical course in ecological engineering primarily employs the BOPPPS teaching model. Prior to class, students are expected to engage with preparatory materials, which may include news reports, journal articles, or short videos related to the course content accessible via the Chaoxing platform. Students are then guided to study the relevant chapters and complete a pre-test consisting of brief questions to assess their initial understanding of the subject matter. This assessment helps determine whether it is necessary to review and reinforce specific knowledge areas from prerequisite courses. During the class, the teacher uses multimedia presentations and on-site scenario-based teaching, incorporating diverse case studies to facilitate learning. Group discussions are organized to encourage critical thinking, followed by concise summaries of the discussions and further knowledge expansion through supplementary literature. After class, students are assigned homework that typically involves summarizing their learning or reflecting on case studies. Moreover, the course experiments are systematically designed based on scientific principles. The experimental component should be integrated with experiments from several other courses within the module to form an independent course. The teaching approach primarily involves previewing learning materials on the Chaoxing platform prior to class, conducting on-site observations and recordings during the experiments, and completing experiment reports afterward. This experimental segment serves a dual purpose: first, it validates the fundamental theories, methods, and techniques of ecological engineering, thereby fostering students' innovative awareness; second, it enables students to acquire additional knowledge and skills within the limited experimental time, reinforce classroom learning, enhance their practical and experimental competencies, and cultivate a spirit of craftsmanship^[7]. Following the experiments, students are encouraged to engage in group discussions to extend the scope of the experiments, which further develops their comprehensive abilities in problem analysis and resolution. In addition, the ecological engineering course includes an ecological engineering design competition, wherein students integrate preparatory courses such as environmental engineering drawing and surveying to comprehensively apply their acquired knowledge and skills in producing ecological engineering projects.

4.2.3 Assessment methods. The theoretical assessment of eco-

logical engineering courses typically includes assignment scores, chapter test scores, and final examination scores. The evaluation of the experimental component may include preview report scores and experimental report scores, primarily focusing on the assessment of knowledge and skills. To address challenges associated with quantifying, evaluating, and assessing quality objectives, a distinction between assessment and evaluation can be implemented. A multidimensional assessment and evaluation framework can be established, covering three temporal phases: before class, during class, and after class; four principal main bodies: the Chaoxing platform, teachers, students, and supervisors/industry professionals; and two teaching forms: in-class and out-of-class activities, as well as two formats: online and offline. The course is evaluated from multiple perspectives, including teachers' teaching, students' learning, daily supervision or peer review. This comprehensive evaluation covers dimensions such as learning attitude, study habits, active participation, teamwork, communication and expression skills, safety awareness, behavioral norms, knowledge acquisition, and practical skill operation. The achievement of ideological and political objectives is assessed through various methods, including research questionnaires, group activities, competition design projects, post-class reflections and summaries, and short course papers.

5 Conclusions

The integration of curriculum-based ideological and political education in ecological engineering courses is about transmission of knowledge, and also encompasses the guidance of values and the cultivation of a sense of responsibility. Through systematic ideological and political education, it is possible to develop ecological engineering talents who possess both professional knowledge and a strong social responsibility, thereby providing robust talent support and intellectual foundations for the advancement of ecological civilization and sustainable development. Looking ahead, the incorporation of artificial intelligence to assist teaching and learning processes has the potential to enhance the vividness and effectiveness of curriculum-based ideological and political education within these courses. Innovative approaches, such as virtual reality simulations, can enable students to more directly perceive the severity and complexity of ecological challenges, thereby stimulating their interest in learning and fostering a spirit of inquiry. This increased engagement can facilitate knowledge acquisition and deepen their understanding of responsibility within a dynamic, relaxed, and enjoyable learning environment.

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