



Exploration of integrating excellent traditional Chinese culture into energy curriculum teaching

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Abstract: The excellent traditional Chinese culture is a valuable resource for ideological and political education. In the context of the construction of new engineering disciplines, integrating excellent traditional Chinese culture as an element of ideological and political education into the teaching of energy-related courses in universities not only imparts professional knowledge and skills but also enhances students' cultural literacy. This is an important foundation for implementing the fundamental task of fostering virtue through education and an important way to enhance cultural confidence. This paper explores the connotations of excellent traditional culture that align with energy engineering disciplines and takes the course "Solar Thermal Utilization Technology" as a specific example. It excavates and organizes the elements of excellent traditional Chinese culture contained in both theoretical knowledge and after-class practice. Furthermore, this paper explores the ways in which teachers integrate these excellent traditional cultural elements into the course teaching under the teacher-student interaction mode, aiming to provide reference for the teaching practice of energy-related courses.

Key words: excellent traditional Chinese culture; solar thermal utilization technology; ideological and political education in courses; teaching exploration

1 Introduction

Excellent traditional Chinese culture is the crystallization of wisdom and cultural heritage in the five-thousand-year history of the Chinese nation. It embodies the spiritual pursuit of the Chinese people and is not only an important source for cultivating the socialist core values but also a solid foundation for China to stand firm in the midst of the world's cultural turmoil. China's 14th Five-Year Plan and the long-term goals for 2035 propose to build China into a strong country in culture, education and talent, and to inherit and promote excellent traditional Chinese culture. *The Report of the 20th National Congress of the Communist Party of China* proposed that "to comprehensively build a modern socialist country, we must adhere to the path of socialist cultural development with Chinese characteristics and enhance cultural confidence" [1]. With the intensification of globalization and the popularization of the Internet, the influx of Western social thoughts has gradually marginalized the excellent traditional Chinese culture. Currently, there is a serious phenomenon of admiring foreign things and fawning on foreigners among Chinese college students, which will profoundly affect their ideological concepts and value orientations. According to a survey, 43.7% of college students believe that traditional Chinese culture is

outdated, while 35.8% of college students know very little about traditional Chinese culture, reflecting that the awareness of traditional Chinese culture among contemporary college students needs to be strengthened [2].

Universities take the cultivation of virtue as the fundamental task, bearing the original mission of cultivating talents for the Party and the country. They are the main places for cultural inheritance and innovation. Since the Ministry of Education issued the *Implementation Outline for Improving the Quality of Ideological and Political Work in Colleges and Universities* in 2017, various universities in China have actively responded and set off an upsurge of teaching reforms with the goal of "ideological and political education in courses" [3]. Integrating excellent traditional Chinese culture as an ideological and political element into professional course teaching is an important measure to carry out excellent traditional culture education, which is conducive to improving the level of ideological and moral education in universities. For example, English courses can use excellent traditional cultural materials such as stories of Chinese celebrities, traditional cultural festivals, and celebration customs, and conduct teaching through Chinese-English translation and storytelling to highlight the charm of traditional Chinese culture [4]. The course on the "History of Ancient Chinese Literature" integrates local excellent cultural customs into the curriculum through on-site literary history teaching, promoting students to better understand the spirit of ancient literati and the artistic charm of ancient literary works [5]. The course on "Ideological and Moral Cultivation and Legal Basis" deepens the study of basic Marxist theories and issues related to traditional Chinese culture, and optimizes the content and structure of course knowledge in combination with the spirit of the times [6]. In addition, the current construction of new engineering disciplines requires comprehensive reforms of engineering education in terms of educational philosophy, development concepts, quality standards, technical methods, and training paradigms [7]. In this context, cultivating students' profound recognition and deep affection for the country, history, and culture is an important requirement for implementing the fundamental task of fostering virtue through education.

Currently, with the increasing severity of global energy shortages and environmental pollution, the energy engineering majors are increasingly set up in Chinese universities. Unlike the courses of liberal arts majors, the energy engineering courses are often highly specialized and lack explicit ideological and political education resources. This leads students to focus on practical and skill training while lacking edification of traditional Chinese culture, resulting in an imbalanced development of personal qualities and moral values. Therefore, the further research is needed on how to integrate excellent traditional Chinese culture into the teaching of energy engineering courses using teaching techniques. This paper takes the "Solar Thermal Utilization Technology" course in the energy major as a case, exploring the elements of excellent traditional Chinese culture as ideological and political education components based on the course content. By adopting case-based teaching design and methods, this paper discusses how to better integrate excellent traditional Chinese culture into course teaching, aiming to fully utilize its value in ideological and political education in professional courses, and to enhance the cultural literacy and comprehensive innovation capabilities of students majoring in energy.

2 Connotations of excellent traditional Chinese culture

Over thousands of years of development, excellent traditional Chinese culture has accumulated profound heritage, diverse content, and extensive fields, becoming an important source for ideological and political education in universities. For engineering disciplines, the main connotations include the following.

(1) Patriotism. Engineering students should not only have solid professional knowledge, but also possess a sense of patriotism and responsibility, showing a high sense of duty and mission. Those significant progress in related fields in China inspires national confidence and pride. (2) Perseverance. Students should have the courage and perseverance to face difficulties in professional studies and engineering practice, embodying the spirit of "happiness comes from hard work". (3) Harmony between man and nature. Solar thermal utilization uses solar energy (a sustainable resource) to replace other

energy consumption, instilling the values of green and sustainable development in engineering practice, and guiding students to adhere to the path of harmonious coexistence between humanity and nature. (4) Spirit of reform and innovation. In traditional culture, the concepts like "poverty leads to change, change leads to success" and "renew yourself daily" emphasize the spirit of innovation, reflecting the progressive nature of Chinese culture. This is also a quality that needs to be taught to students in the era of rapid technological development and industrial reform. (5) Craftsmanship spirit. This reflects the spirit of dedication, excellence, and integrity of our predecessors, which is the professional value orientation and behavior of engineering technicians. (6) Standardization concept. The standardization behavior can effectively improve production efficiency and quality. Traditional agricultural proverbs in Chinese culture summarize the experience of agricultural production and provide standardized guidance for production activities. In modern industrial production, emphasizing the authority of technical standardization and the importance of management standardization is a professional quality that engineering technicians need to possess.

3 Theoretical strategies for integrating excellent traditional Chinese culture into courses

It is necessary to extract excellent traditional Chinese culture as ideological and political elements based on course knowledge. The traditional teaching of solar thermal utilization technology is limited to knowledge such as radiation calculation and application principles, lacking the extension of ideological and political education. In fact, the knowledge of this course can be associated with many excellent traditional Chinese cultural elements, as shown below, thereby effectively improving students' moral literacy.

3.1 Cultural concept

When studying the current status of energy development in the course introduction, students are guided to establish the awareness of environmental protection, energy conservation, and sustainable development from the perspective of harmony between humanity and nature. When learning about the development history of solar energy utilization, students are told that there was an example of a Yang Sui mirror lighting a fire towards the sun in the Western Zhou Dynasty of China, showcasing the diligence and wisdom of Chinese people. When studying solar radiation angles, the teacher expounds the traditional cultural knowledge of the 24 solar terms by introducing the changes in the solar declination angle at the four special moments of spring equinox, autumnal equinox, winter solstice, and summer solstice. When students derive the formula of solar sunshine duration, it involves the limitation of boundary conditions, the rigor of the derivation process, and the accuracy of the calculation results, which can cultivate students' scientific and meticulous thinking and craftsmanship spirit.

3.2 Scientist story

When learning about solar thermal power generation, students are introduced to the story of Wang Zhigang, a light chaser of the 50 MW solar thermal demonstration project in Delingha by China Guangdong Nuclear Power Corporation (CGNPC), and learn about his spirit of hard work, taking on heavy responsibilities, self-improvement, and dedication as a great craftsman of the nation. When learning about vacuum tube collectors, students can watch the video "Yin Zhiqiang talks about the path of solar thermal utilization achievements transformation" to learn the spirit of hard work of predecessors, which can inspire students' passion for learning. When learning about seawater desalination, the teacher tells the scientific story of Gao Congjie, a leading academician in the field of seawater desalination in China, who has worked tirelessly for fifty years for a single membrane. The experiences of the older generation in the development of seawater desalination and membrane industry in China inspires students to understand the spirit of perseverance and patriotism.

3.3 Grand industrial project

When learning about solar thermal storage, the teacher shows the picture of the 100 MW molten salt tower solar

thermal power station in the vast desert of Dunhuang to celebrate the birthday of the Party with light, and guides students to pay attention to the application of China's great projects. This behavior is expected to enhance students' national pride and patriotism, as well as their appreciation for the beauty of engineering construction. Meanwhile, it arouses students' sense of historical mission to study hard and serve the country. When learning about the performance analysis and technical requirements of flat-plate collectors, the teacher display the national standard documents for solar collectors to cultivate students' rigorous scientific attitude and meticulous learning style.

4 Practical strategies for integrating excellent traditional Chinese culture into courses

Traditional Chinese culture emphasizes the unity of knowledge and action. The ideological and political education in professional courses should not be limited to theoretical teaching of traditional Chinese culture but should focus on the organic integration of traditional culture in practice. This helps establish correct value pursuits in practice and implement the core values of socialism.

4.1 Sunrise/sunset/daylight duration calculation project

After learning the knowledge in this section, the teacher gives students the task of calculating the sunrise time of the eastern part of the Ussuri River and the western part of Pamir Plateau at the same Beijing time to experience the time difference of "when the Ussuri River is bathed in sunlight, the Pamir Plateau is still full of stars". In addition, by calculating the sunrise/sunset/sunshine time of the winter solstice and summer solstice in the city where the university is located, students can understand the application value of the course knowledge by comparing the calculation results, meteorological data and their personal experiences.

4.2 Solar water heating system project

After learning about the different operating modes and system load calculations for solar water heating systems, the teacher assigns students the task of designing a hot water supply system for a hotel or residential community based on their knowledge and the related literature, and calculating daily water consumption and daily heat consumption.

5 Methods of integrating excellent traditional Chinese culture into course teaching

5.1 Enhancing teacher's cultural literacy

The key to implementing ideological and political education in courses lies in teachers, as their cultural literacy and abilities directly affect the integration of excellent traditional Chinese culture with course content. Therefore, teachers should not only improve their professional knowledge but also spend their spare time reading, thinking, browsing cultural websites, and watching cultural TV programs (such as Chinese Poetry Conference, Lecture Room, and Everlasting Classics). They should research Chinese cultural phenomena to fully enhance their own traditional cultural literacy.

5.2 Building a resource library

Teachers should construct a resource library by extracting matching elements of traditional Chinese culture based on course content. Students can also participate in building the resource library through after-class research during their learning process.

5.3 Integrating cultural elements into teaching

During the teaching of professional knowledge points, teachers should subtly integrate excellent traditional Chinese culture into professional teaching through relevant videos, pictures, personal stories, and engineering cases.

5.4 Guiding students to appreciate culture

In this integrated teaching approach, teachers should guide students to feel and appreciate excellent traditional Chinese culture, so that students can understand the values behind the course knowledge.

5.5 Enhancing students' emotional and moral development

Teachers should help students improve their emotions and enhance their moral education through ideological and political education in the curriculum, thereby increasing students' self-motivation. This approach not only allows students to learn about excellent traditional culture theoretically, but also enables them to experience it practically.

6 Conclusion

Culture is the inheritance of a nation's bloodline and the concentrated embodiment of a country's spirit. In the construction of new engineering disciplines, integrating excellent traditional Chinese culture into the ideological and political education can maximize the educational function, enhance professional literacy while providing traditional cultural education to students. This is an important measure for cultivating well-rounded talents in the engineering field.

This paper elaborates on the connotations of excellent traditional Chinese culture that align with energy engineering courses and takes the "Solar Thermal Utilization Technology" course as an example. It explores and organizes the elements of excellent traditional Chinese culture related to patriotism, perseverance, hard work, craftsmanship, reform and innovation, and standardization awareness from the theoretical teaching level. It also discusses the quality of the unity of knowledge and action from the practical level. Finally, it outlines the strategies for integrating excellent traditional Chinese culture into professional course teaching through teacher-student interaction.

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Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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