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Research on the Ideological and Political Education Model of the Course 'Energy and Environment' under the Promotion of Competition

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Abstract: ***Against the backdrop of the national 'dual carbon' strategy and the coordinated advancement of ideological and political education within the curriculum, this study explores the integration of the 'Challenge Cup' Entrepreneurship Competition as a practical platform to construct an ideological and political teaching model for the course 'Topics in Energy and Environment' through case-based instruction. A three-dimensional linkage mechanism—comprising knowledge dissemination, competency development, and value shaping—was established to organically incorporate ideological elements such as ecological civilization and the spirit of serving the nation through science and technology into practical components, including renewable energy technology development and environmental governance planning. The successful implementation of the 'Soil Guardian' project, which involves the green conversion of agricultural waste into bio-organic hydrogen fertilizer, significantly enhanced students' sense of social responsibility and awareness of innovation and entrepreneurship. By analyzing the development process before and after the project won the Challenge Cup Gold Award, the study identifies a replicable and scalable pathway for talent cultivation and curriculum-based ideological and political education.***

Keywords: Challenge Cup Entrepreneurship Competition, Curriculum-Based Ideological and Political Education, Energy and Environment, Innovation and Entrepreneurship Education, Teaching Reform**.**

1. Introduction

Under the national strategy of 'carbon peaking and carbon neutrality' higher education in the fields of energy and environment is entrusted with the critical mission of cultivating talents equipped with concepts of sustainable development and innovative practical capabilities. The Central Committee of the Communist Party of China and the State Council have issued the 'Opinions on Fully, Accurately, and Comprehensively Implementing the New Development Concept and Advancing Carbon Peaking and Carbon Neutrality Work' (hereinafter referred to as the 'Opinions'), which provide clear guidance for advancing carbon peaking and neutrality efforts. The 'Opinions' explicitly call for the establishment of a comprehensive talent cultivation system to support carbon peaking and neutrality goals, and encourage higher education institutions to establish new disciplines and majors aligned with these national strategic priorities [1].

However, significant challenges remain in the implementation of ideological and political education in universities. In particular, the traditional 'Energy and Environment Special Topic' course often suffers from a disconnect between theoretical instruction and real-world application. Ideological and political elements are frequently inserted in a rigid and superficial manner, making it difficult to effectively engage students or cultivate a genuine sense of social responsibility, scientific patriotism, and environmental awareness [2]. This gap between curriculum content and students' cognitive and emotional resonance hinders the development of a well-rounded educational experience.

In this context, the 'Challenge Cup' Chinese College Student Entrepreneurship Plan Competition—widely recognized as one of the most influential platforms for innovation and entrepreneurship among university students in China—offers a valuable opportunity to bridge this gap. As a comprehensive practice-oriented event, it encourages students to tackle real-world problems with interdisciplinary thinking and innovative solutions. Leveraging such a competition as a practical teaching platform can significantly enhance the relevance and impact of ideological and political education.

Therefore, a pressing issue in current teaching reform is how to organically integrate the transmission of professional knowledge with ideological and political education through competition-driven and project-based approaches. Achieving this integration can not only invigorate classroom teaching, but also cultivate students' innovation capacity, national consciousness, and commitment to sustainable development.

2. The Current Research Status of the Competition Driven Learning and Education Model

With the escalating challenges of energy crises and global climate change, there is an urgent global demand for interdisciplinary talents in the fields of energy, environment, and sustainable development. In light of the specific requirements for cultivating 'dual carbon' talents, the current landscape of talent development, and the prevailing issues in educational practice, particular attention has been given to constructing a three-dimensional linkage mechanism that integrates 'knowledge imparting, ability cultivation, and value shaping'. Existing research has made notable progress in exploring the synergy among value-oriented education, curriculum-based ideological and political instruction, and innovation and entrepreneurship training. However, further efforts are still required to deepen integration and enhance the practical effectiveness of such models in the context of interdisciplinary education. Li et al. proposed an innovative talent cultivation pathway for the field of carbon neutrality, which encompasses clarifying educational objectives,

promoting interdisciplinary integration, enhancing teaching quality, and strengthening government support [3]. Their approach emphasizes the alignment of talent development goals with national strategies, the dismantling of disciplinary silos to foster cross-domain learning, the continuous improvement of faculty teaching capabilities, and the cultivation of students' innovation and entrepreneurship skills. Sui et al leveraged high-quality student competition projects as templates and utilized institutional platforms such as the university-level modern engineering training center, innovation workshops, and the 'double innovation' (innovation and entrepreneurship) base to implement hands-on training [4]. This approach created a supportive environment for students to 'pursue their dreams' and significantly enhanced the overall quality and impact of student-led projects. Zhang et al. [5] proposed a teaching model combining 'project-driven' and 'value-driven' approaches. Through the reform of the 'Plant Physiology Experiment' course and integration with the 'Challenge Cup' extracurricular academic and technological competition for college students, the positive impact of practical projects on the internalization of ideological and political education was confirmed. Among the various teaching practices that promote learning through competition, the National College Student Challenge Cup Entrepreneurship Plan Competition and the National College Student Challenge Cup Extracurricular Academic Works Competition stand out as the most representative and exemplary student competitions in China, playing a pivotal role in this process. Yang et al. analyzed the significance of the 'Challenge Cup' competition by reviewing its current status and proposed measures for its promotion. Their insights offer valuable references for advancing college students' scientific and technological innovation activities and enhancing their innovation and entrepreneurship capabilities [6]. Nie et al. took the 'Challenge Cup' national college students' extracurricular academic and technological works competition as a case study and proposed measures to foster innovation through student technology competitions [7]. They emphasized strengthening the construction of professional courses, integrating innovative concepts, and aligning with the 'Challenge Cup' competition. By leveraging the role of application-oriented universities, they advocated for cultivating students' innovative abilities. Additionally, they highlighted the importance of experimental practice courses in nurturing students' creativity and innovation.

3. The Significance of the 'Challenge Cup' Gold Award Case for Ideological and Political Education

The 'Challenge Cup' competition aims to 'advocate science, pursue true knowledge, study diligently, innovate, and meet challenges', reflecting a specific requirement of the times for contemporary college students [8]. Therefore, using the 'Challenge Cup' as an opportunity holds great significance for case-based ideological and political education, particularly in the context of innovation, entrepreneurship education, and curriculum development. To win the gold medal in the 'Challenge Cup', students must possess solid professional knowledge, excellent comprehensive qualities, innovative values, as well as a strong sense of purpose and perseverance, ultimately leading to success.

The original intention behind learning and the aspiration to cultivate innovation and entrepreneurship abilities are deeply aligned, both striving to address the needs of the country, the market, our individual capabilities, and future directions, with the ultimate goal of contributing meaningful scientific research. This vision is not just about academic growth but is closely tied to societal impact and the advancement of relevant, applied knowledge. A compelling example of this is the biohydrogen production team at Henan Agricultural University, which has been at the forefront of biohydrogen research for over 20 years. Over these years, the team has dedicated itself to pioneering studies in biohydrogen science and engineering, with the university serving as a solid foundation for their work, and a clear focus on supporting agriculture and rural development.

The team's research has led to significant innovations such as hydrogen-alkane co-production, hydrogen-alcohol co-production, hydrogen-algae co-production, and hydrogen-fertilizer co-production. These ideas have quickly gained widespread social attention due to their practical potential and relevance to current environmental and energy challenges. Moreover, the related technologies have seen rapid transformation and application, further demonstrating the power of research-driven innovation. In the context of this innovation and entrepreneurship journey, the hydrogen-fertilizer co-production initiative has emerged as a key breakthrough.

The original intention of the students at Agricultural University—to improve the lives of farmers and contribute valuable research to the land of their homeland—has been seamlessly integrated into a transformative innovation and entrepreneurship project. This effort not only showcases a deep sense of responsibility to society but also exemplifies how academic and entrepreneurial goals can converge to create impactful solutions. Ultimately, it has resulted in a remarkable case of ideological and political education, demonstrating how innovation, entrepreneurship, and social responsibility can be harmoniously intertwined to foster both personal and societal growth.

Once a choice is made, perseverance is essential. In the case of biohydrogen fertilizer, a groundbreaking and novel product, its promotion faces unique challenges. Initially, the speed of the fixed fertilizer production device was not fast enough, and students experienced significant pressure from their academic commitments and competitions. These challenges often led to moments of hesitation among teachers and mentors during the teaching process. Furthermore, the lack of sufficient funding support created difficulties in sustaining research and preparation expenses, which posed additional hurdles. Despite these obstacles, the commitment to persevere remains crucial. This perseverance, in itself, is one of the core qualities that should be emphasized within the ideological and political education process of the curriculum.

The decision to persist, even in the face of adversity, is not without reward. The preparation for and participation in the 'Challenge Cup' competition represents a process of continuous growth for students. From the initial excitement of joining the competition to handling real-world cases, from selecting the right images to designing effective layouts, and from engaging with policy mentors to learning from industry

experts, each step contributes to the students' development. Moreover, the process involves utilizing various resources such as technology, talent, and alumni networks, all facilitated by different departments within the university. These experiences, rich in practical skills and knowledge, serve as important demonstrations of the values conveyed through ideological and political education courses.

Through their participation in such a meaningful competition, students not only develop technical and entrepreneurial skills but also internalize the values of persistence, collaboration, and innovation. This journey, marked by challenges and eventual success, becomes a powerful tool for guiding students in their broader educational and personal development, reinforcing the deeper purpose behind their academic and entrepreneurial pursuits.

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4. Conclusion

The ‘Challenge Cup’ competition has a significant and far-reaching influence across universities. It adheres to the core principles of ‘advocating science, pursuing true knowledge, diligent learning, innovation, and meeting challenges’, which align perfectly with the talent cultivation philosophy upheld by universities. In the context of the dual-carbon era, there is an urgent need to cultivate scarce and specialized talents, particularly in the realm of ideological and political education. Therefore, the ideological and political education reform within the ‘Energy and Environment Special Topic’ course leverages academic competitions such as the ‘Challenge Cup’ as an opportunity to update and enrich course content.

By introducing project-based teaching and case-based ideological and political education, the reform aims to break away from traditional teaching methods and enhance the relevance of learning. The focus shifts to optimizing the course assessment plan, aligning it with the goal of shaping students’ values while promoting critical thinking and innovation. This approach not only transforms the course structure but also plays a pivotal role in cultivating students who can effectively address real-world challenges.

The significance of this reform lies in its potential to explore a new model of talent cultivation—one that ‘promotes learning through competitions’. This model encourages students to actively engage with practical challenges, fostering a deeper understanding of the subject matter and a stronger commitment to their roles in society. Furthermore, it enhances the overall quality of talent cultivation and strengthens the ideological and political education framework. Ultimately, the integration of academic competitions such as the ‘Challenge Cup’ provides a powerful tool for improving both the academic and ideological development of students, contributing to their holistic growth and preparation for future societal contributions.

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