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Research on Teaching Reform and Innovative Practice of Power Electronics Technology Course

Xiaozhong Qi[1,a], Xiao Li[2,b,*], Desheng Liu[1,c]

[1]College of Information and Electronic Technology, Jiamusi University, Jiamusi City, Heilongjiang Province, 154007, China
[2]College of Mechanical Engineering, Jiamusi University, Jiamusi City, Heilongjiang Province, 154007, China
[a]qi_xiaozhong322@163.com, [b]13351640288@163.com, [c]zdhlds@163.com
**Corresponding author*

Abstract: *Under the background of higher education in the new era, the integration of comprehensive literacy into curriculum construction has become an important direction of college education. This paper takes the course of power electronics technology as the research object, and discusses how to deeply integrate comprehensive literacy elements with professional knowledge. By analyzing the shortcomings of the traditional teaching mode, a three-in-one teaching system of "value shaping-ability training-knowledge imparting" is proposed, and the ideological and political elements in the course of power electronics technology, such as family and country feelings, innovative spirit and engineering ethics, are deeply explored. Innovative teaching methods such as case teaching, project-driven and information-based means are adopted to construct the two-dimensional teaching goal of "technology-humanity". At the same time, a diversified teaching effect evaluation system is established to verify the effectiveness of ideological and political education. The curriculum reform can improve the comprehensive quality of students, provide useful practical reference for the construction of engineering courses, and help to cultivate innovative engineering talents with both professional quality and social responsibility.*

Keywords: *Power Electronics Technology, Comprehensive Literacy Education, Curriculum Innovation*

1. Introduction

In today's era of vigorous development of higher education, the integration of comprehensive literacy into curriculum construction has become an important starting point for college education. On May 28,2020, the "Guiding Outline for Ideological and Political Construction of Higher Education Curriculum" issued and implemented by the Ministry of Education pointed out the direction for this work. It emphasized the importance of professional education curriculum, and clearly pointed out that professional education curriculum should be based on the characteristics and advantages of different disciplines. In-depth study of the educational goals of different majors, in-depth excavation and refinement of the ideological value and spiritual connotation contained in the professional knowledge system. In the course of power electronic technology, the cultivation of comprehensive literacy is very important [1].It can not only help students master professional knowledge, but also guide students to establish correct values, cultivate their sense of social responsibility and innovative spirit, and inject ideological impetus into the sustainable development of the power industry.

2. Research Purpose

The traditional teaching mode of power electronic technology is usually teacher-centered, with teaching materials as the core, and adopts a one-way knowledge transfer method. Through classroom teaching, blackboard writing and multimedia presentation, teachers systematically explain power electronic devices, circuit principles and application technologies, while students mainly accept them [2].The experimental teaching is mainly based on confirmatory experiments, and the students complete the operation according to the fixed steps. However, this model lacks the cultivation of students' innovative thinking, teamwork ability and social responsibility, and it is difficult to meet the needs of high-quality compound talents in the new era.

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Based on the shortcomings of the above traditional power electronic technology teaching, this paper will deeply explore the ideological and political elements in the power electronic technology course through the ideological and political reform of the course, and organically integrate them with professional knowledge. This paper focuses on the development of a new model of ideological and political education with discipline characteristics, organically embeds core value elements such as engineering ethics, craftsman spirit and innovation consciousness into the curriculum system, and constructs the two-dimensional teaching goal of "technology-humanity". Through the ideological and political reconstruction of frontier cases such as smart grid construction and new energy technology, students' feelings of serving the country through science and technology are cultivated. With the help of digital means such as virtual simulation, the engineering practice situation is created, and the professional ethics and team cooperation ability are cultivated in the process of solving complex engineering problems. We strive to build a three-in-one teaching system of "value shaping-ability training-knowledge imparting," form a scalable implementation paradigm of ideological and political education in engineering courses, and provide theoretical support and practical solutions for cultivating innovative engineering talents with both professional quality and social responsibility. This paper will break through the phenomenon of decentralization of traditional ideological and political education and professional teaching, establish a curriculum ideological and political evaluation mechanism based on engineering education certification standards, and promote the overall improvement of the quality of engineering personnel training.

3. Research significance

This study systematically expounds the multiple research value of ideological and political construction of power electronic technology course from three aspects: talent training, education reform and industrial development.

3.1 The significance of talent training

First of all, it has the significance of shaping a sound personality and values. By integrating ideological and political education into the course of power electronics technology, students are guided to establish a correct world outlook, outlook on life and values, deepen patriotism education, and enhance national identity and social responsibility. Under the background of globalization and multiculturalism, we should help students strengthen their ideals and beliefs, abide by professional ethics, and form a sound personality of active and courageous. At the same time, it guides students to pay attention to the frontier development and major achievements of the global power electronics industry, cultivates their sense of mission to promote social progress with scientific and technological innovation, and aspires to use professional knowledge to meet global challenges in their future careers[3].

And then, the significance of cultivating innovative thinking and practical ability. Typical engineering cases are introduced in the course teaching, and problem-based learning (PBL) and project-driven teaching methods are adopted to encourage students to analyze problems from multiple perspectives and propose innovative solutions. Through teamwork, simulation experiments and engineering practice, students' critical thinking, interdisciplinary integration ability and engineering practice ability are improved, which lays a solid foundation for future scientific research innovation or technology research and development.

3.2 The significance of education reform

First of all, it has the significance of implementing the basic task of moral education. By constructing a "professional education + ideological and political education" dual-integration model, the socialist core values, craftsman spirit, engineering ethics and other ideological and political elements are organically integrated into the power electronic technology curriculum system to form a "course teaching-scientific research training-social practice" full-chain education mechanism. Then through case teaching, situational simulation, enterprise practice and other ways, enhance the appeal and effectiveness of ideological and political education, and cultivate high-quality engineering and technical talents with both ability and political integrity.

Secondly, it has the significance of promoting the connotative development of professional courses. Guided by ideological and political education, we should optimize curriculum objectives, reconstruct

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teaching content, innovate teaching methods, and realize the deep integration of professional education and ideological and political education. For example, when explaining “power electronic devices”, the case of “independent innovation of domestic chips” is integrated, and the strategic significance of “double carbon” is emphasized in “new energy conversion technology”. At the same time, a diversified assessment system is established, and technical ability, innovative thinking and professional ethics are included in the comprehensive evaluation to improve the quality of personnel training.

Finally, it has the significance of promoting the innovation of teaching methods. Using modern teaching methods such as mixed teaching, flipped classroom and virtual simulation, classroom interaction is enhanced and students’ awareness of independent learning is stimulated. Using digital twin technology to simulate the operation of new energy power plants, combined with AR / VR to restore major engineering sites, students can deepen their understanding of professional knowledge in immersive learning, while strengthening their sense of social responsibility and engineering ethics [4].

3.3 The significance of industrial development

Firstly, it has the significance of cultivating high-quality industry talents. Power electronics technology is the core supporting technology in the fields of energy transformation, smart grid and industrial automation. The cultivation of innovative talents with advanced technology and professional quality through curriculum ideological and political education can better serve the needs of the industry and promote technological innovation and industrial upgrading. For example, we should strengthen the concepts of “localization substitution” and “green manufacturing” in teaching, guide students to pay attention to industry problems, and cultivate their ability to solve practical engineering problems [5].

Secondly, it has the significance of promoting the sustainable development of industry. The concept of sustainable development runs through the whole process of teaching, and cultivates students' sense of social responsibility and engineering ethics. For example, relevant cases are introduced in the course for analysis, and energy efficiency improvement and resource saving are emphasized in “Power Electronic Device Design”. Relying on school-enterprise cooperation, we integrate green energy project practice into teaching, aiming to cultivate students ' core ability to cope with climate change. This not only deepens their understanding of clean technology, but also directly contributes to the green future of the power sector and drives the synergy of economy, society and environment. The specific aspects and core contents of the above research significance are summarized in Table 1.

Table 1: The Significance of Study

Aspect	Partial contents note
personnel cultivation	Shaping a sound personality and values
	Cultivate innovative thinking and practical ability
educational reform	Implement the basic task of moral education
	Promote the connotative development of professional courses
	Promote the innovation of teaching methods
industrial development	Cultivate high-quality industry talents
	Promote sustainable development of the industry

4. The value guidance connotation and teaching practice of power electronic technology course

4.1 The excavation and teaching design of curriculum education elements

In the teaching of power electronic technology courses, in-depth excavation and systematic design of ideological and political elements are the key link to realize the collaborative education of

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professional education and ideological and political education. Through consulting relevant literature, it is found that integrating the key technology research process of the industry into professional teaching can effectively cultivate students' sense of mission and independent innovation consciousness of serving the country with science and technology. This paper discusses the two dimensions of technology development process and engineering practice cases. From the perspective of the technological development of power electronic devices, China's breakthrough from early dependence on imports to gradual realization of independent research and development has fully demonstrated the patriotism and independent innovation spirit of scientific and technological workers to overcome difficulties. Teachers can guide students to establish mission consciousness of serving the country through typical case analysis. From the perspective of engineering practice cases, the cases of major engineering accidents caused by power electronic system faults provide vivid materials for cultivating students' engineering ethics consciousness and social responsibility. By analyzing the dialectical relationship between safety and economy in technical decision-making, students' professional ethics of "engineering benefits mankind" is strengthened. Based on the above perspectives, it is necessary to construct a multi-level framework of curriculum ideological and political elements including family and country feelings, innovative thinking, and ethical norms. By formulating quantifiable ideological and political teaching objectives, designing a modular teaching case library, and adopting diversified teaching methods such as heuristics and seminars, we can realize the organic integration of ideological and political elements and professional knowledge, and finally form a three-in-one curriculum education model of "knowledge imparting-ability training-value shaping".

4.2 Teaching methods and practice

In the ideological and political teaching of power electronic technology course, the innovation and practice of teaching methods is the key link to achieve the ideological and political goals of the course. Using case teaching method, the actual engineering cases of the power industry are organically combined with ideological and political education, which can guide students to deeply understand the ideological and political connotations contained in the process of analyzing and solving practical problems, such as engineering ethics, social responsibility and patriotism. At the same time, the project-driven teaching method takes the actual project as the carrier and encourages students to complete the project tasks in teamwork, which not only cultivates students' practical ability and innovation ability, but also enhances their teamwork spirit and social responsibility. In addition, the application of information-based teaching methods, such as virtual simulation experiments and online learning platforms, provides students with richer and more convenient learning resources, stimulates students' interest and initiative in learning, and enables ideological and political education to be more naturally integrated into professional knowledge learning. This diversified teaching method not only improves the teaching effect of the course, but also provides a useful practical reference for the ideological and political construction of higher education courses.

4.3 Ideological and political integration in practical teaching

In terms of practical teaching, this paper innovatively adopts the dual-track teaching mode of "project-driven + ideological and political guidance". Taking the practical engineering projects such as the design of new energy power generation system and the development of electric vehicle charging device as the carrier, through the complete process of "project analysis-scheme design-simulation verification," students can deepen their professional cognition in the process of solving complex engineering problems. Through consulting relevant literature, it is found that teaching based on real engineering projects can significantly improve students' engineering practice ability and innovative thinking. In the course design, a three-dimensional ability training system is constructed. Firstly, the frontier engineering challenges represented by long-distance transmission are introduced as teaching cases to guide students to establish the ambition of solving complex problems with technology. Secondly, through group collaboration to complete comprehensive project tasks, effectively temper team collaboration and communication skills; finally, in the experimental process, strict process standards and quantifiable quality requirements are emphasized, and the awe of the project and the rigorous and realistic scientific attitude are cultivated. This teaching mode of "learning by doing and learning by understanding" has realized the coordinated promotion of professional knowledge teaching and value shaping. The framework for teaching practice and the implementation pathway to cultivate the value connotations of the Power Electronics course is illustrated in Figure 1.

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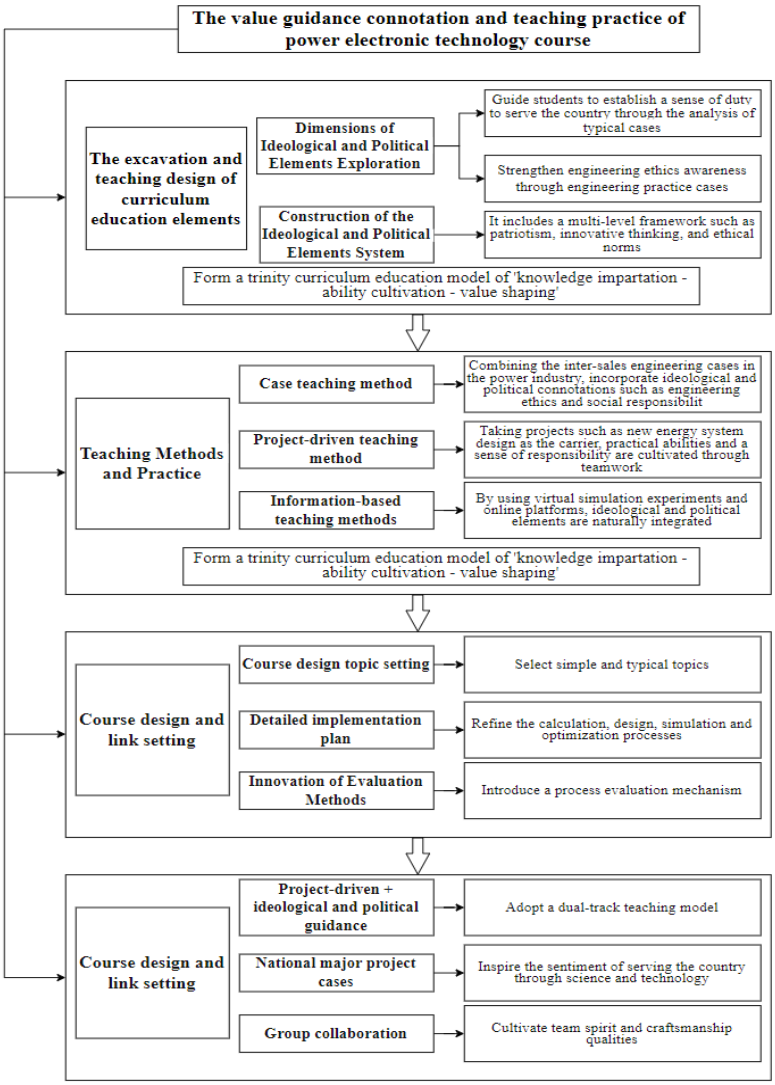

Figure 1: The teaching practice and implementation path of the value connotation of power electronic technology course

5. Comprehensive and effective evaluation of power electronic technology course teaching

In the evaluation of ideological and political teaching effect of power electronic technology course, a comprehensive evaluation index system is constructed, which covers the mastery of students' professional knowledge, the improvement of ideological and moral level, the acceptance and satisfaction of teaching methods. The evaluation method comprehensively uses questionnaires, interviews, and analysis of student achievement and learning performance. Through questionnaires and interviews, we have a deep understanding of students' feelings and feedback on the ideological and political teaching methods of the curriculum, as well as the changes in their ideological and moral standards. The evaluation results show that curriculum ideological and political education has a significant impact on students' comprehensive quality, not only improving students' professional knowledge level, but also enhancing their sense of social responsibility, professional ethics and innovation ability. However, it is also found that some teaching methods have some room for improvement in the implementation process. In the future, teaching methods will be further optimized according to the evaluation results, such as adding more ideological and political cases combined with practical engineering, improving the team cooperation mechanism of project-driven teaching, so as to better realize the teaching objectives of ideological and political education in power electronic technology courses, and provide strong support for cultivating high-quality talents with both ability and political integrity.

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6. Conclusion

In the reform and exploration of the course of power electronics technology, this paper has injected new vitality into the course by carefully improving and adjusting the syllabus, opening special lectures on cutting-edge technology, broadening students' horizons, adding course design links, and strengthening the cultivation of practical ability. At the same time, we should vigorously promote the construction of ideological and political teaching, so as to make the ideological and political education more systematic. These measures have effectively solved the problems of numerous and outdated course contents, lack of research on cutting-edge technologies, weak experimental training links, and unsystematic integration of ideological and political education. Nowadays, the teaching content is more scientific and meets the needs of the development of the times, which can better stimulate students' learning motivation and exploration enthusiasm. Students have significantly improved in independent research, hands-on practice and independent innovation ability, and the spirit of patriotism and dedication has also been effectively cultivated. These achievements not only improve the comprehensive quality of students, but also lay a solid foundation for them to better serve the country and society.

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