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Research on the Training Mode of New Energy Professionals under the Background of Industry-Education Integration

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Abstract: With the implementation of the "dual-carbon" concept and the rapid development of the energy industry, industry-education integration has gradually become an important path in the training of new energy professionals. Based on this, the author will focus on the basic requirements of the new energy industry for talents in the new era, systematically explore the construction of the training mode of new energy professionals under the background of industry-education integration, hoping to provide some references and help for readers.

Keywords: Industry-education integration; New energy major; Talent training

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1. Introduction

Against the backdrop of the accelerated transformation of the global energy structure towards low-carbonization and cleanliness, the new energy industry, as a core area of strategic emerging industries, has become an important engine driving the green development of the economy and society. Technological iteration and industrial upgrading have led to an explosive growth in the demand for professionals in this industry. Industry-education integration, as a key path to resolving the contradiction between supply and demand in talent cultivation, emphasizes the deep interaction between education and industry to achieve the organic integration of knowledge imparting and production practice. In this context, constructing a new energy professional talent cultivation model oriented by industrial needs, centered on school-enterprise collaborative education, and characterized by progressive ability stratification is not only an inherent requirement for improving the quality of talent cultivation, but also an inevitable choice to serve the country's "dual-carbon" strategy and support the high-quality development of the new energy industry [1].

2. The important value of the integration of the production and education concept in the cultivation of new energy professionals

2.1. Improving educational quality: Building a collaborative education system of "Industry, Education, Research and Application"

Under the traditional education model, teachers mostly focus on imparting theoretical knowledge, which leads to students' lack of practical ability and great limitations in technical vision, making it difficult for them to adapt to the rapid development of the new energy industry. However, through the means of integrating production and education, enterprises can directly participate in the formulation of talent training programs and integrate cutting-edge industry technologies into teaching content, ensuring that what students learn is seamlessly connected with what the industry needs. In terms of practical teaching, through the co-construction of training bases by schools and enterprises, enterprises provide real equipment and project scenarios, allowing students to deeply participate in real enterprise projects, so as to realize "learning by doing", accumulate rich practical experience, and improve their ability to solve complex engineering problems [2].

At the same time, under the background of the integration of production and education, the construction of a "double-qualified" teacher team has also become an important part of teaching reform. Schools should encourage teachers to take temporary positions in enterprises and participate in technical research and development together, transforming industrial experience into teaching cases. They can also invite enterprise experts to enter the classroom to share front-line technical problems and solutions, realizing two-way empowerment between teaching and industry [3].

2.2. Enhancing students' competitiveness: achieving "Employment upon Graduation"

As a technology-intensive field, the new energy industry has extremely high requirements for talents' practical ability and innovative literacy, and the traditional education model is difficult to fully meet enterprise needs. The integration of production and education builds a dual-subject training platform of "school + enterprise", introducing real enterprise projects and technical standards into the classroom, enabling students to directly contact cutting-edge industry technologies in the learning process, master the ability to solve practical problems, and effectively shorten the adaptation period from campus to workplace [4].

In the process of integrating production and education, enterprise mentors can transform market demand into teaching cases by participating in curriculum design and practical training guidance, improving students' professional cognition. Students can also deeply participate in enterprise R&D projects. This "work-study alternation" model not only enhances students' sensitivity to industry trends, but also enables them to have post-competency before graduation, directly matching enterprise employment needs. At the same time, through forms such as order-based training and co-construction of industrial colleges, the integration of production and education provides students with stable employment channels. Enterprises lock in talents in advance, and students can take up posts immediately after graduation, realizing the seamless connection of "employment upon graduation."

2.3. Serving the regional economy: Promoting the development of the local new energy industry

By accurately connecting local resource endowments and industrial foundations, the new energy industry can not only effectively utilize local clean energy such as wind and solar energy, reduce dependence on traditional fossil energy, but also drive the coordinated development of upstream and downstream industrial chains, forming

an industrial cluster effect. This can not only create a large number of employment opportunities for the local area, improve residents' income levels, but also attract external investment and enhance the endogenous growth momentum of the local economy. At the same time, the development of the new energy industry helps optimize the local energy structure, improve energy utilization efficiency, and reduce carbon emissions, which is of great significance for achieving the goal of green and low-carbon development. Through the combination of policy guidance and market mechanisms, the research, development and application of new energy technologies can be accelerated, promoting industrial innovation and upgrading, enabling the local area to take the lead in the new energy field and form competitive advantages [5].

3. Problems existing in the cultivation of new energy professionals

3.1. The curriculum system lags behind technological iteration

The current lag of the new energy professional curriculum behind technological iteration is mainly reflected in three aspects: the disconnection between curriculum content and cutting-edge industrial technologies, the mismatch between the technical update cycle and the rhythm of curriculum adjustment, and the lack of courses in emerging technical fields. Firstly, the update speed of course content may lag behind the development of industrial technologies. For example, although the efficiency of perovskite batteries has exceeded 30% and entered the pilot-scale test phase, most colleges and universities still focus on the principle of crystalline silicon batteries, lacking core technical courses such as perovskite material synthesis, interface engineering, and large-area preparation. This leads to a serious mismatch between students' knowledge structure and industrial needs. Secondly, there is a contradiction between the technical iteration cycle and the curriculum adjustment mechanism. The technical update cycle in the new energy field has been shortened to 1–2 years, while curriculum adjustments in colleges and universities usually take 3–5 years. This time gap makes the technologies learned by students obsolete before they graduate [6].

3.2. Insufficient faculty and practical training resources

In the current cultivation of new energy professionals, the problem of insufficient faculty and practical training resources is particularly prominent. The main reason is the imbalance in the proportion of "double-qualified" teachers with industrial experience. Many teachers have been away from front-line production for a long time and lack cognition of practical engineering issues such as perovskite battery coating processes and hydrogen energy storage and transportation system debugging, which leads to a serious disconnection between theoretical teaching and industrial needs [7].

3.3. Insufficient depth of integration of industry and education

At the practical level, although vocational colleges generally have established school-enterprise cooperation mechanisms, the forms of cooperation mostly remain in shallow interactions such as order-based class training and lectures by enterprise experts, lacking in-depth collaboration around the entire industrial chain. For example, the matching degree between professional settings and the needs of regional leading industries is not high, and some colleges and universities still have the phenomenon of "running schools behind closed doors", failing to timely adjust the curriculum system according to the digital and intelligent transformation of industries, resulting in the disconnection between students' knowledge and cutting-edge technologies in the industry. At the resource integration level, the construction of industry-education integration platforms lags behind. The number of

carriers, such as school-enterprise co-built laboratories and industrial colleges, is limited, and there is the problem of "valuing listing over operation". The enthusiasm of enterprises to participate in vocational education has not been fully stimulated, and there is a lack of supporting policies support such as tax incentives and financial subsidies, leading to slow progress in projects such as the construction of internship and training bases and the joint training of technical and skilled talents [8].

3.4. Insufficient interdisciplinary capabilities

Affected by traditional educational concepts, many colleges and universities still follow the traditional subject-based teaching model. The professional curriculum setup shows obvious "barrier" characteristics, and the knowledge systems of different disciplines lack organic connection, making it difficult for students to form systematic problem-solving thinking [9].

At the practical teaching level, interdisciplinary project design is seriously lacking. Practical training tasks mostly focus on a single technical link. For example, photovoltaic laboratories only conduct cell efficiency tests, but do not involve system-level issues such as component packaging processes and inverter control strategies, so students cannot master the full-link design methods of wind-solar-storage integrated systems. In addition, emerging technologies such as digital twins and AI algorithms have not been integrated into traditional experimental courses. For example, in wind farm operation and maintenance, students lack experience in using digital twin technology for virtual debugging, making it difficult to meet the needs of fault prediction and intelligent decision-making in real scenarios [10].

4. Talent cultivation strategies for new energy majors under the background of industry-education integration

4.1. Optimizing the curriculum system and teaching content

Under the background of industry-education integration, optimizing the curriculum system and teaching content of new energy majors is crucial for cultivating talents who can meet the needs of the industry. To this end, schools should first closely focus on the development trends and technical needs of the new energy industry to build a scientific and reasonable curriculum system. This includes setting up basic theoretical courses on new energy, such as the principles of solar energy, wind energy, hydropower, etc., to lay a solid theoretical foundation for students. At the same time, schools should further strengthen the setting of professional technical courses, such as new energy conversion and storage technology, to help students master new technologies and methods in the field of new energy [11].

The new energy field involves multiple disciplines such as physics, chemistry, materials, and electronics. Schools can cultivate students' comprehensive literacy and innovative ability by setting up interdisciplinary courses. They can also invite enterprise experts to participate in curriculum development and teaching, integrate the enterprise's actual needs and cases into teaching content, so that students can better understand the actual situation of the industry, improve the pertinence and practicality of learning, and cultivate new energy professionals who have both a solid theoretical foundation, rich practical experience, and innovative ability.

4.2. Strengthening the practical teaching links

Practical teaching can enable students to closely combine theoretical knowledge with practical operations, and improve their professional skills and innovative ability. To achieve this, schools should strengthen the

construction of on - campus training bases, equip them with advanced and complete new energy experimental equipment and instruments, simulate real new energy production and application scenarios, provide students with sufficient practical opportunities, and let them deepen their understanding of theoretical knowledge and skillfully master the operation process of new energy technology in practice [12].

In addition to on-campus training bases, a good school-enterprise cooperation relationship is also an important measure to improve the effect of practical teaching. Schools need to establish long-term and stable cooperative relations with new energy enterprises, and arrange students to practice in different positions of enterprises according to the needs of enterprises and the professional characteristics of students. During the internship, students can directly participate in the actual projects of enterprises, understand the production process, technical standards and management norms of the new energy industry, and accumulate valuable work experience [13].

4.3. Promoting the construction of teaching staff

Teachers are the foundation of teaching work. The technology of the new energy industry is updated rapidly, which puts forward high requirements for teachers' professional quality and practical ability. Therefore, schools must take multiple measures to strengthen the construction of teaching staff. In this process, introducing and cultivating "double-qualified" teachers is the key. On the one hand, schools should actively introduce professionals with rich practical experience and profound theoretical knowledge from new energy enterprises and scientific research institutions to enrich the teaching staff. They can bring the latest industry technologies and actual cases to the school, making the teaching content more in line with the needs of the industry. On the other hand, encourage existing teachers to participate in various professional training and academic exchange activities, constantly update their knowledge structure, and improve their professional level. At the same time, arrange teachers to take temporary posts in enterprises, participate in the research and development of actual projects and the production process, accumulate practical experience, improve the ability of practical teaching, and truly become "double-qualified" teachers who can not only impart theoretical knowledge but also guide students' practice [14].

In addition, schools should establish long-term and stable cooperative relations with enterprises and formulate detailed plans for teachers' temporary posts. During their temporary posts, teachers go deep into the front line of enterprise production, understand the development trend of the industry and the dynamics of technological innovation, and bring the actual problems of enterprises back to the classroom to enrich the teaching content. In addition, enterprise technical backbones and experts can be invited to the school to teach part-time and serve as practical tutors for students. Their rich practical experience and industry insights can broaden students' horizons and stimulate their interest in learning [15].

5. Conclusion

In summary, amid the wave of the "dual carbon" goals and the transformation of the energy industry, the integration of industry and education has become an inevitable path for cultivating professionals in the new energy sector. The proposal of the concept of industry-education integration has brought a new reform direction to the current training of new energy professionals. To this end, colleges and universities should start by optimizing the curriculum system and teaching content, strengthening practical teaching links, and promoting the construction of teaching staff. They should break down the barriers of traditional education, build a bridge for

in-depth integration of education and industry, and through the organic connection of the education chain, talent chain, with the industrial chain and innovation chain, cultivate more high-quality talents who meet the needs of the times for the new energy industry. This will help China seize the initiative in the global energy transformation and realize the coordinated development of economic and social green development and the "dual carbon" goals.

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