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Analysis of Teaching Approaches for Ideological and Political Education in the "New Energy and Grid Connection" Course

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ABSTRACT
The "New Energy and Grid Connection " course, a cornerstone for engineering majors, is pivotal in advancing the energy transition. This course emphasizes fundamental theories of new energy technologies to foster students' social responsibility and innovative spirit. This paper explores strategies and approaches for incorporating ideological and political education into the "New Energy and Grid Connection" course, aligned with the "dual carbon" goals. The course integrates ideological and political cases, advances teaching technologies, employs teacher-led demonstrations, and adopts targeted methods to guide students in cultivating a low-carbon mindset, deepening their understanding and commitment to the "dual carbon" goals.

KEYWORDS
New energy; Ideological and political education; Engineering major program; Dual carbon vision

1 Introduction

Higher education institutions should prioritize cultivating well-rounded socialist builders and successors, emphasizing comprehensive development in moral, intellectual, physical, aesthetic, and labor education, while maintaining moral education as the central focus[1]. This principle necessitates integrating ideological and political education into professional education, embedding it throughout the educational process to achieve a harmonious blend of knowledge dissemination and value guidance.

The "New Energy and Grid Connection" course, a core component of the Electrical Engineering and Automation major, aims to develop students' professional skills and innovative capabilities while serving as a vital platform for ideological and political education[2]. Rooted in the "dual carbon" strategy and aligned with national energy transition goals, the course delivers specialized knowledge in new energy generation and grid connection. By incorporating green development, social responsibility, and patriotism into its teaching, the course helps students deeply understand the role of new energy technologies in advancing national strategies, nurturing their social responsibility and mission[3].

The teaching process employs a point-to-surface approach, integrating real-world cases and problem-based methods. This approach enhances students' understanding of professional knowledge and subtly encourages them to internalize their learning into values and behavioral norms. This method effectively fulfills the moral education objective, establishing a strong foundation for cultivating high-quality engineering talents with both integrity and expertise.

2 Ideological and political teaching practice based on the "New Energy and Grid Connection" course

The "New Energy and Grid Connection" course comprises five key sections: an introduction to new and renewable energy, wind power generation and grid connection, solar power generation and grid connection, power electronics in new energy systems, and distributed grid connection and microgrid operation. The course explores mainstream global new energy generation models, equipping students with essential concepts and analytical methods for new energy systems and grid connections. Among these sections, "Wind Power Generation and Grid Connection" and "Solar Power Generation and Grid Connection" are the core focus areas.

New energy generation is crucial for achieving global "dual carbon" goals. It supports the transition by replacing fossil fuels, reducing carbon emissions, transforming global energy structures, fostering technological innovation, creating green jobs, stabilizing energy supplies, increasing environmental awareness, and attracting social capital to sustainable sectors. These efforts strongly support the green transition of the global economy, ecological balance, and sustainable development.

2.1 Teaching program for the ideological and political education

Implementing ideological and political education in courses requires a well-structured and scientifically designed teaching plan. This serves as the foundation for achieving professional education goals and fulfilling the mission of "cultivating morality and fostering talents." Teachers must thoroughly understand the objectives of professional talent

cultivation and, guided by the course syllabus, create a teaching plan that integrates ideological and political content throughout the process. In the design process, teachers should identify and integrate ideological and political elements in each module, including the "dual carbon" strategy, green energy development, and social responsibility. Teachers should clearly define ideological and political objectives and seamlessly combine them with professional knowledge to deepen students' understanding of national development and their sense of personal mission.

Teaching methods such as case analysis, problem-based learning, and classroom discussions are utilized to integrate course content with ideological and political education. This approach ensures that students not only gain professional knowledge but also cultivate social responsibility and patriotism. This well-structured teaching design not only strengthens students' professional competencies but also subtly shapes their values, building a strong foundation for cultivating high-quality talents with integrity and expertise. Table 1 presents the chapter-based teaching plan for integrating ideological and political education into the "New Energy and Grid Connection" course.

Table 1 Teaching program of the "New energy and grid connection" course in the chapter on ideology and politics

Chapter	Ideological and Political Education Content	Ideological and Political Education Methods	Ideological and Political Objectives
Overview of new and renewable sources of energy	1.National "dual carbon" strategy 2.Exploring China's energy structure 3.China's Achievements in New Energy Power Generation	1. Organize the viewing of new energy-related videos 2. Promote China's international energy status as a major energy country and enhance national pride.	Enabling students to Understand the importance and necessity of new energy development in the context of the national "dual carbon" strategy
Wind power generation and grid-connected technology	Discussion on how to better go green in wind power generation	Lecture on the current status of China's wind power development and its position internationally, and demonstrate the strengths of China's wind power.	To enable students to understand the important role of wind power in the optimization of China's energy structure and the construction of an ecological civilization
Solar power generation and grid-connected technologies	1.Guiding students to think about the diversity of renewable energy sources and the future direction of energy development 2.Educational activities on the theme 'Light chasers'	1.Posting reports on solar energy in video programs on solar power generation on online platforms 2.Organize their own research on the link between solar energy development and China's economic rise	Provide students with a deep understanding of the key position of solar energy in solving the energy crisis and protecting the ecological environment
Power Electronics in New Energy Generation and Energy Storage	To guide students to understand the key role of power electronics in manufacturing and its importance to the economic and social development of the country	Introduce the new energy generation inverter industry in China, and show students the development status in recent years through PPT	1.To enable students to understand the significance of energy storage technology for the efficient use of new energy sources and its role in the "dual carbon" goal. 2.Enhance students' confidence in the innovative development of new energy storage technology and power electronics.
Distributed Power Grid Integration and Microgrid Operation Technology	Watch development of the energy storage technology in China in recent years	Study the advantages and disadvantages of various types of electrical energy storage technologies and review relevant literature.	To make students aware of the value of distributed energy and microgrid technologies in enhancing energy autonomy and optimizing energy use

2.2 Implementation of ideological and political education in courses

New energy technology courses in colleges and universities face the challenge of balancing limited classroom time with extensive content, making it difficult for students to gain a comprehensive and in-depth understanding of the technology and its development through traditional teaching alone. Thus, exploring innovative teaching methods and optimizing course content are essential to addressing this issue. To address this, the course incorporates multimedia resources as a vital supplement to traditional classroom teaching. These resources cover fundamental concepts, technical advancements, key challenges, and relevant policies, offering students multidimensional learning support.

Traditional lecture-based teaching is no longer the sole method for implementing ideological and political education in the course. Multimedia resources provide new opportunities to integrate ideological and political content

Incorporating ideologically and politically significant content before, during, and after class helps guide students in fostering national pride, innovation awareness, and social responsibility For instance, presenting the history of technological advancements, major breakthroughs, and their significance highlights the importance of independent innovation, instilling in students the value of "serving the nation through technology" while strengthening their professional ethics and sense of responsibility.

In teaching practice, emphasizing the students' central role through diverse interactive activities is essential to enhancing their engagement with ideological and political education. Case-based discussions foster a relaxed and open classroom environment, encouraging students to share their perspectives. Teachers can guide students during discussions to explore the educational value of cases and align conclusions with the objectives of ideological and political education. This method enhances knowledge acquisition while simultaneously providing value guidance. Assigning post-class research tasks that involve in-depth investigations and report writing deepens students' understanding of professional knowledge while fostering social responsibility and innovation.

Integrating modern teaching technologies, diverse methods, and ideological and political elements enables the course to reinforce both knowledge transmission and ideological education. The teaching team should routinely assess course effectiveness through student feedback and classroom performance, identifying areas for improvement and refining content and strategies. This iterative process ensures the achievement of the educational goal of "cultivating morality and fostering talents."

3 ‘New Energy and Grid Connection’ ideological and political education reform

To effectively utilize the ideological and political elements of the "New Energy and Grid Connection" course and optimize its content, teachers must enhance their teaching methods. Aligning with the course objectives and actively engaging students ensures the effective integration of ideological and political education into professional teaching.

Integrating ideological and political cases into teaching is essential for achieving educational objectives. Analyzing the knowledge system of the "New Energy and Grid Connection" course reveals intersections between professional concepts, such as wind and solar power, and national energy policies and ecological civilization efforts. For example, teachers can present cases showcasing China's advancements in wind and photovoltaic power generation and their role in achieving the “dual carbon” goals. During lectures, teachers can flexibly introduce cases based on the schedule and students' needs, encouraging reflection and discussion on the importance of new energy development. This method integrates professional knowledge with national strategies and environmental principles, helping students acquire professional skills while shaping their values and enhancing their comprehensive abilities[4].

Leveraging modern teaching technologies enhances the teaching process. Modern teaching technologies can enrich offline teaching by incorporating interactive topics, such as "How can new energy technologies improve the energy structure?" or "What is the significance of distributed energy for the future energy grid?" Students can engage in discussions using real-time interactive tools, including online forums, live comment streams, submissions, and group discussions. While teaching wind power and photovoltaic grid connection technologies, teachers can incorporate current events from the domestic and international new energy sectors. For instance, highlighting China's leadership in international new energy technology reflects the "strong nation through science and technology" strategy, helping students link professional knowledge to national development. Real-time interaction enables teachers to understand students' learning needs and adjust teaching plans, thus enhancing learning outcomes[5].

Enhancing teaching effectiveness through teacher demonstration. Teachers' behavior and attitudes in the "New Energy and Grid Connection" course act as role models for students. Teachers should exhibit enthusiasm and a rigorous approach to new energy technologies, such as discussing the importance of hybrid wind-solar-storage systems and energy storage development, to inspire students' learning motivation. Furthermore, teachers should share their professional learning experiences, serving as examples for students and encouraging them to align their aspirations with national energy development goals, thereby fostering a sense of responsibility and mission[6].

Implementing targeted teaching using the "Four-Class Model." The "Four-Class Model," comprising the "First Class," "Theory Class," "Experiment Class," and "Summary Class," is designed to align with student characteristics and course requirements, emphasizing ideological and political education objectives:

The "First Class": establishing the course's overall direction. The "First Class" introduces the course by addressing three key questions: "What will we learn?", "Why should we learn it?", and "How should we learn it?". These questions help students align their personal goals with national development, fostering ownership, responsibility, and a sense of mission. For example, using videos and case studies on new energy policies, teachers can address questions such as "Why study New Energy and Grid Connection?" and "How can we effectively learn new energy technologies?" This method inspires students to prioritize national energy security and green development, enhancing their understanding of the "dual carbon" strategy.

The "Theory Class": combining knowledge and values within the framework of the “dual carbon” strategy. The "Theory Class" focuses on delivering professional content in depth while embedding ideological and political elements. By integrating national strategies and industry trends with key topics like "Wind Power Generation and Grid Connection" and "Photovoltaic Power Generation and Grid Connection," the class emphasizes China's core strengths and development pathways in new energy technologies. This approach helps students gain a deeper understanding of the value of professional knowledge and the global energy landscape's relevance to national strategies. It cultivates a strategic mindset, instilling patriotism and national pride.

The "Experiment Class": integrating learning with practice for comprehensive education. Unlike the "Theory Class," the "Experiment Class" emphasizes practical application and operational engagement, embedding ideological and political education through experiential activities. Through virtual simulation technology, students perform wind and photovoltaic power generation experiments in collaborative, group-based settings. This approach enhances teamwork and practical skills, encouraging students to tackle challenges in modeling, analyze problems, and develop solutions. This process fosters perseverance, problem-solving abilities, and a deeper appreciation of the “dual carbon” vision's practical implementation. Experiential learning reinforces students' confidence in contributing to sustainable development goals.

The "Summary Class": reflecting, connecting, and elevating the theme. The "Summary Class" reviews the course's knowledge framework, links theoretical concepts with real-world applications, and encourages students to reflect on the course's relevance to their professional growth and industry contributions. Through exploring advancements in distributed generation and smart grid technologies, students are prompted to consider their career paths in the course content. This method strengthens students' sense of responsibility, mission, and professional identity, providing a solid foundation for their future growth.

4 Results

The "New Energy and Grid Connection" course, a core part of the undergraduate Electrical Engineering curriculum, seeks to impart professional knowledge in new energy while inspiring students to support the nation's strategic development. In the context of the "dual carbon" goals, the course content must be regularly updated to reflect advancements in the new energy and grid connection industry, enhancing students' professional competence. The teaching process must integrate ideological and political elements with course content. Through diverse teaching methods, the course guides students to align their career aspirations with sustainable development goals. Practical and research-based learning approaches enhance students' application skills and foster innovative thinking. It cultivates students' sense of responsibility and enthusiasm for realizing the "dual carbon" goals. By nurturing young talents with firm beliefs and professional confidence, the course prepares students to advance the new energy sector and support the realization of the "dual carbon" vision.

About the Author

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References

[1] ZHANG Wei, WANG Congjiao, ZUO Dongsheng, SUN Bing Research and Practice on Ideological and Political Teaching in Course of Smart Grid. Advances in Education, 2022, 12(1): 88-92.

[2] Li L. Teaching of ideological and political education for college students from the perspective of culture[J]. DEStech Transactions on Social Science Education and Human Science, 2017, 1: 656-661.

[3] ZHANG Wei. Teaching Reform of "New Energy and Grid Connection" under the Scientific Thinking Oriented Teaching Mode. Advances in Education, 2024, 14(3): 286-290.

[4] Liu X, Xiantong Z, Starkey H. Ideological and political education in Chinese Universities: structures and practices[J]. Asia Pacific Journal of Education, 2023, 43(2): 586-598.

[5] Wang J. Analysis of challenges and countermeasures of ideological and political education in colleges and universities in the new era. J. High. Educ. Res, 2021, 2: 35.

[6] Exploring Path of Integrating Ideological and Political Elements intoTeaching Under Background of Golden Course-Taking Five Functions inVocational Management as an Example.