



# “Introduction to Environmental Science” Course Civics for Freshmen Exploration and Practice

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## Abstract

Based on the educational goals of environmental engineering majors, "Introduction to Environmental Science" defines four key dimensions: values, knowledge and literacy, industry development, and global perspective. The course focuses on integrating critical thinking and political education, establishing a framework for these elements, utilizing various teaching methods tailored to students' backgrounds, and implementing a feedback mechanism and assessment system to ensure the effective integration of moral, technical, and critical thinking education within the professional knowledge and skills curriculum. We have conducted in-depth research on the elements of ideology and politics embedded in the course. We created a library of ideological and political materials from various directions, and selected and updated these elements according to the specific contents of the course. We implemented the "problem-oriented + double subject" mode and established a comprehensive evaluation system for the ideological and political teaching of the course. This approach aims to enhance the mastery of professional knowledge points and foster students' passion for the profession. The "problem-oriented + double-subject" model is implemented, and a whole-process evaluation system for the teaching of ideology and politics is established. This system promotes the mastery of professional knowledge and the enhancement of ideological and political awareness. It also stimulates students' passion for their professions and significantly influences their perspectives on career choices. The impact is far greater than the sum of its parts, surpassing the simple arithmetic of "1+1>2".

## Keywords

Introduction to Environmental Science, Freshmen, Course Civics, Teaching Model

“Introduction to Environmental Science” Course (Zhou et al., 2017) is divided into four parts: basic theories of environmental studies, environmental pollution and governance, population and resources and environmental issues, and ecosystems. The course begins with basic environmental concepts, then objectively analyzes China's major environmental problems from a global environmental perspective and introduces the disciplinary system of environmental studies. Based on this, environmental science systematically elaborated on the issues related to pollutants such as water, air, soil, sound, and solid waste. Finally, the theory and practice of ecological civilization and the importance of sustainable development are explained from the perspective of ecosystems. “Introduction to Environmental Science” can help students quickly understand that the root cause of environmental problems lies in many inappropriate human activities, improve students' awareness of environmental protection, and, at the same time, provide the necessary theoretical basics for subsequent courses such as Water Pollution Control and Atmospheric Pollution Control, as well as cultivate students' love for the

discipline of environmental engineering.

## 1. Training objectives of “Introduction to Environmental Science”

“Introduction to Environmental Science” is a course for freshmen, who will have different degrees of confusion when they first enter the university, this stage is very crucial to their personality development and is a turning point in their learning styles. “Introduction to Environmental Science” has a wide range of knowledge, involving all aspects of the environment, through the course of thought and politics to provide appropriate guidance, stimulate professional interest, and cultivate the ability to learn independently (Jiang et al., 2021). The course will be properly guided to stimulate professional interest and cultivate the ability of independent learning.

The primary ideological and political task is to give "soul", that is, to explain the vocational courses and promote the truth, goodness, and beauty seamlessly combined, so that the dissemination of professional knowledge can achieve the perfect combination of "depth + temperature", which is the sublimation of the teaching process. In the classroom, teachers have to "preach, teach and solve problems", which not only requires teachers to be more professional but also need to use their emotional attitude, good quality, and values to guide and sensitize students (Tang & Hu, 2021).

It is also the new direction of the new era to promote Civic Policy in the curriculum, which is complementary to the Civic Policy in the curriculum, to update the educational concepts, to construct a model for nurturing people, and to promote the improvement of teachers' teaching level and the overall development of students. With the core educational task of "cultivating moral integrity", organically integrating the cultivation and practice of basic socialist values into the entire environmental knowledge structure system, centering on the orientation of industry-related institutions and the objectives of talent cultivation for engineering majors, and guided by the overall ideological and political teaching objectives of the course, “Introduction to Environmental Science” not only establishes the principle of "knowledge transmission, skill development, and knowledge transfer", but also establishes the principle of "knowledge transfer, skill development, and skill development", which is the new direction of the course. Under the guidance of the overall ideological and political teaching objectives of the course, "Introduction to Environmental Science" not only establishes the teaching objectives of "knowledge transfer, skill training, and literacy formation", but also establishes the educational objectives of four dimensions: values, knowledge literacy, industrial development, and global vision (Fig. 1).

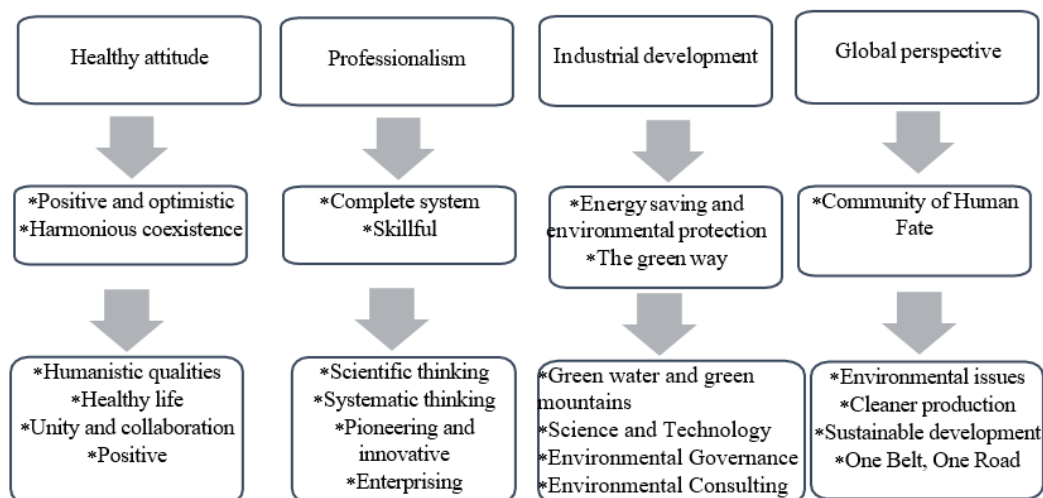


Figure 1. Nurturing goals of the introductory environmental studies program's civic policy.

## 2. Exploration and incorporation of resources for "ideological teaching" in the “Introduction to Environmental Science”

### 2.1 Establishing a library of political thinking elements for the “Introduction to Environmental Science”

In-depth excavation of the "Civic and Political" elements in the knowledge points of each chapter, collection of "Civic and Political" cases, videos, news, and other teaching resources, searching, categorizing, building a library, and categorizing the Civic and Political elements of the course “Introduction to Environmental Science” into five major categories:

development of disciplines, national policies, the spirit of science, technology, application, and current events. application, technology, and current events.

The first major category includes important people and the most important events in the development of the discipline. Budding Stage Chinese Confucianism advocates the "unity of heaven and mankind", emphasizing that human beings should follow the laws of nature to achieve harmony between human beings and nature, the perfect state of harmony between heaven and mankind (Chen et al., 2022).

The second category is national policies, laws, and other measures, such as President Xi Jinping's idea of ecological civilization, the General Secretary's "green mountains are golden mountains" and the "two mountains theory", which vividly explain the dialectical relationship between economic development and ecological environmental protection. To protect and improve the environment, prevent and control other public hazards, protect public health, promote the construction of an ecological civilization, and promote sustainable economic and social development, the State implemented the new Environmental Protection Law of the People's Republic of China on 1 January 2015, while the State Council promulgated and implemented the Action Plan for Prevention and Control of Atmospheric Pollution, the Action Plan for Prevention and Control of Water Pollution, and the Action Plan for Prevention and Control of Soil Pollution on 1 January 2015.

The third category is the power of scientific spirit. Such as Qu Geping "Qu Lao", with a lifetime of dedication, dedication to environmental protection, silent dedication, known as "the father of China's environmental protection"; Qian Yi academician engaged in education all his life, the oldest still plowing in the three feet of the podium, from green hair to white hair, not forgetting the original intention; Prof. He Kebin has been committed to environmental protection and governance technology innovation, advancing with the times, pioneering and innovative, and constantly broadening the academic and scientific research horizons, exploring and developing new research directions (He et al., 2019). Let students absorb and apply the scientist's spirit of patriotism, innovation, truth-seeking, dedication, and collaborative education in their study and life.

The other two categories include technological applications and topical issues. By precisely integrating these categories of ideological elements into the teaching of different curricular knowledge, students are cultivated to be enterprising, to strive for advancement, and to have a humanistic sentiment.

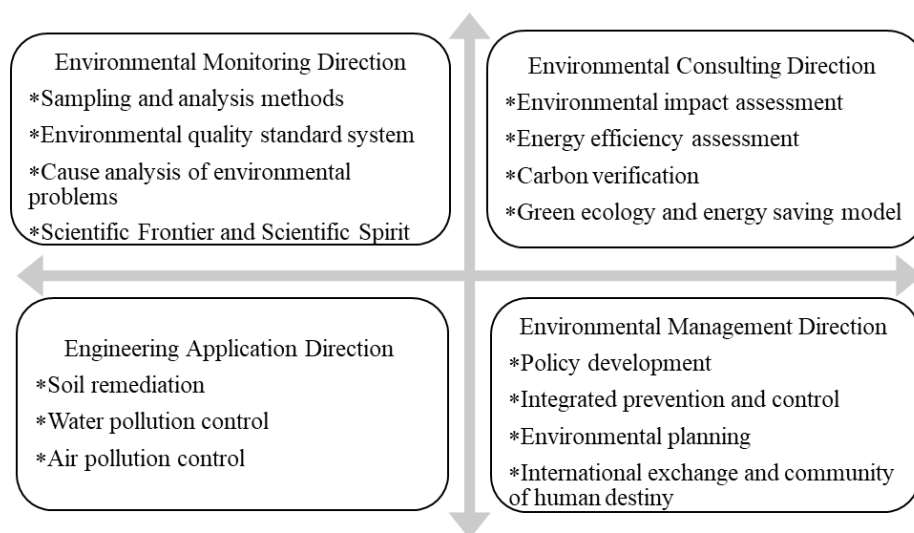
## **2.2 Adoption of diversified ways of integrating the ideology and politics of the curriculum**

How to value lead in limited classroom time and what effective ways to incorporate curricular thinking are worth thinking about and researching (Jiang et al., 2021). We adopt the following ways of integration. We adopt the following ways of integration: (1) Case interpolation. For example, when explaining the development history of the environmental discipline, recognizing that the essence of environmental problems is economic development, the introduction of the world's most representative of the environmental problems of the early 20th century, "the eight major public hazards" (the Maas Valley incident in Belgium, the U.S. Donora incident, the U.S. Los Angeles, the United States, the photochemical smog event, the British London smog event, the Japanese city of Yokkaichi asthma). (2) Combination of "topics", such as "air pollution control" and "meteorology" two chapters, "water pollution control" and "marine pollution". The two knowledge points of "water pollution prevention and control" and "marine pollution" are respectively composed of "thematic ideology" elements. For example, In the movie "My Hometown and I", students not only mastered the theoretical knowledge and expanded their horizons, but also enhanced their sense of national pride and the sense of responsibility for the construction of a beautiful China. (3) Discussion and analysis, in explaining the knowledge point of "environment and war", on the theme of "the harm caused by war to the environment", using the form of a group to let the students check and organize their information, and after thinking about it to put forward their point of view, and then discuss it among the group, which not only cultivates students' independent learning but also helps them to learn and develop their knowledge. (4) Use of the "eye-catching" and "implicit penetration" approaches to teaching and learning. The integration of various ways can effectively trigger students to think, learn knowledge with curiosity, enliven the classroom atmosphere, better grasp and understand knowledge, and perceive the importance of the spirit, making the teaching activities of ideology and politics colorful (Qiao et al., 2022).

## **2.3 Integration of the ideology of the curriculum by differentiating between the student population and professional orientation**

Because our students come from secondary vocational schools and ordinary high schools, there are differences in the professional foundation, and there are differences in professional bias, after the questionnaire survey of the students, through the teachers' discussion and argumentation, to establish the professional knowledge and the content of the course

ideology of different professional bias (Fig. 2). For example, for students in the direction of environmental monitoring, in addition to the teaching of professional knowledge, it also incorporates the latest monitoring and analysis technology and the spirit of scientists, to expand the innovative spirit of the students; the other directions, such as environmental consulting, engineering applications, environmental management, three directions respectively, into the "green ecology + energy-saving model". The other directions, such as environmental consulting, engineering application, and environmental management, respectively incorporate the ideological elements of "green ecology + energy-saving model", "technological innovation + scientific and technological power" and "international exchange + community of human destiny", which stimulate the students' spirit of challenge, broaden their international vision, and cultivate their vocational literacy and sense of the big picture (Wang et al., 2021).



**Figure 2. Civics content of courses in different major directions (preferences).**

### 3. Implementation of Civics in the "Introduction to Environmental Science" Program

#### 3.1 Operation of the "double subject" and "problem-oriented" teaching model

The teaching concept of "student-centered" is the direction and requirement of the current national education development. Therefore, in the teaching practice of the "Introduction to Environmental Science" course, we use "flipped classroom", "role exchange", "research learning" and other methods to carry out civics' activities in the course "student-oriented, teacher-guided" to stimulate students' active participation and active thinking. In the course "student-oriented, teacher-led", we carry out the activities of Civics and Politics to stimulate the students' ability to active participation and active thinking. Group members in the form of a team to discuss after the class, access to the information, and internally determine the members of the main task Division of labor, organize information, extract key points, create works; in the classroom display session, mutual evaluation between groups, and finally by the teacher to summarize the comments, to enhance theoretical knowledge and political awareness.

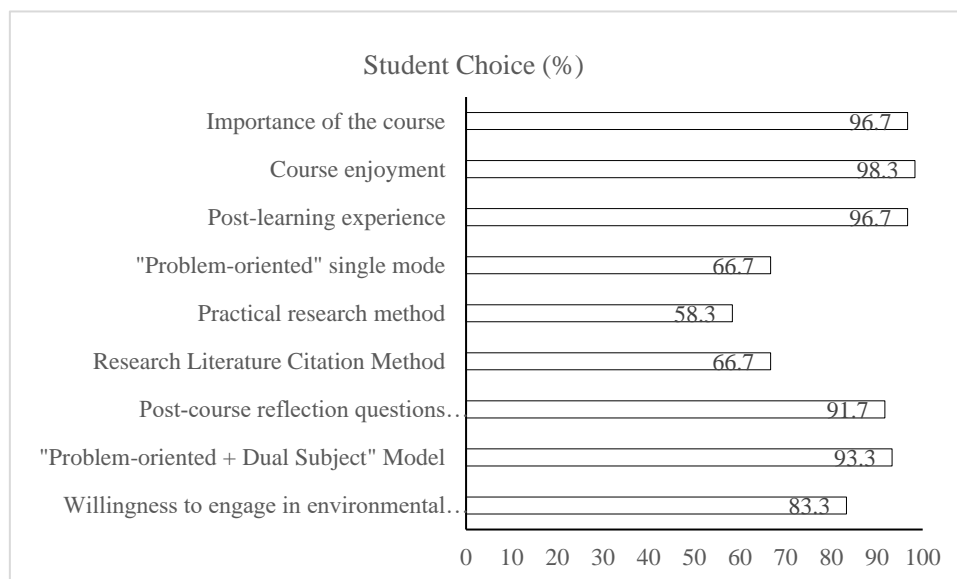
"Problem-oriented" as a teaching method is very suitable for the course "Introduction to Environmental Science", because the ecological and environmental issues concerned in this course are the main body of the course teaching (Gao & Zhang, 2015). Because the ecological and environmental issues that this course is concerned with are the main body of the course teaching, it is a suitable mode of ideology for the teaching of "Introduction to Environmental Science", which can not only improve the student's ability to learn independently, but also strengthen the student's understanding and application of the knowledge points, and significantly improve the effectiveness of educating people.

#### 3.2 Establishing a feedback mechanism for the whole process of teaching civics in the curriculum

Establishment of a feedback mechanism for the whole process of teaching course civics (Meng & Li, 2022). Before the class, the teacher comes to the classroom 10 minutes in advance and plays documentaries related to the theme of the class, interview clips (Yuan Longping and other academicians on "food security" insights), expert interpretation (such as Prof.

He Kebin's understanding of the "dual-carbon goal"), current events (green development and harmony between man and nature issues raised in the 20th National Congress), and so on. In the classroom, we use discussion and analysis, "thematic" combination, and other ways to integrate "Civic Politics", and implement the "problem-oriented + double subject" model, so that students as the main body to tell the "story of Civic Politics" and "story of Civic Politics".

In the course of "Introduction to Environmental Science", the teacher can grasp the effect of professional teaching and civics through open-ended assignments, discussions, quizzes, class discussions, and other methods. The questionnaire survey on the effect of studying the "Introduction to Environmental Science" course for the environmental engineering technology majors of the classes of 2020 and 2022 (Fig. 3) shows that this interactive embedded course civic-political teaching enhances the bidirectional effect of "teaching + civic-political" and realizes the synergistic effect of "1 + 1 > 2", in which 98.3% of the teachers have achieved the synergistic effect of "1 + 1 > 2". Among them, 98.3% of the students are willing to study this course, 93.3% of the students are attracted to the mode of "problem-oriented + double subject", 96.7% of the student's sense of gain has been significantly improved, and 83.3% of the students said that they have gained confidence in environmental protection, and they are willing to be engaged in environmental protection after graduation to serve the green eco-industry. In addition, teachers also keep long-term contact with some graduated students to understand the effect of Civics in the course applied to internships and work, and receive feedback from the dean of teaching and counselors, to update the content and methods of Civics in the course promptly, and to enhance the ability to cultivate people of morality, ethics and skills.



**Figure 3. Student questionnaire after the "Introduction to Environmental Science" class (Environmental Engineering Technology students, Classes of 2020 and 2022).**

### 3.3 Establishment of an evaluation system that includes the teaching of Civics in courses

According to the professional talent training program and curriculum standards, a comprehensive evaluation system has been developed the proportion of the assessment of Civic and Political elements has been increased, including two parts: process evaluation and final examination (Hu, 2022). In the process evaluation, attendance, classroom interaction, "double subject" mode, and post-course quiz and reflection account for 5%, 10%, 10%, 10%, and 5% of the total grade respectively, and the evaluation is completed by combining the "moral, intellectual, physical and aesthetic" aspects of students' course learning. The final closed-book examination will increase the subjectivity of the subjective examination. The final closed-book examination increases the proportion of subjective questions, and the subjective questions are closely related to pollution prevention and control, hot environmental issues, etc., with a value of 55 points, which significantly improves the students' agility, patriotic spirit, social identity and sense of responsibility towards environmental pollution prevention and control technologies and issues.

## 4. Conclusion

Combined with the curriculum, teaching objectives, teaching PPT, and talent cultivation objectives of "Introduction to

Environmental Science", we have conducted in-depth research on the elements of ideology and politics embedded in the course, created a library of ideological and political materials of different directions, selected and updated the elements of ideology and politics according to the specific contents of the course, implemented the "problem-oriented + double subject" mode, and established a whole-process evaluation system for the ideological and political teaching of the course to promote the mastery of professional knowledge points and the improvement of students' love for the profession. The "problem-oriented + double-subject" model is implemented, and a whole-process evaluation system for the teaching of ideology and politics is established, which promotes the mastery of professional knowledge and the improvement of ideological and political awareness, stimulates the students' love for their professions, and greatly influences the students' view of career choice, and the effect is much greater than "1+1>2".

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