Exploration of the Introduction of Ideological and Political Elements in Energy and Power University Courses under the "Double Carbon" Strategy

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Abstract: "Decision Theory and Methods" serves as a core professional course for graduate students in Management Science and Engineering, employing quantitative approaches to analyze decision-makers' value judgments. Addressing the learning challenges faced by students in energy and power-related universities, the course establishes ideological and political objectives such as "correct energy and power perspectives, social responsibility, and systemic holistic thinking," cultivating "dual-carbon" mindset. Through innovative teaching methods including expert interviews, comparative pedagogy, and comprehensive exercises, the course not only imparts scientific decision-making methodologies but also delves into the fundamental questions of "for whom we make decisions" and "why we make decisions."

Keywords: Energy and Power University; Graduate Professional Course; Ideological and Political Element; Decision Theory and Methods

1. Introduction

Achieving carbon peaking and carbon neutrality represents a profound systemic transformation of the economy and society, which imposes new requirements for cultivating diverse talents in the new era [1-2]. The Ministry of Education's "Work Plan for Strengthening the Talent Training System in Higher Education for Carbon Peaking and Carbon Neutrality" emphasizes accelerating the development of specialized professionals in engineering, finance, management, and other fields, while supporting multi-level cultivation of high-quality undergraduate and graduate students [3-5].

"Decision Theory and Methods" is a foundational theoretical course for graduate students in management science and engineering, combining strong theoretical depth with practical value [6-7]. The course employs quantitative approaches to analyze decision-makers' value judgments, covering key topics such as stochastic decision-making, multi-criteria decision-making, intelligent decision-making theories and methods, and group decision-making theories and methods [8-10]. Aligning the course with the "dual carbon" era's talent development objectives has become a critical benchmark for advancing its exploration and implementation under the "dual carbon" strategic goals.

Shanghai University of Electric Power is a high-level local university dedicated to the national "dual carbon" strategy, focusing on building a "new power system with new energy as the mainstay" and developing distinctive energy and power characteristics. Its educational philosophy is "rooted in power, application, and frontline practice." Taking Shanghai University of Electric Power as an example, this paper explores the development of the graduate course "Decision Theory and Methods" in energy and power universities, leveraging the opportunity of integrating ideological and political education into curriculum design to highlight the "dual carbon" mindset..

2. Ideological and Political Objectives

In the years of teaching postgraduate students, the teaching team found that most of the students studied in non-energy and electric power universities, and paid less attention to the knowledge of energy and electric power. There were three problems: the lack of awareness of the major practical problems of national energy strategy, the lack of expression of the value of energy and electric power, and the mismatch of knowledge integration and innovation ability.

To address the challenges in the aforementioned course, the teaching team conducted in-depth discussions and repeated practices, refining the

instructional design and innovatively proposing and implementing the "Three Excellence and Three Establishments" teaching philosophy. The "Three Excellence" innovative measures include: First, refining the ideological and political objectives by deeply integrating the "dual carbon" strategic thinking with the course's teaching goals, forming a hierarchical and mutually supportive system of ideological and political objectives. Second, optimizing the teaching content by restructuring the curriculum around practical decision-making issues faced by the energy and power industry under the "dual carbon" goals. Third, enhancing teaching methods by adopting diverse approaches such as case studies, scenario simulations, and project-based learning to improve teaching effectiveness. The "Three Establishments" educational objectives include: establishing a correct perspective on energy and power, fostering social responsibility, and cultivating a systemic and holistic mindset. These three objectives are interconnected and progressively layered, forming a complete educational system.

Establishing a proper perspective on energy and electricity serves as both the guiding principle and cognitive foundation. In teaching, we systematically introduce China's energy structure characteristics and development trends, guiding students to deeply understand that achieving the "dual carbon" goals is an inherent requirement and inevitable choice for overcoming resource and environmental constraints and realizing sustainable development. By analyzing the development paths of traditional and new energy sources, we help students comprehend the complexity and long-term nature of energy transition, cultivating their dialectical thinking. Presenting the latest achievements in energy and power technology innovation boosts students' confidence in industry development and inspires their intrinsic motivation to actively embrace energy transition and revolution.

Cultivating social responsibility forms the core of motivation and values. The curriculum emphasizes nurturing students' sense of mission and commitment by analyzing the energy and power sector's pivotal role in ensuring national energy security and advancing green development. It guides students to proactively shoulder the historical responsibility of driving clean, low-carbon energy transition and building a modern society where humans and nature coexist harmoniously. Through showcasing inspiring case studies of frontline workers in energy supply and technological innovation, the program subtly instills professional ethics and dedication, inspiring students to become practitioners and advocates for carbon peaking and carbon neutrality initiatives.

The cultivation of a holistic systems thinking approach serves as both methodology and practical pathway. Given the inherent complexity of energy and power systems, this curriculum emphasizes developing students' decision-making capabilities within large-scale, multi-objective, multi-constraint, and multi-stakeholder environments. Through real-world case studies such as grid planning and power structure optimization, students are trained to apply systems thinking in problem analysis, fostering a mindset that prioritizes overall optimization amidst conflicting objectives. By simulating scenarios like electricity market transactions and renewable energy integration, the program enhances students' ability to make scientifically informed decisions in complex contexts, with a focus on achieving comprehensive system safety, economic efficiency, and environmental sustainability. These three educational objectives collectively form a complete ideological and political education framework, establishing a solid foundation for nurturing high-caliber professionals aligned with the "dual carbon" strategy requirements.

3. Teaching Content

The course "Decision Theory and Methods" consists of five chapters. The teaching team has meticulously designed the content for each chapter, maintaining the integrity of the theoretical framework while organically integrating practical cases from the energy and power sector with ideological and political elements. This approach achieves a harmonious balance between imparting professional knowledge and guiding values.

In the foundational chapter on decision-making theory, the text not only introduces core concepts and methodologies but also emphasizes the historical context and strategic significance of China's "dual carbon" goals. Through detailed analysis of the scientific rationale, global context, and strategic considerations behind these targets, students gain a comprehensive understanding of the systematic and evidence-based nature of this major national strategy. The course design

encourages discussions on how these goals were formulated through rigorous scientific assessments and domestic/international considerations, helping students develop a macro-level perspective and recognize how their career development aligns with this national strategy. Additionally, by highlighting China's international commitments and concrete actions in climate change mitigation, the curriculum cultivates students' sense of national identity and strategic thinking, fostering a stronger sense of belonging and mission to the country's development strategies.

In the chapter on risk-based decision-making, the teaching team innovatively introduced a case study of power grid contingency plans for extreme weather. This case provides a detailed analysis of the trade-offs between resource investment costs and potential power outage losses under different contingency plans, demonstrating strong practical relevance. Through expected value calculations and sensitivity analyses during instruction, students gained a deeper understanding of why regular resource allocation for grid reinforcement is essential, fostering a prevention-oriented mindset. By examining lessons from major power outages both domestically and internationally in recent years, the course highlighted the critical importance of power security for national socioeconomic development, cultivating bottom-line thinking and risk awareness. A key emphasis was placed on consistently upholding the "people-first" principle in decision-making analysis, prioritizing electricity supply for public welfare – a practice that exemplifies the superiority of the socialist system.

In the multi-attribute decision-making chapter, the wind farm site selection case study is designed as a typical multi-attribute decision-making problem. This case involves multiple decision-making attributes such as power generation efficiency, environmental impact, investment costs, and benefits to local communities, fully demonstrating the complexity of energy project decisions under the "dual carbon" goals. During the teaching process, students are organized into group discussions, where they assign different weights to various attributes to personally experience how to balance economic, social, and environmental benefits in decision-making. This case particularly emphasizes guiding students to understand the development philosophy that "lucid waters and lush mountains are invaluable assets," encouraging them to consider ecological protection and social benefits alongside economic gains, reflecting the requirements of sustainable development. Through studying this case, students not only master multi-attribute decision-making methods but, more importantly, develop systematic thinking and a sense of social responsibility.

In the Data and Decision-making chapter, the teaching team focuses on the application of big data and artificial intelligence in the energy and power sector. By showcasing technological breakthroughs in China's power grid, particularly in smart grid management and renewable energy forecasting, the program cultivates students' scientific rigor and innovative confidence. The curriculum encourages students to explore how emerging technologies can address real-world challenges in energy and power systems, such as enhancing renewable energy integration and improving operational efficiency—critical issues under the "dual carbon" goals. Through analyzing China's technological advancements in this field, the program strengthens students' national pride and innovation drive, fostering a pioneering spirit of "daring to be the first."

The group decision-making chapter presents a dynamic case study of electricity market transactions, vividly illustrating strategic interactions among power generators, grid operators, and consumers. Through role-playing simulations, students gain firsthand experience of diverse market participants' decision-making stances and interests, transitioning from zero-sum game mentality to cooperative approaches. This guides them to explore how market mechanisms can maximize social welfare. The pedagogy emphasizes collaborative win-win outcomes, holistic perspectives, and integrity, helping students appreciate the advantages of the socialist market economy. By analyzing China's electricity market development practices, the program cultivates students' strategic vision and teamwork skills, laying a solid foundation for future participation in energy and power industry management.

4. Teaching Methods and Assessment

Based on the traditional theory teaching and case analysis method, the teaching team innovatively introduced a variety of teaching methods and reformed the assessment method accordingly to

ensure the effect of ideological and political education.

The expert interview method has become a vital bridge connecting theory and practice. The teaching team meticulously designed a series of expert interviews, inviting technical specialists, managers, and distinguished alumni from energy and power enterprises to participate in teaching through online connections or offline recordings. These experts include grid company dispatch operators, new energy project leaders from power generation groups, and policy makers from energy regulatory authorities. During the interviews, experts vividly demonstrated practical applications of decision-making theories in the energy and power sector through their professional experiences. For instance, a grid dispatch expert explained how to apply risk decision theory in formulating power supply guarantee plans under extreme weather conditions through real-world cases. A new energy enterprise manager shared insights on balancing economic and environmental considerations in project investment decisions using multi-attribute decision-making methods. Through direct dialogues and Q&A sessions with experts, students not only deepened their understanding of theoretical knowledge but also gained insights into industry trends and practical demands, which sparked their learning interest and professional identity.

The comparative teaching methodology has demonstrated remarkable effectiveness in the group decision-making module. The teaching team developed a comprehensive instructional framework: Before introducing core concepts of group decision-making, students were first guided to explore the discussion question "How to establish fair and equitable electricity market trading rules" using their existing knowledge. After systematic study of group decision-making methodologies, students were challenged to propose solutions to the same problem. Through post-intervention comparisons, students clearly observed shifts in their thinking patterns and enhanced decision-making capabilities. This approach particularly cultivates systematic thinking, enabling students to apply integrated planning methodologies in electricity market rule design and improve energy and power planning management competencies. In practice, students showed strong engagement, participated in lively discussions, and contributed numerous innovative perspectives, demonstrating excellent teaching outcomes.

Comprehensive exercises serve as a vital component in evaluating students' learning outcomes. The teaching team designed an interdisciplinary project titled "Developing a Carbon Neutrality Pathway for a City's Industrial Park," which combines strong integrative and practical elements. Students were required to apply course-based methods like multi-objective decision-making, leveraging local strategic planning and energy characteristics, while detailing in their reports the impacts of their proposals on the "Dual Carbon" strategy, regional economy, and environmental sustainability. This project challenged students to synthesize various decision-making approaches while considering technical feasibility, economic viability, and social acceptability, significantly enhancing their systems thinking and complex problem-solving skills. Throughout the process, students demonstrated exceptional responsibility and innovative spirit. Some teams even proactively conducted field research to gather firsthand data, showcasing strong professional ethics.

The reform of course assessment methods also reflect the requirements of ideological and political education. In daily assignment evaluations, particular emphasis has been placed on observing and assessing political behavior: In comprehensive major assignments, teachers focus on evaluating the achievement of Ideological and Political Objective 1 and Objective 3 through students' topic preferences, analytical perspectives, and conclusion formulations. For assignments involving selected readings of classic energy and power literature, an innovative peer review mechanism has been implemented: Students post their reading reflections on an online platform and select 5-10 favorite reflections to like. The student with the highest number of likes receives higher regular scores. This assessment method not only evaluates students' understanding of professional knowledge but, more importantly, promotes the internalization of Ideological and Political Objective 1 and Objective 2 through peer learning. Practice has shown that this approach effectively stimulates students' learning initiative, cultivates teamwork spirit, and enhances the appeal of ideological and political education in courses.

5. Teaching Effectiveness

To objectively evaluate the effectiveness of ideological and political education in courses, the teaching team conducted a systematic assessment of instructional practices. Through multiple dimensions including course satisfaction surveys, analysis of student learning outcomes, and tracking of competition performance, they comprehensively examined the implementation results of ideological and political education in courses.

The satisfaction evaluation of ideological and political education in courses was conducted through anonymous questionnaires, covering five dimensions: inspirational quality, integration level, participation rate, implementation effectiveness, and faculty assessment, with 20 specific indicators in total. Survey results showed that 96.5% of students expressed satisfaction or high satisfaction with the implementation of ideological and political education, particularly in indicators such as "alignment between course content and real-world energy and power issues" and "enhanced recognition of professional values." Additionally, 97.7% of students praised teachers' instructional performance, noting their ability to lead by example and naturally integrate ideological and political elements into professional teaching. In open-ended feedback, students wrote: "This course not only taught decision analysis methods but, more importantly, helped me understand the responsibilities and missions of energy and power industry practitioners," and "Case-based teaching revealed the value of professional knowledge in serving national strategies, making learning objectives clearer." These responses clearly demonstrate widespread student recognition of the ideological and political education initiatives.

The improvement in students' learning interest and capabilities was particularly evident. After completing the course, students maintained sustained interest in current hot topics in the energy and power sector. During classroom discussions and post-class exchanges, they actively applied theoretical methods learned in the course to analyze real-world industry challenges. Notably, students demonstrated enhanced innovative awareness and practical skills throughout the learning process. In recent years, the course instructors have significantly increased the number of awards won by student teams in various energy and power innovation competitions, achieving outstanding results. At the Provincial Engineering Management Innovation Competition, five teams participated for the first time in 2023, winning two third prizes and three excellence awards. The progress was even more remarkable in 2024, with seven teams competing and securing one first prize, two second prizes, three third prizes, and one excellence award. Most entries focused on energy and power management innovations under the "dual carbon" goals, such as "Multi-objective Decision-making Optimization Scheme for New Energy Microgrids" and "Power Investment Project Decision Model Considering Carbon Constraints," fully demonstrating students' ability to apply course knowledge to solve practical problems.

6. Conclusion

The implementation of ideological and political education in the "Decision Theory and Methods" course demonstrates that the deep integration of specialized courses with ideological education is not only necessary but also entirely feasible. The core of curriculum development lies in bridging the gap between "cold" decision-making models and theories with "hot" national conditions and industry missions. Through deliberate course design, this approach achieves an organic unity of knowledge transmission, capability cultivation, and value guidance.

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References

[1] Li Zhuo, Jing Hiran, Zhou Tingyue, et al. Exploring the Pathways for Cultivating Innovative Talents in Carbon Neutrality under the "Dual Carbon" Vision. Future and Development, 2022,46(07):83-86.

[2] Zhang Kai, Zhou Lin. Exploration of the "Computer Network" Course in Energy and Power Universities under the Background of "Dual Carbon". China Electric Power Education, 2021, (S1):93-94.

[3] Tan Zhijiao, Zhang Mengmeng. Research on Professional Textbooks Integrating Ideological and Political Content with Professional Content. Century Bridge, 2025, (16):106-108.

[4] Xia Caiyun. Research on the Integration of Ideological and Political Education into the Teaching Practice of Core Courses in Higher Vocational Logistics-Taking "Procurement and Supply Chain Management" as an Example. China Storage and Transportation, 2025, (10):35-36.
[5] Wang Liping, Li Zhenhua. Exploring the Reform of Ideological and Political Education in International Logistics Courses Based on BOPPPS. Modern Trade Industry, 2025, (21):50-52.
[6] Fang Guohua, Huang Xianfeng, Wen Xin. Curriculum Teaching Reform in the Context of New Engineering Education: A Case Study of the Course "Multi-objective Decision Theory and Method". Journal of Education and Teaching Forum, 2022, (44):74-77.
[7] Yi Shenbo. Teaching Reform of "Decision Theory and Methods" Course from the Perspective of New Liberal Arts: A Case Study of Nanchang Hang Kong University. Journal of Nanchang Hang Kong University (Social Sciences Edition), 2023,25(02):110-118.
[8] Tang Shuaiwen, Yu Haiyue, Dou Yajie. Innovation and Practice of the "Decision Theory and Methods" Course with "Knowledge Integration and Ability Hierarchy" -A Case Study of the National University of Defense Technology. Educational Teaching Forum, 2024, (34):125-128.
[9] Chen Weijie. Teaching Reform and Exploration of the Master's Course "Decision Theory and Methods". Modern Trade and Industry, 2020,41(18):167.
[10] Ma Ji. Analysis of Teaching Reform for "Decision Theory and Methods" under the New Liberal Arts Framework. Knowledge Economy, 2019, (30):144-145.

