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Synergistic Alignment of Engineering Education Accreditation Philosophy and Curriculum Ideological-Political Education—A Case Study of Practical Teaching in Hydrology and Water Resources Engineering

Feng Jianguo[1,a], Yin Huiyong[1,b,*], Wang Min[1,c], Zhang Shengtang[1,d], Xia Lu[1,e], Zhang Yuqi[1,f], Liu Jiutan[1,g]

[1]College of Earth Science and Engineering, Shandong University of Science and Technology, Qingdao, China
[a]fengjianguo20316@sohu.com, [b]huiyongy@sdust.edu.cn, [c]brightwangm@163.com, [d]zst0077@163.com, [e]xialu5272@126.com, [f]zyqsdust@163.com, [g]ljtsdust@126.com
**Corresponding author*

Abstract: *In alignment with the philosophy and standards of Engineering Education Accreditation, the training program and course syllabi for Hydrology and Water Resources Engineering have undergone systematic revision. The cultivation of practical competence constitutes a core component in enhancing talent quality within undergraduate education and serves as a critical pathway for strengthening students' ability to solve complex engineering problems. Currently, while integrating Curriculum Ideological-Political Education into theoretical classroom instruction has gained broad consensus among university faculty, the significant proportion of credits allocated to practical teaching within the Hydrology and Water Resources Engineering major presents a pressing issue: how to effectively implement ideological-political education in practical courses. Grounded in the objective of fostering high-quality talent, this study systematically examines the ideological-political elements embedded in practical teaching from the perspective of Engineering Education Accreditation. It strives to achieve a profound integration of professional knowledge transfer with ideological and value guidance, explores a talent cultivation model that highlights distinctive disciplinary characteristics, and ultimately fulfills the fundamental mission of fostering virtue through education.*

Keywords: *Engineering Education Accreditation, Curriculum Ideological-Political Education, Hydrology and Water Resources Engineering, Practical Teaching*

1. Introduction

The embryonic form of China's Hydrology and Water Resources Engineering specialty can be traced back to the establishment of the Hehai Engineering Specialized School in 1915. After 1949, numerous higher education institutions and technical secondary schools successively established hydrology departments or launched hydrology programs. In 1993, the majors of Land Hydrology, Ocean Engineering Hydrology, and Water Resources Planning and Utilization were unified and adjusted into the major of Hydrology and Water Resources Utilization. In 1998, the major name was further revised to Hydrology and Water Resources Engineering.

Currently, approximately 50 universities across the country offer programs in Hydrology and Water Resources Engineering. Nearly half of these programs have evolved from pre-existing Hydrogeology specialties. Particularly, programs at institutions with a historical background in Geology and Mineral Resources exhibit a distinct emphasis on groundwater studies.

Cultivating high-level, application-oriented professionals in Hydrology and Water Resources Engineering—who possess a solid foundation of specialized knowledge and strong practical engineering capabilities to adapt to evolving circumstances—constitutes the common objective of universities offering this major.

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2. The Educational Philosophy of Engineering Education Accreditation

On June 2, 2016, China officially became a signatory of the Washington Accord, signifying the nation's attainment of a significant standing and voice within the international engineering education community. Engineering education accreditation contributes to the establishment of a quality assurance framework for engineering education in China and propels the reform of engineering education practices.

China initiated its Engineering Education Accreditation efforts in 2006. The pilot accreditation for water conservancy disciplines commenced in 2007, encompassing four specific majors: Hydrology and Water Resources Engineering, Water Conservancy and Hydropower Engineering, Port, Waterway and Coastal Engineering, and Agricultural Water Conservancy Engineering. The number of accredited programs currently accounts for approximately one-quarter of the total number of water conservancy programs nationwide [1].

Professor JIANG Hongdao of Hehai University posits that the most pressing need for water conservancy in the new era is the cultivation of interdisciplinary, innovative talents capable of addressing the diverse demands of the water sector [2]. It is essential to center efforts on the fundamental mission of fostering virtue through education, to be guided by the core principles of professional accreditation, to engage in comprehensive planning while highlighting key priorities, to advance initiatives in a coordinated manner, and to pursue continuous improvement.

3. Educational Requirements for Curriculum-Based Ideological and Political Education

"Maintain a stretch of canal, cultivate a plot of responsibility field" and "Like salt dissolved in water, moisturizing things silently" are vivid descriptions of curriculum-based ideological and political education (CIPE). Over more than a decade, CIPE has evolved through three stages: practical exploration, theoretical formation, and full-scale implementation.

In 2014, Shanghai launched reforms shifting from "ideological and political courses" to "curriculum-based ideological and political education". In 2020, the Ministry of Education stressed the comprehensive advancement of CIPE nationwide.

Curriculum ideological-political education is an educational concept and practice focused on fully implementing the fundamental task of fostering virtue through education. Its essence lies in exploring the ideological and political elements contained in various non-ideological-political courses, conducting ideological education in the process of professional knowledge teaching and practical ability cultivation, and strengthening value guidance. The goal of curriculum ideological-political education is to achieve an organic integration of explicit and implicit ideological-political education and establish a full-curriculum talent cultivation pattern [3].

The full implementation of curriculum ideological-political education represents a major reform of China’s educational philosophy. Since 2004, the central government has successively issued documents on further strengthening and improving the ideological and moral development of minors and the ideological and political education of college students. The focus of current teaching reform has shifted from merely emphasizing the construction of moral education courses in basic education to the coherent and integrated development of moral education curricula. This process clearly reflects the concept of building a talent cultivation pattern involving all staff and all courses.

Actively guiding college students to form a correct worldview, values and outlook on life, and cultivating them into qualified successors for socialist modernization has become a core issue in the field of ideological and political education in colleges and universities.

4. The Role of Practical Teaching in Talent Cultivation

Many experts and scholars have analyzed the role of practical teaching in talent cultivation and reached a consensus that practical teaching is an important part of talent training for the Hydrology and Water Resources Engineering major, and plays a vital role in improving the quality of talent cultivation.

Based on the current situation of practical teaching for the Hydrology and Water Resources Engineering major at East China University of Technology, Liu Yuanyuan et al. analyzed the main problems existing in practical teaching and put forward reform and optimization measures for professional practice from five aspects, which improved students’ practical and professional skills [4].

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Peng Liang et al. constructed a closed-loop training system of "classroom – base – experiment – classroom". Starting with formulating practical teaching objectives for hydrological survey internships, they set internship tasks and contents, and adopted a hybrid teaching mode involving professional teachers and technical personnel from practice bases, so as to train and develop the practical abilities of undergraduate students majoring in Hydrology and Water Resources Engineering [5].

Song Xiaomeng et al. argued that practice is the source of innovation. Practical teaching and the cultivation of practical ability are key links affecting the quality of talent training and a major direction of educational reform. Taking hydrological survey production practice as an example, they proposed a new five-integrated practical teaching model to enhance students' comprehensive ability and innovative quality [6].

Taking the practical teaching reform of the Hydrogeochemistry course as an example, this study integrated practical teaching reform with theoretical teaching, professional internships and industrial demands, explored ways to improve the quality of practical courses, established a multi-level practical teaching system, cultivated students' practical ability and innovative spirit, raised teaching quality, and strengthened students' employability [7].

In accordance with the requirements of emerging engineering education and combined with the characteristics of the Hydrology and Water Resources Engineering major, a diversified practical teaching system of "in-class experiments, after-class open practice, off-campus internships" was constructed, which improved students' hands-on ability, engineering practice ability and scientific research innovation ability [8].

In engineering education, practical teaching is an important part of talent cultivation and is of great significance for training students' professional skills and improving their professional literacy. In response to problems in practical teaching such as extensive process management, unreasonably high and arbitrary course scores, and insufficient student interest in some practical courses, guided by the "outcome-based education" concept of engineering education accreditation, three measures were proposed: establishing a practical and operable practical teaching quality assurance system, strengthening quality control of practical links, and improving the assessment of practical modules. These measures ultimately realize the transformation from "teachers having taught" to "students having mastered" and from "students having learned" to "students being able to apply", striving to improve the quality of practical teaching and cultivate high-quality engineering talents meeting social needs [9].

5. Research Status of Ideological and Political Education in Practical Teaching

Practical teaching is an extremely important part of ability cultivation for science and engineering majors in universities. Through practical teaching, students can integrate theoretical knowledge learned in class with practice, deepen their understanding of knowledge, accelerate the transformation from knowledge to ability, and promote the development of students' competence and overall quality.

Integrating ideological and political courses into practical teaching in universities is a key focus for improving the quality of ideological and political education. From an educational perspective, such integration can enhance the practicality and pertinence of ideological and political courses, develop students' critical thinking and innovative abilities, strengthen their sense of social responsibility and civic awareness, and promote the in-depth integration of ideological and political courses into practical teaching. The core idea of curriculum-based ideological and political education is to explore the spiritual connotations and ideological and political elements contained in professional courses and organically integrate them with professional content. While imparting professional knowledge, it combines the educational view of practical materialism with the characteristics of situational teaching to correctly guide students' moral education and values in diverse ways, which is an important embodiment of fulfilling the requirement of "guarding one's section of the canal and cultivating one's own field of responsibility".

At present, integrating ideological and political education into classroom theoretical teaching has become a consensus among university teachers, and numerous studies and achievements have been made in fields such as hydrological forecasting [10], hydrological and water resources calculation [11], hydrogeology [12], and groundwater dynamics [13]. For science and engineering majors in universities, practical teaching accounts for a large proportion of the total curriculum. Therefore, how to carry out ideological and political education in practical teaching has become an urgent issue to be studied and solved.

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In practical work, hydrological survey is usually carried out under harsh working conditions. In teaching, emphasis is mostly placed on training students in hydrological observation technologies and methods, while the integration and coordination between professional knowledge instruction, skill training and ideological and political education are relatively weak, leading to insufficient guidance on students' values. At this stage, priority should be given to comprehensively improving students' ability to solve complex problems, cultivating a pragmatic and rigorous scientific attitude, and fostering professional dedication and professionalism [14–15].

Hydrogeology experimental teaching is mostly conducted following the steps of background introduction, instrument operation and result sorting, with a monotonous teaching mode. It often focuses only on the transmission of professional knowledge while neglecting moral education, and generally suffers from insufficient exploration of ideological and political elements [16–17].

6. Design of Talent Cultivation through Practical Teaching

The Hydrology and Water Resources Engineering program at Shandong University of Science and Technology began enrolling students in 2003, with an average annual enrollment of 65 students. By the end of 2025, a total of 1,215 students had graduated, among whom 605 were admitted to master's degree programs.

After years of development and construction, the program has formed distinctive features including a solid professional foundation, strong faculty strength and clear advantageous research directions. It has built prominent cultivation characteristics in the fields of water hazard prevention and control in underground engineering, water resources assessment and environmental protection. The program was selected as a First-Class Undergraduate Program in Shandong Province (2022) and passed the Engineering Education Professional Accreditation in 2023.

In the revision of the 2024 edition of the training program, the professional training objective was further clarified:

"Consciously practice core socialist values, possess good humanistic qualities and professional ethics, have a strong sense of social responsibility, professionalism, safety awareness and environmental awareness in work, and be able to actively serve the country and society."

In the graduation requirement of *Ethics and Professional Norms*, emphasis is placed on:

"Having the awareness of serving the country and the people through engineering, possessing humanistic and social scientific literacy and social responsibility, being able to understand and apply engineering ethics, abide by professional ethics, national or industrial norms and relevant laws in engineering practice, and fulfill corresponding responsibilities."

In the decomposition of indicators, higher requirements were put forward for the supporting role of curriculum ideological and political education, such as:

Indicator 3.3 be able to consciously examine the feasibility of solutions from the perspectives of health and safety, life-cycle cost and net-zero carbon requirements, laws and ethics, society and culture, and reasonably design hydrology and water resources engineering schemes.

Indicator 6.3 for hydrology and water resources engineering projects, have the awareness and concept of environmental protection and sustainable development, understand their connotations, and be able to evaluate their impacts on the natural ecological environment and the sustainable socio-economic development.

Indicator 7.1 Establish a correct worldview, outlook on life and values, practice core socialist values, and possess humanistic and social scientific literacy.

Students in this program are required to complete 171 credits as specified in the training program, including: General education courses: 61 credits, Basic professional courses: 33.5 credits, Core professional courses: 16 credits, Elective professional courses: 17 credits, Practical training modules: 43.5 credits.

Major practical teaching components include:

(1)General Practice

Labor practice, military training, comprehensive practice of ideological and political theory courses,

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innovation and entrepreneurship practice, college students' mental health education practice, and College Physics Experiment (B).

(2)Professional Practice

Comprehensive Experiment of Hydrology and Water Resources, Field Practice of General Geology, Course Design of Structural Geology, Production Practice of Hydrological Survey, Course Design of Hydrological Analysis and Calculation, Course Design of Special Hydrogeology, Course Design of Mine Water Disaster Prevention and Control, and Teaching Practice of Hydrological and Environmental Geophysical Prospecting.

(3)Comprehensive Practice

Comprehensive Professional Internship, Special Internship of Hydrology and Water Resources Engineering, Graduation Internship, and Graduation Design (Thesis).

In the process of compiling syllabi for practical teaching courses, guided by the concepts of engineering education professional accreditation and the ideology of curriculum ideological and political education, and in close combination with course contents and characteristics, ideological and political elements are deeply explored from the perspectives of worldview, outlook on life and values, patriotism and sense of mission, work style, environmental protection and sustainable development, so as to serve the cultivation of high-quality applied and innovative talents with all-round moral, intellectual, physical, aesthetic and labor development (Table 1–Table 4).

Table 1 Examples of CIPE on Worldview, Outlook on Life and Values

Knowledge Points	Ideological and Political Element Cases	Course Name
Representation of various contact relationships on geological maps	Students are made aware that various situations may occur in life, and only through repeated tempering can they become truly useful to society.	Course Design of Structural Geology
Main prevention and control measures for water disasters	Concrete analysis of concrete problems is a concentrated expression of materialist dialectics. Students are required to adopt different measures according to different conditions when dealing with matters and thinking about problems, rather than applying a one-size-fits-all approach.	Course Design of Water Disaster Prevention and Control
Interpretation of geophysical prospecting internship data	Through the identification and interpretation of anomalous bodies, students' ability to see the essence through phenomena is cultivated, guiding them to comprehend the connotation of scientific research using dialectical viewpoints of Marxism.	Teaching Practice of Hydrological and Environmental Geophysical Prospecting
Dongmenshan Internship Area: weathering of granite and formation of rock basins	This is linked to the virtues of perseverance and "constant dripping wears away the stone", cultivating students' rigorous scientific spirit of diligence, pragmatism, perseverance, and upholding truth.	Field Practice of General Geology
Compilation of hydrogeological achievement maps	Adhere to seeking truth from facts and problem-oriented approaches, understand the importance of the Earth system, master basic theories of Marxist philosophy, and improve dialectical thinking.	Special Internship of Hydrology and Water Resources Engineering

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Table 2 Examples of CIPE on Patriotism, Sense of Mission and Responsibility

Knowledge Points	Cases of Ideological and Political Elements	Course Name
Practical significance of Structural Geology Course Design	Structural geology plays a vital role in engineering site selection, earthquake prevention, oil and gas exploration, etc. Students are required to apply knowledge to practice instead of studying mechanically. The ultimate goal is to serve practical applications and contribute to the prosperity of the country.	Course Design of Structural Geology
Writing of General Geology Practice Report	Before field practice, students are advised to read *WEN Jiabao's Geological Notes*. It helps to correct learning attitude, encourage students to apply what they have learned, and cultivate their patriotism.	Field Practice of General Geology
Application of Hydrogeological Maps	Understand the great demand in the hydrological field, enhance patriotism and the sense of mission to devote themselves to the hydrological cause.	Special Internship of Hydrology and Water Resources Engineering
Significance of Water Disaster Prevention Design	Mine water disaster prevention design occupies an important position in the national economy and is an indispensable basic work. Through course design, students' professional pride and responsibility are cultivated, and the spirit of loving the major and making solid contributions is established.	Course Design of Water Disaster Prevention and Control
Marine Environmental Zoning: Marine Erosion Landforms	Introduce the progress of China's ocean scientific research, cultivate students' patriotism, recognize the important strategic significance of scientific and technological innovation for national development, and encourage students to actively participate in national marine research and contribute to the national strategy of building a strong marine country.	Field Practice of General Geology

Table 3 Examples of CIPE on Work Style

Knowledge Points	Cases of Ideological and Political Elements	Course Name
Review and analysis of hydrological data	The collected hydrological data vary in format, and the recording and processing methods of long-series data differ greatly. Meticulousness and conscientiousness are the most basic requirements.	Course Design of Hydrological Analysis and Calculation
Watershed phenomenon in Xiaozhu Mountain	This is intended to tell students that there are many choices in life. Instead of being complacent, they should make efforts to try, face challenges earnestly, and accumulate their abilities and knowledge.	Field Practice of General Geology
Concept of groundwater seepage	Cultivate the scientific spirit and work style of being rigorous, hard-working, pragmatic, realistic, indomitable, and adhering to truth.	Special Internship of Hydrology and Water Resources Engineering
Water level measurement	Water level fluctuations often occur during water level measurement using a staff gauge, making it difficult to obtain a stable reading. This requires patience, calmness, and a responsible attitude in work to ensure that every water level data measured is accurate and meets the requirements.	Production Practice of Hydrological Survey
Field data collection in internship	Field data collection under harsh natural conditions cultivates students' awareness of teamwork and hard work.	Teaching Practice of Hydrological and Environmental Geophysical Prospecting

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Table 4 Examples of CIPE on Environmental Protection and Sustainable Development

Knowledge Points	Cases of Ideological and Political Elements	Course Name
Threats of mine water disasters to human survival and development	Foster a holistic, long-term and systematic perspective, adhere to the priority of protection, implement the national strategies of resource conservation and environmental protection, and protect the ecological environment.	Course Design of Water Disaster Prevention and Control
Water quality monitoring	Although the water environment quality in China has improved in recent years, there is still a gap from the goal of "lucid waters and lush mountains" in some river basins. Water quality monitoring clarifies the actual water quality status and provides a basis for formulating policies and measures.	Production Practice of Hydrological Survey
Water-related environmental and geological problems	Follow up on the investigation of groundwater pollution status, and adhere to the concept of protecting groundwater and that "lucid waters and lush mountains are invaluable assets".	Comprehensive Professional Internship
Hydrochemical types of groundwater	Publicize the basic requirements of China's ecological civilization construction and establish the development concept that "lucid waters and lush mountains are invaluable assets".	Special Internship of Hydrology and Water Resources Engineering

7. Conclusion

The new requirements for hydrological work in the new era call for the cultivation of a new type of undergraduate talents in hydrology. Adhering to the integrated development of the engineering education accreditation concept and curriculum ideological and political education is the fundamental need for talent training in the major of Hydrology and Water Resources Engineering.

Fully implementing the core concepts of engineering education professional accreditation is an important approach to advancing the construction and reform of Hydrology and Water Resources Engineering. Under the framework of the "big ideological and political course", ideological and political education should be extended to practical teaching, so as to give full play to the advantages of practical teaching in implementing curriculum ideological and political education. By fully exploring the ideological and political elements contained in practical teaching and integrating them organically with professional knowledge points for mutual enhancement, an effect like salt dissolving in water can be achieved, thus serving the fundamental task of fostering virtue through education.

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