

The Problems and Countermeasures of Ideological and Political Reform in the Course of "Quantitative Remote Sensing" under the Background of New Engineering Construction

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The first two authors agree on the supply and demand of this article

Abstract. Within the New Engineering Education framework, there's an urgent demand to nurture outstanding professionals equipped with exceptional skills and competencies. The course "Quantitative Remote Sensing" assumes a pivotal role in shaping highly proficient remote sensing experts. It requires a seamless integration of ideological and educational aspects, aiming to bolster students' ethical principles and expand the pool of adept professionals driving remote sensing in China. Grounded in the context of the New Engineering Education, this article offers an overview of the prevailing challenges within the ideological and educational dimensions of the "Quantitative Remote Sensing" course. It proposes a multifaceted approach to revamping these dimensions and outlines a practical pathway for enhancing the course. The ultimate goal is to boost the effectiveness of the ideological and educational elements by introducing innovative teaching philosophies, methods, and content. This approach will accelerate the attainment of moral education goals and contribute to the advancement of the New Engineering Education paradigm. The issues scrutinized, reform strategies delineated, and the practical roadmap provided in this article furnish both theoretical and practical guidance for addressing ideological and educational aspects in courses spanning diverse disciplines within the New Engineering Education framework.

Keywords: New Engineering Education, Quantitative Remote Sensing Course, Ideological and Educational Reform, issues and solutions.

1. Introduction

The development of New Engineering Education constitutes a multifaceted, expansive initiative with significant and unique Chinese attributes. This endeavor exerts a demonstrative and directive influence on the reform and advancement of higher education in China[1]. Within the realm of New Engineering Education, the term 'new' embodies elements associated with emerging, innovative, and fresh dimensions[2]. It encompasses traits like direction, fusion, inventiveness, interdisciplinary cooperation, and growth. In May 2020, the Ministry of Education issued the "Guidelines for Ideological and Political Education in Higher Education Institutions' Curricula," emphasizing the widespread promotion of ideological and political education within curricula. This document perceives curriculum-based ideological and political education as a strategic approach to fulfill the fundamental objective of nurturing students' ethics, serving as a pivotal initiative to enhance the caliber of talent cultivation. "Quantitative Remote Sensing" stands as a pivotal branch of remote sensing science and technology, grounded in the application of mathematical and physical models [3]. In the current national context, which prioritizes innovation-driven progress and the advancement of science and technology[4], "Quantitative Remote Sensing" has extensive applications. Therefore, reforming ideological and educational aspects within the "Quantitative Remote Sensing" curriculum can align the discipline with national requirements, fostering innovative and socially conscious professionals. The inclusion of ideological and political education

content in the curriculum can enhance students' professional skills and humanistic attributes. However, in current engineering course instruction, there is a gap between knowledge transmission and value orientation. Students often lack ideal beliefs and motivation, hindering the progress of ideological and educational reforms within the sphere of New Engineering Education[5]. This article positions itself within the framework of New Engineering Education, using the "Quantitative Remote Sensing" course as its research focus. Its primary objective revolves around curriculum-based ideological and educational reform, providing a comprehensive examination and discussion on restructuring the ideological and educational dimensions within the "Quantitative Remote Sensing" course. The key areas of focus include curriculum objectives, course content organization, and the implementation of teaching methodologies.

In doing so, it presents a practical blueprint for advancing the integration of ideological and educational reform into the "Quantitative Remote Sensing" course. This approach serves as a valuable source of theoretical guidance and practical insights, not only for the reform of ideological and educational components within the "Quantitative Remote Sensing" course but also for other disciplines operating within the New Engineering Education framework.

2. Issues in the Ideological and Educational Aspects of the "Quantitative Remote Sensing" Course

2.1 Insufficient Systematic Integration of Ideological and Educational Elements

The core of ideological and educational reform in the "Quantitative Remote Sensing" course lies in the seamless incorporation of ideological and educational components into the course delivery, establishing a strong connection between these elements and the course content. This integration aims to augment students' comprehension of professional knowledge from an ideological perspective. Currently, the ideological and educational aspects of the "Quantitative Remote Sensing" course often adhere to a "knowledge transmission + value guidance" model. Nevertheless, due to the nuanced nature of ideological and educational guidance, many educators have not fully explored these aspects, thus failing to effectively blend them with knowledge transmission. Additionally, there is an absence of deliberate design in the ideological and educational aspects within the "Quantitative Remote Sensing" course. On one hand, some instructors have not systematically implemented the embedded ideological and educational components in their teaching, resulting in a superficial treatment of these elements. On the other hand, the "Quantitative Remote Sensing" course itself is characterized by its strong emphasis on theory, technical proficiency, and professional attributes, making it challenging to seamlessly integrate ideological and educational guidance. As a result, when instructing the "Quantitative Remote Sensing" course, educators must consider the distinctive characteristics and requisites of various disciplines, effectively melding professional knowledge with ideological and educational elements.

2.2 Outdated and Monotonous Teaching Methods and Content

The teaching methods and content within the "Quantitative Remote Sensing" course exhibit obsolescence and uniformity, posing specific challenges to the effective incorporation of ideological and educational elements within the curriculum. Presently, instruction in the "Quantitative Remote Sensing" course heavily relies on traditional lecture-style teaching, wherein educators employ PowerPoint presentations and textbook materials as their primary teaching tools. The pedagogical emphasis remains primarily theoretical, with limited incorporation of real-world applications and insufficient integration of the latest advancements in the field and scientific research into the ideological and educational facets of the course. This situation results in students acquiring an incomplete grasp of quantitative remote sensing knowledge and can engender resistance among them during the learning process. Hence, within the context of New Engineering Education, addressing the reform of ideological and educational dimensions within the "Quantitative Remote

Sensing" course stands as a pivotal challenge. This endeavor entails leveraging the discipline's distinct characteristics to introduce diverse teaching methods, rejuvenate course content, and strategically integrate ideological components. Guaranteeing the provision of ideological and political education tailored to the characteristics of quantitative remote sensing constitutes a noteworthy deficiency in the teaching of this course in China. It represents a prominent and intricate issue requiring resolution within the broader reform of ideological and educational aspects in the "Quantitative Remote Sensing" course.

2.3 Weak Student Awareness as the Learning Subject

Presently, instruction in the "Quantitative Remote Sensing" course remains grounded in a predominantly one-way "transmission" teaching model, wherein educators often do not prioritize interaction and communication with students. On one hand, instructors predominantly deliver textbook content to students in a passive manner and may not fully harness their potential to offer guidance and inspiration concerning ideological and educational dimensions. This can lead to some educators not affording due attention to the cultivation and direction of students' moral and ideological development. On the other hand, students have grown accustomed to passive learning, displaying limited self-reflection and lacking the impetus for active engagement in ideological and educational learning within the course. Furthermore, influenced by traditional science and engineering teaching philosophies, a significant number of students, when studying the "Quantitative Remote Sensing" course, prioritize the acquisition of technical skills associated with quantitative remote sensing, often displaying diminished interest in ideological and political education. Consequently, when acquiring knowledge in domains pertaining to humanistic qualities and ideological and political education, students frequently lack self-motivation and exhibit a dearth of self-directed learning awareness.

3. The Implementation Path for the Reform of Ideological and Educational Aspects in the "Quantitative Remote Sensing" Course

3.1 Objectives and ideas for curriculum education reform

The reform objectives for the ideological and educational dimensions within the "Quantitative Remote Sensing" course should align with Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era. These objectives should emphasize patriotism education, the cultivation of students' correct worldviews, life philosophies, and values, and the nurturing of innovative thinking and practical capabilities. When setting specific goals, a comprehensive evaluation of the existing ideological and educational aspects in higher education institutions' "Quantitative Remote Sensing" courses is essential. The objectives for these aspects should include identifying ideological and educational components that fit the course's knowledge structure, designing relevant activities in line with the professional knowledge system, developing educational resources corresponding to the course's knowledge structure, and using assessment methods that align with the professional knowledge system. The reform should integrate ideological and political education throughout the course's teaching process. The general approach for integrating ideological and educational aspects into the "Quantitative Remote Sensing" course is as follows: Adherence to the Party's Education Policy: Fully implement the Party's education policy, uphold the spirit of the National Education Conference, establish the "Four Consciousnesses," maintain "Four Confidences," and uphold the "Two Safeguards." Prioritizing Morality and Student Development: Prioritize nurturing students' moral character, place student development at the forefront, and incorporate the concept of "Three Holistics Education" into the teaching of professional courses. Seamless Integration of Ideological and Educational Elements: Delve into the ideological and educational components within the course instruction and organically integrate these elements with professional knowledge. Capacity Enhancement for Teaching Staff: Strengthen the professional

development of teaching staff, raise their awareness of ideological and educational aspects in their courses, and enhance their teaching competencies. Quality Assurance for Teaching: Improve the quality assurance framework for teaching, with teaching quality assessment as a pivotal metric for evaluating instructors' teaching competence in professional courses.

3.2 Curriculum Content and Case Design

Integrating ideological and educational components into the "Quantitative Remote Sensing" course calls for innovative teaching materials and case studies. In terms of teaching content, these elements should be integral parts of the curriculum, incorporated into thematic units. While conveying fundamental knowledge of quantitative remote sensing, one can seamlessly interweave the "Spirit of Chinese Scientists," emphasizing noble character, the pursuit of knowledge for its intrinsic value, and the determination to overcome challenges. For instance, the captivating narrative of Academician Li Xiaowen, acclaimed as the "Father of Geometric Optics Models," can be introduced as an illustrative example. His Li-Strahler model, derived from satellite data analysis, revealed intriguing patterns in satellite-captured forest shadow images. It harnessed the geometric attributes of forests to quantitatively elucidate the radiative transfer of sunlight within forest environments, offering further insight into the interplay of light with forests. In the segment dedicated to "Remote Sensing Technology and Applications," the applications of remote sensing technology in ecological environmental monitoring, disaster emergency management, and other domains can be expounded upon. For instance, the application of remote sensing technology in environmental monitoring can integrate the noteworthy contributions of Academician Li Deren and Academician Wang Liheng to the "High-Resolution Earth Observation System" project outlined in the National Mid-to-Long Term Development Plan for 2006-2020. In the context of instructing remote sensing data processing techniques, relevant cases from the "Digital Silk Road" International Science Program can be incorporated to shed light on the journey of Academician Guo Huadong. With over 40 years of dedication to the field of remote sensing data processing, he has consistently advanced the field. Lastly, when covering the topic of "Global Change and China," the theme of "The Impact of Global Climate Change on China's Economic and Social Development" can serve as a conduit to discuss specific strategies and methods for China to achieve its dual carbon goals. By analyzing and elucidating concrete application cases and delving into the accomplishments of exceptional scientists and role models, the seamless integration of knowledge points and ideological and educational elements within the "Quantitative Remote Sensing" course can be effectively realized.

3.3 Teaching Implementation and Case Analysis

The teaching implementation of the "Quantitative Remote Sensing" course comprises three main components: theoretical instruction, case analysis, and practical teaching. Theoretical Instruction: This component focuses on imparting knowledge related to remote sensing principles, quantitative remote sensing models, and remote sensing classification methods. Case Analysis: The case analysis segment centers around two primary themes: the development of quantitative remote sensing models and quantitative remote sensing inversion. Practical Teaching: Practical teaching mainly involves executing quantitative remote sensing experiments within the course. The integration of ideological and educational components within the curriculum occurs by seamlessly incorporating these elements into theoretical discussions and case analyses. This integration is further reinforced through practical teaching, creating a close connection between ideological and educational elements and the course content to fulfill the objectives of ideological and educational dimensions within the course. For instance, in the chapter dedicated to "Remote Sensing Applications," the journey can begin with the introduction of various domains where remote sensing finds applications. These applications include environmental and resource monitoring, such as tracking agricultural and urban heat island effects, as well as research into global change issues like the dynamics of carbon cycling and land-atmosphere interactions. Students can then be

informed about the vital role of remote sensing in national development by presenting satellite image data processing techniques, trends, and recent instances of novel technology applications. Finally, specific course projects can be integrated to enhance students' proficiency in addressing real-world challenges, deepening their understanding of remote sensing applications and environmental conservation.

4. Conclusion and Outlook

The reform of ideological and educational dimensions within the "Quantitative Remote Sensing" course represents a pivotal focus and content within contemporary higher engineering education. It offers a potent avenue for harmoniously intertwining professional education and ideological development, constituting a fundamental prerequisite for nurturing high-caliber engineering professionals equipped with international perspectives and a profound sense of societal responsibility. This article, centered on the primary task of nurturing students' ethical values, places students at the core of the educational process, employs professional knowledge as the conduit, and harnesses practical activities to seamlessly integrate ideological and educational elements throughout the complete teaching trajectory of the "Quantitative Remote Sensing" course. In response to the challenges and inadequacies encountered during the reform of ideological and educational aspects within the "Quantitative Remote Sensing" course, a series of concrete reform measures and methodologies have been proffered. These measures encompass delving deeply into the ideological and educational elements inherent to the course, fostering enhanced interaction and communication, fully harnessing the subjectivity of students, innovating teaching methods to amplify the efficacy of ideological and educational dimensions, and supplying training and guidance to elevate the capacities and proficiency of instructors in the domain of reforming ideological and educational aspects within the course. The reform of ideological and educational aspects within the "Quantitative Remote Sensing" course is an extensive, systemic, and intricate undertaking. It cannot be rushed, nor can it be undertaken with complacency. It necessitates collective dedication and support from an array of stakeholders.

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References

- [1] J. Shen, T. Li, and M. Wu, "The New Engineering Education in China," *Procedia Computer Science*, vol. 172, pp. 886-895, 2020/01/01/, 2020.
- [2] Y. Lijing, L. Zhenzhen, and W. Jiaojiao, "Reform of Engineering Drawing Curriculum System Based on Emerging Engineering Education Concept and First-Class Curriculum Construction." pp. 169-173.
- [3] X. Li, Strahler, and H. A., "Geometric-Optical Bidirectional Reflectance Modeling of a Conifer Forest Canopy," *Geoscience and Remote Sensing, IEEE Transactions on*, 1986.
- [4] W. Yongfen, C. Weiwei, L. Zhigang, L. Yong, S. Lei, and L. Ying, "Exploration of Teaching Reform for C Programming Course Based on OBE-BOPPPS Model and Rain Classroom." pp. 467-470.

- [5] Y. Zhu, Y. Guo, H. Lv, T. Zhang, Y. Yu, and Y. Liu, "The Reform and Practice of PYTHON Programming Teaching in the Context of Emerging Engineering Education." pp. 552-559.