

A Discussion on the Path of Cultivating Energy Economics Talents through Industry-Education Integration

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Abstract: Under the guidance of the "Dual Carbon" goal, China's energy system is undergoing profound changes. Energy transformation is imminent, and the market-oriented reform of electricity is gradually deepening. The construction of a new power system is advancing steadily. The energy sector urgently needs skilled professionals who possess both basic knowledge of the energy industry and understanding of economic theories and practices. This highlights the significance of the energy economics discipline. Currently, there are common problems in the training of energy economics talents in universities, such as the separation of theory and practice. Integrating resources through industry-academia cooperation and improving the training path is the key to effectively solving this problem. This paper systematically explores the training path for energy economics talents and proposes specific measures for cultivating outstanding energy economics talents through Industry-Education Integration. These include: establishing a collaborative education mechanism for Industry-Education Integration, enhancing the practical course training system, and tailoring training based on students' interests and specialties. Corresponding safeguard measures are also proposed. This provides a reference for improving the training system of energy economics talents.

Keywords: Energy Economics; Industry-Education Integration; Interdisciplinary Field; Talent Cultivation

1. Introduction

China has set the goal of achieving carbon peak by 2030 and carbon neutrality by 2060. Currently, there are only five years left until the

carbon peak target is reached, and the task is extremely urgent. The energy system needs to undergo significant changes to meet this goal. Energy transformation requires the support of technological progress, as well as the promotion and guarantee of economic theories and policies. It is an inevitable choice to cultivate professionals who are both familiar with economics and energy. However, the current energy economics talent training model in universities generally has the problem of theoretical and practical disconnection. At the same time, students lack understanding of the actual situation of the energy industry, and the learning of related theories cannot be integrated. In application-oriented undergraduate schools, there is a phenomenon of disconnection between theoretical teaching and social practical needs when cultivating professionals in the economic and management fields [1]. In 2021, Shanghai released the "Action Plan for Deepening Industry-Education Integration and Collaborative Education in Shanghai (2021-2025)", which proposed to build a university-enterprise collaborative education system and pointed out the importance of industry-education integration. Through the model of industry-education integration, strengthening the positive interaction and effective communication between enterprises and universities is an effective path to solve the current problem of energy economics talent training.

Current research on energy economics teaching is increasing year by year. For instance, Zeng[2], Wang[3] and Li [4] have respectively proposed improvement measures from different aspects such as theoretical teaching, assessment methods, case teaching, and innovative cultivation. The improvement of teaching methods in energy economics is receiving more attention. In the research on Industry-Education Integration, Fang proposed a diversified evaluation system for

Industry-Education Integration teaching based on big data technology [5]; Jiang discussed the application strategies of Industry-Education Integration in logistics management major in higher vocational colleges under the digital economy era[6]; Wu analyzed the significance and problems of optimizing logistics management professional teaching from the perspective of Industry-Education Integration[7]; Zhang proposed a "five-element" Industry-Education Integration teaching model through industry demand research, and adopted a "four sessions and one manual" teaching module design[8]. Overall, Industry-Education Integration promoting teaching reform needs to be targeted at different majors, and it is currently in the exploration stage.

Based on the characteristics of the energy industry and the existing problems in the training mode of universities, this article explores specific paths to promote the cultivation of energy economic talents through the integration of industry and education, with the aim of achieving the goal of providing an excellent talent reserve for China's energy transformation.

2. Main Issues in the Cultivation of Energy Economics Talents

2.1 Students Lack Understanding of the Micro and Macro Aspects of the Energy Industry

During the teaching of energy economics, the author found that current students generally have a lack of understanding of the specific production processes of the energy industry, especially economics students generally lack knowledge of the basic principles of coal, oil, natural gas, new energy and secondary energy electricity. They are not familiar with energy technologies, are not sensitive to energy policies, and lack attention and understanding of the national energy strategy. The energy industry is greatly influenced by policies, and the market-oriented reform is in a continuous advancement stage. It requires both market regulation and national policy guidance. No matter if students later engage in the energy production industry, energy trading industry or energy policy research, they need to have certain understanding and knowledge of energy macro policies and micro enterprises. However, the current educational model mainly focuses on theoretical teaching and lacks connection with

the actual development needs of the energy industry. This inevitably makes the graduates cultivated by universities unable to meet the talent demands of the energy industry.

2.2 The Practical Operation Part of the Teaching is Rather Weak

Due to the rapid development of the energy industry, the energy production and energy market are changing rapidly. Currently, the practical courses in energy economics teaching are generally out of sync with the actual needs of enterprises. The course content is updated slowly and it is difficult to cover emerging energy fields such as energy big data, carbon trading market, and electricity spot market. At the same time, the practical teaching lacks practical operation conditions. Graduation theses mainly focus on theoretical simulation research, which makes it difficult to closely follow the development needs of the energy industry. The investment in energy economic laboratories by universities is insufficient, and the simulation software has a large difference from the real environment. The number of off-campus internship bases is limited, so observation is the main method and it is impossible to get involved in business practical operations.

2.3 The Teaching Staff Lacks Experience in the Energy Industry

Since most university teachers are fresh graduates, they generally lack industry work experience and do not have a deep understanding of the industry. Although they have strong academic research capabilities in energy, they find it difficult to closely combine abstract economic theories with energy industry practices in teaching when facing a rapidly changing energy industry. It is also difficult to cultivate the urgently needed energy professionals by them. At the same time, as the energy economics discipline is a cross-disciplinary and integrated discipline, some teachers with certain energy industry backgrounds may also find it difficult to keep up with the changes in the energy market if they are away from the industry for a long time. The teaching content is generally lagging and limited.

3. The Path of Cultivating Energy Economics Talents through Industry-Education Integration

3.1 Establish a Collaborative Education Mechanism for Industry-Education Integration

Universities should strengthen communication and collaboration with industry associations, establish long-term ties with energy enterprises, and regularly exchange and discuss industry development and talent demands. The formulation of training plans should widely solicit opinions from enterprises and listen to their demand suggestions. Strengthen the basic training of students, enhance their theoretical learning, guide practice through theory, and promptly feedback the talent demands of enterprises and the demands of industry development. At the same time, the deep integration of power infrastructure and modern agriculture has urgently demanded specialized talents with a comprehensive background[9], and the demand for specialized energy storage professionals is constantly increasing [10]. Attention should be paid to that the universities are cultivating high-quality talents with a comprehensive background, and the theoretical foundation of students is particularly important. It is necessary to cultivate students' learning ability and thinking ability to adapt to the rapid development of the energy industry. At the same time, keep up with industry demands. For example, the development of the electricity spot market has put forward a large number of high-standard requirements for talents, and energy economics professionals engaged in electricity spot market transactions have obvious advantages in energy economics understanding, which can help students quickly adapt to the market and use economic theories to guide electricity spot practice transactions. Therefore, it is very important to build a collaborative education mechanism for industry-education integration through the combination of theoretical learning and practical guidance.

3.2 Enhance the Practical Course Training System

According to the needs of energy enterprises, develop a series of cutting-edge and applied courses, such as "Energy Trading Theory and Practice", "Carbon Market Trading Mechanism and Practice", "Electricity Spot Trading Theory and Practice", etc. At the same time, deepen the training mode of large-scale practical assignments, strengthen the specificity and practicality of large-scale assignments. For

example, the large-scale practical assignment of energy economics should closely follow the cutting-edge research in energy economics, closely follow the academic frontiers in the analysis process, continuously iterate and improve the modeling methods, especially for some students who continue to pursue further studies, the training standards should be raised and the reserve talents for energy economics research should be strengthened. Improve the student graduation thesis training mechanism, take real enterprise problems and major national energy issues as topics, fully utilize the role of off-campus enterprise mentors, and let students understand and know the real problems and solutions in the energy field through the writing process of the graduation thesis.

3.3 According to Students' Interests and Specialties, They Are Cultivated in Specific Directions

A system of undergraduate training mentors has been established. For students with strong practical skills, they are encouraged to have more contact with enterprises, through internships and practical exercises to enhance their working abilities, understand the practical skills requirements of energy enterprises, strengthen practical skills, and prepare for early entry into the workplace; for students with a solid theoretical foundation and strong analytical skills, they are encouraged to cultivate academic interests, participate more in teachers' academic research projects and related topics, and lay a solid foundation for further studies. Based on the training results of Shanghai University of Electric Power in the past three years, the direction-based cultivation has achieved good results. Some students' practical abilities have been strengthened, and they have entered energy enterprises and received favorable comments from employers; another group of students' academic research abilities have been significantly improved, they have published relevant academic papers in undergraduate studies, and have entered domestic and international high-level institutions for further studies, becoming high-level energy research talents.

Strengthen the interaction and communication between the teaching staff and energy enterprises. Encourage teachers to participate in the production and operation as well as management of energy enterprises, improving

teachers' ability to solve problems in the energy industry. Universities can hire enterprise executives and technical experts as off-campus mentors, providing regular lectures and seminars for students and guiding graduation theses. Teachers can be selected to serve in enterprises for on-the-job training, participating in real business operations, understanding the talent needs of enterprises, and cultivating teachers' ability to understand energy enterprises and solve energy-related problems. Through interaction and communication, break down the information barriers between universities and enterprises, cultivate students' abilities according to the needs of enterprises, solve practical problems for enterprises, and at the same time enhance teachers' understanding and recognition of the energy industry, achieving a win-win situation for enterprises and universities.

4. Measures and Suggestions

4.1 Strengthen Policy Support and Institutional Guarantees for the Integration of Industry and Education

The government should continue to encourage the integration of industry and education, clearly define the training methods of this integration, conduct dynamic supervision of the industry-education integration projects, and study more effective policies to support the development of industry-education integration. At the same time, the achievements of industry-education integration should be included in the assessment and evaluation systems of universities and state-owned enterprises, and a complete system of rewards and punishments should be established. Strengthen the research on the evaluation system of the effectiveness of industry-education integration, especially considering the evaluation system based on enterprise feedback. Timely track and understand the needs of enterprises to ensure that industry-education integration can truly meet the talent demands of enterprises and guarantee that students' employment keeps pace with the development of enterprises. The government, universities, and enterprises should establish corresponding institutional guarantee mechanisms, clearly define corresponding regulations and rules, institutionalize and scale up industry-education integration, and achieve long-term institutional guarantees for industry-education integration between enterprises and universities.

4.2 Establish a Mutually Beneficial and Win-Win Mechanism between Enterprises and Universities

Through the bridging role of the government and industry associations, establish a long-term communication mechanism between enterprises and universities, construct diversified evaluation indicators, and conduct supervision through various methods such as project support, practical guidance, and enterprise evaluation. Universities will cultivate talents for enterprises, and enterprises will provide more suitable job positions for universities. This will achieve mutual benefit and win-win results for enterprises and universities. Through the integration of industry and education to cultivate talents suitable for enterprise needs, both enterprises and universities can achieve mutual benefits. The corresponding gains should be shared by both parties. Clearly link the employment evaluation of universities with their relevant funds, enrollment scale, etc., and link the evaluation of the effectiveness of cultivating students through industry education and the evaluation of the social responsibility of enterprises. Establish a mutual trust interaction mechanism between both parties to achieve mutual benefit and win-win results for enterprises and universities.

4.3 Strengthen the Main Responsibility of Universities

The main responsibility of universities is to cultivate talents that meet the needs of the country and enterprises. Therefore, the construction of teachers integrating industry and education should be regarded as a key project. In line with the implementation of the national energy strategy, based on the demand for talents by energy enterprises, detailed implementation rules and safeguard measures should be formulated. Special attention should be given to resource allocation, internal management, and reward and punishment mechanisms. A campus culture emphasizing the integration of industry and education should be created. Talents suitable for the needs of the energy economy should be cultivated. University admissions should be linked to student employment. Through the cultivation of industry and education integration, professional directions with better employment outcomes will receive more admission resources. At the same time, corresponding special funds

for industry and education integration should be established to focus on supporting the integration of industry and education in related fields and the training of relevant teachers. Teachers and institutions with significant outstanding achievements should be rewarded, and relevant experiences in industry and education integration should be promoted.

5. Conclusion

With the accelerated advancement of China's energy transition, there is an increasing demand for cultivating energy economic talents that are suitable for enterprises and the country. This article analyzes the problems faced by the cultivation of energy economics talents in China, combines the author's practical teaching experience, and examines the main issues currently faced in the cultivation of energy economics talents in China, including students' lack of understanding of the micro and macro aspects of the energy industry, relatively weak practical teaching, and the lack of energy industry experience in the teaching staff. Three main problems are identified: students' lack of understanding of the micro and macro aspects of the energy industry, weak practical teaching, and the lack of energy industry experience among the teaching staff. Three suggestions are proposed to address these issues: establishing a collaborative education and training mechanism integrating industry and education, enhancing the practical course training system, and strengthening interaction and communication between the teaching staff and energy enterprises. Additionally, suggestions are made for strengthening policy support and institutional guarantees for the integration of industry and education, establishing a mutually beneficial mechanism between enterprises and universities, and strengthening the main responsibility of universities. The specific paths and guarantee measures proposed in this article for cultivating talents through the integration of industry and education provide a reference for improving the construction of the energy economics talent training system, and offer support for achieving the dual carbon goals, promoting energy transition, and achieving better and faster development of the energy industry.

Acknowledgments

This paper is supported by the university-level first-class undergraduate curriculum

development project of Shanghai University of Electric Power (Energy Economics) (No. 202427B005), and the Shanghai Municipal Government's Decision-making Consultation Research Project (Exploration of the Construction Model for Applied Undergraduate Colleges with Industry-Education Integration) (No.2025-LH-JY02-024).

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