

Exploration and Practice of Curriculum Ideological and Political Education Based on the Five “SHI” Dimensions Under the “Dual Carbon” Strategy — A Case Study of “Principles of Refrigeration”

Yingying Yang*, Shuaijun Li, Weidong Wu, Zilong Wang, Xi Chen, Hua Zhang

University of Shanghai for Science and Technology, Shanghai 200093, China

**Author to whom correspondence should be addressed.*

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Abstract: Under the background of the “Dual Carbon” strategy, higher education urgently needs to actively align with national development needs and keep pace with national strategies. Based on the “Dual Carbon” strategy and guided by curriculum ideological and political education, the teaching team of “Principles of Refrigeration” has constructed a five “SHI” education model through teaching practice, promoting the reform and innovation of the “Principles of Refrigeration” curriculum system.

Keywords: “Dual Carbon” strategy; Curriculum ideological and political education; “Principles of Refrigeration”

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1. Introduction

To advance the national “Dual Carbon” strategy^[1], higher education, as a pillar of national development, should integrate the “Dual Carbon” goals into the entire process of talent training^[2], and keep pace with national strategies. Universities not only need to update green and low-carbon curriculum content but also comprehensively innovate in teaching systems, practical links, and educational concepts^[3], integrate ideological and political education into classrooms, and cultivate new-era engineering talents with green thinking, innovative capabilities, and social responsibility^[4] to support energy transformation and sustainable development. As a major energy consumer, the refrigeration industry is a key area for achieving the “Dual Carbon” goals. Reducing its energy consumption and carbon emissions is of great significance in realizing carbon neutrality. Refrigeration technology is widely used in daily life, industrial and agricultural production, medical care, scientific research, and national defense construction, and is a key field driving social modernization and improving production efficiency^[5]. As a core course for the refrigeration and low-temperature direction of the Energy and Power major,

”Principles of Refrigeration” also serves related majors such as Building Environment and Food Science. Its teaching reform has become an important topic in the innovation of university curriculum systems^[6].

Taking this course as an example, combined with the “Dual Carbon” strategy and curriculum ideological and political practice^[7], this paper proposes a five “SHI” dimension education plan: educating through “History”, educating through “Knowledge”, educating through “Practice”, educating through “Cases”, and educating through “Teachers”. By reforming the teaching model, improving the teaching level of the team, and cultivating students’ innovative capabilities and green development awareness^[8], it provides reference and inspiration for other courses.

2. Five “SHI” dimension education under the “Dual Carbon” strategy

From the perspectives of history, theoretical knowledge, practice, cases, and teachers, a five “SHI” dimension education plan is proposed (see Figure 1).

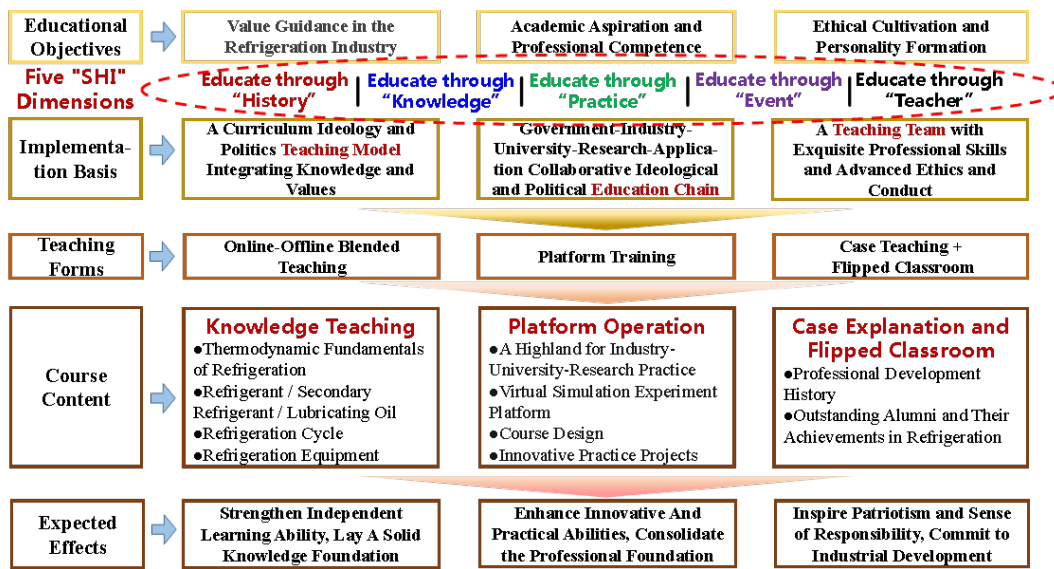


Figure 1. Five “SHI” Dimension Education Under the “Dual Carbon” Background.

2.1. Educating through “History” — Establishing industry beliefs and stimulating students’ patriotic feelings

History is a mirror that reveals the rise and fall. The refrigeration industry originated in the mid-19th century and has gradually developed with the commercial application of vapor compression refrigerators. Despite continuous technological progress, it still faces problems of high energy consumption and high emissions, prompting the continuous exploration of new, environmentally friendly refrigerants and efficient systems^[9]. China’s refrigeration industry started in the 1950s, relying heavily on imports for a long time and facing “chokepoint” dilemmas in key areas. Through the continuous efforts of scientific researchers, China has gradually broken technological blockades and achieved development from scratch and from weakness to strength. By reviewing the industry’s development history, students can understand the importance of technological independence and self-reliance, recognize the key role of refrigeration technology in the national “Dual Carbon” strategy, and

inspire young students to base themselves on their majors, serve the country, and contribute wisdom to green and low-carbon development, realizing the in-depth integration of curriculum teaching and ideological and political education.

2.2. Educating through “Knowledge” — Consolidating professional knowledge and cultivating industry leaders

“Principles of Refrigeration” is a core course for energy and power majors, mainly teaching basic refrigeration concepts and cycle principles. In the teaching process, teachers can combine common daily equipment, such as refrigerators and air conditioners, and concretize abstract refrigeration cycle systems through physical disassembly, visits to refrigeration exhibitions, laboratory refrigeration units, and cold storage, helping students understand and master professional knowledge in practice. At the same time, teachers integrate their own scientific research achievements, experimental experience, and engineering cases into the classroom to enhance the connection between curriculum content and engineering practice^[10]. Relying on laboratories, engineering training centers, and university-enterprise cooperation bases, students are guided to participate in the entire process of scientific research and practice, cultivating their ability to discover, analyze, and solve problems, and stimulating their learning interest and exploration spirit.

2.3. Educating through “Practice” — Strengthening practical concepts and cultivating students’ spirit of exploration and innovation

Under the background of the country’s in-depth promotion of the “Dual Carbon” strategy, refrigeration professional education should actively align with green development needs and promote the in-depth integration of classroom teaching with social practice, scientific research practice, and innovation and entrepreneurship education. While consolidating theoretical teaching, the “Principles of Refrigeration” course focuses on the integration of ideological and political elements and the expansion of practical teaching. Relying on university-enterprise cooperation, scientific research platforms, and government resources, it builds a “Government-Industry-University-Research-Application” collaborative education mechanism^[11], creating conditions for students to participate in engineering practice and scientific research innovation. Teachers combine scientific research projects to guide students to participate in the entire process from literature research, experimental design, data analysis to achievement refinement, cultivating scientific research thinking and problem-solving abilities^[12]. Through educating through “Practice”, students are guided to combine professional development with national green transformation goals, cultivate innovative awareness and engineering practice capabilities in serving society and industry development, and grow into new-era engineering and technological talents with patriotic feelings.

2.4. Educating through “Cases” — Promoting the spirit of scientific and technological innovation and serving national livelihood

The “Principles of Refrigeration” course is closely related to major practical issues such as energy and the environment, and contains rich ideological and political education elements. In teaching, by exploring the value connotation in professional knowledge and combining typical cases of China’s refrigeration industry, professional content is integrated with social hot issues, guiding students to perceive Chinese wisdom while mastering knowledge and enhancing confidence in China’s development path and industry progress^[13]. Taking the deeds of outstanding alumni in the field as examples, such as outstanding graduates who founded minimally invasive

medical companies and developed aerospace refrigerators to break foreign monopolies, students are inspired to engage in scientific and technological innovation and realize their life values in serving the national livelihood.

2.5. Educating through “Teachers” — Demonstrating personality charm through words and deeds and imperceptibly shaping students’ character

Teachers are the first responsible persons for curriculum ideological and political education and should continuously strengthen the construction of teachers’ ethics and style. The teaching team of “Principles of Refrigeration” adheres to “moral education first” and promotes coordinated progress in teachers’ ethics, team collaboration, and teaching reform^[14]. Represented by the low-carbon technology teacher team led by Professor Zhang Hua, which was selected as a “National Huang Danian-style Teacher Team”, teachers cultivate morality, devote themselves to scholarship, and play a demonstration and leading role in serving the national “Dual Carbon” strategy and talent training. Through the collaboration of old, middle-aged, and young teachers and the mentoring mechanism, the quality of curriculum teaching is continuously improved^[15]. Adhering to educating through “Teachers” lays a solid foundation for cultivating high-quality “Dual Carbon” talents with both moral integrity and ability and a sense of family and country.

3. Achievements of curriculum construction and reform

Based on this curriculum reform and teaching practice, the “Principles of Refrigeration” course has achieved remarkable results in talent training, teaching achievements, and team development. The curriculum construction has yielded fruitful results (see **Figure 2**), and it was rated as a National First-Class Undergraduate Course (2025), indicating that the curriculum has reached the leading domestic level in teaching philosophy, teaching mode, and curriculum resource construction, fully reflecting the systematicness, demonstration, and promotability of the curriculum construction.



Figure 2. Achievements of “Principles of Refrigeration” Curriculum Reform.

4. Conclusion

Through the five “SHI” dimension education plan, this paper deeply integrates the “Dual Carbon” goals with ideological and political education, enhances students’ understanding of green and low-carbon development concepts, cultivates their professional literacy, improves their spiritual outlook, and lays a solid foundation for their career and lifelong development, thereby advancing the teaching reform of “Principles of Refrigeration”. In the future, the team will continue to adhere to the fundamental task of moral education, take the “Dual Carbon” strategy as the driving force, and take curriculum ideological and political education as the core momentum to continuously promote the high-quality development of the “Principles of Refrigeration” course. It will strive to create a typical and replicable teaching reform model and transport more high-level talents for China’s green and low-carbon cause.

Disclosure statement

The authors declare no conflict of interest.

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