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Teaching Reform and Practice Research on Ideological and Political Integration in Motor and Electrical Control Technology Course

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Abstract: *Motor and Electrical Control Technology, a core specialized course for electromechanical and automation majors, plays an essential role in cultivating students' electrical application capabilities, engineering logic, and occupational adaptability. Using the pedagogical practice at Wenzhou Polytechnic as a case study, this paper adheres to the fundamental educational principle of fostering virtue. It systematically explores the implicit ideological and political elements embedded within each teaching module to construct a tripartite teaching objective system: knowledge acquisition, skill development, and value orientation. By implementing curriculum reforms, optimizing professional content, and innovating diversified teaching methods, this study establishes a multidimensional and continuous evaluation mechanism. These efforts achieve a seamless integration and synergy between professional training and ideological and political education. Pedagogical practice demonstrates that systematically incorporating holistic education throughout teaching, practical training, and assessment effectively enhances students' professional proficiency and comprehensive competencies. Ultimately, this approach cultivates high-quality electrical engineering talents equipped with solid technical capabilities, rigorous professional ethics, and a strong sense of industry responsibility.*

Keywords: *Motor and Electrical Control Technology; teaching reform; professional education; ideological and political education*

1. Introduction

In the context of Emerging Engineering Education (EEE), moral education serves as a core guiding principle for vocational education reform. The seamless integration of ideological and political education (IPE) into professional instruction is essential for cultivating high-quality, versatile technical professionals[1]. As a core course for mechanical, electrical, and automation engineering majors, Motor and Electrical Control Technology aligns closely with the occupational demands of the intelligent and modern manufacturing industries. It serves a dual educational function: consolidating students' theoretical knowledge and practical engineering skills, while simultaneously shaping their professional values. Through its professional curriculum, the course not only strengthens students' practical application of electrical technology but also fosters rigorous professional ethics and a dedication to serving the nation through industrial advancement[2].

Although curriculum-based IPE has been widely promoted across higher vocational colleges, the practical teaching of this course still faces three prominent challenges[3]: First, the educational dimensions are unbalanced. Traditional pedagogy has long prioritized technical skills over moral cultivation, resulting in an insufficient integration of professional knowledge with ideological education, and an underemphasis on holistic student development. Second, the integration methods are often rigid. In some classrooms, ideological and political elements are merely appended superficially, lacking a seamless and immersive integration[4]. Third, the evaluation mechanisms remain outdated. Traditional summative assessments focus exclusively on knowledge and skill outcomes, failing to quantify the internalization of professional values, thereby leading to an incomplete educational evaluation.

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To address these pedagogical challenges, this paper leverages the construction practices of ideological and political demonstration courses at Wenzhou Polytechnic to propose a systematic teaching reform. This reform encompasses the reconstruction of teaching objectives, the exploration of ideological elements, the optimization of instructional design, the innovation of teaching methods, and the enhancement of evaluation systems. Ultimately, this study constructs a comprehensive, closed-loop IPE system, providing a practical reference for the pedagogical development of similar engineering courses.

2. Construction of Ideological and Political Teaching System for the Course

Characterized by strong engineering practicality and high occupational adaptability, the course Motor and Electrical Control Technology must transcend the traditional, purely skill-focused teaching model. This paper reconstructs a tripartite teaching system that integrates knowledge acquisition, skill development, and value orientation. This approach achieves the deep integration and synergistic empowerment of professional instruction and ideological and political education (IPE), thereby fulfilling the educational goal of cultivating professionals equipped with both technical expertise and moral integrity.

2.1. Reconstruction of Teaching Objectives

In alignment with the requirements of Emerging Engineering Education (EEE) and the occupational standards of the electrical industry, this study reconstructs a tripartite set of teaching objectives—encompassing knowledge, skills, and professional values. These objectives are tailored to the competency requirements for roles in electrical operation and maintenance, equipment commissioning, and circuit construction, precisely adapting to the training goals for high-quality technical professionals in higher vocational electrical engineering programs.

Knowledge Objectives: To equip students with a systematic understanding of the structure, composition, and operating principles of transformers and AC/DC motors. Students will proficiently grasp parameter identification, the selection criteria for low-voltage electrical components, and the design methods for electrical control circuits. This constructs a comprehensive professional knowledge framework in electric drives and control systems, laying a solid theoretical foundation for engineering practice.

Skill Objectives: To cultivate students' engineering logic, alongside their capabilities in diagnosing electrical equipment faults and the installation, commissioning, operation, and maintenance of electrical systems. This objective aims to enhance comprehensive practical skills, including reading electrical schematics, designing circuits, executing standardized construction, and conducting equipment maintenance. Furthermore, through group-based practical training projects, students will develop essential occupational adaptability, such as teamwork, analytical discussion, and collaborative problem-solving.

Value Objectives: To foster patriotism and a dedication to serving the nation through industrial advancement, while cultivating a spirit of craftsmanship characterized by the pursuit of perfection and excellence. This objective establishes core electrical professional ethics: safety first, standardized operations, and a supreme sense of responsibility. Additionally, it reinforces the sustainable development concepts of green energy conservation and low-carbon practices, guiding students to form sound scientific and professional values.

2.2. Exploration of Ideological and Political Elements

This course encompasses core teaching modules—including motor principles, low-voltage electrical components, electrical control circuits, and safe electrical operation and maintenance—that combine theoretical depth with practical engineering application. These modules contain abundant resources for ideological and political education (IPE). By systematically reviewing the curriculum content and aligning it with industry norms and occupational competency standards, this study synthesizes the IPE elements into four core dimensions: ideological concepts, professional ethics, competency traits, and social values. This framework ensures the precise alignment and deep integration of ideological elements with professional instruction, effectively preventing the disconnect between technical training and moral education.

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The ideological concepts dimension focuses on scientific thinking, dialectical reasoning, and patriotism. Utilizing case studies on the iterative advancement of motor technology and localized breakthroughs in domestic electrical equipment, it cultivates students' scientific spirit of truth-seeking and innovation, alongside confidence in the national industry. The professional ethics dimension emphasizes safe electrical production, standardized operations, and occupational responsibilities, shaping students' professional character with a focus on safety awareness, accountability, and dedication. The competency traits dimension relies on the integration of theoretical and practical teaching to foster rigorous engineering logic, practical problem-solving skills, and a strong sense of teamwork. Finally, the social values dimension highlights the application of electrical technology in intelligent manufacturing, safeguarding public livelihoods, production safety, and green energy conservation, thereby strengthening students' professional identity and sense of industrial mission.

The precise correspondence between each core course module and these four IPE dimensions is detailed in Table 1.

Table 1: Correspondence between Core Knowledge Modules of Motor and Electrical Control Technology and Ideological Political Elements

Core Knowledge Modules	Ideological and Political Elements
Basic Principle and Structural Cognition of Motors	Patriotism, technological confidence, truth-seeking and pragmatic spirit, rigorous academic attitude, manufacturing industry identity
Cognition and Selection of Low-voltage Electrical Appliances	Industrial confidence, pragmatic spirit, standardized employment, attention to details, green energy conservation, safe production awareness
Design and Installation of Electrical Control Lines	Craftsman spirit, innovative thinking, safety bottom-line awareness, quality responsibility, standardized literacy, people's livelihood responsibility
Detection and Troubleshooting of Electrical Faults	Difficulty tackling spirit, rigorous and prudent attitude, risk prevention and control, post responsibility, review and optimization awareness, engineering literacy
Operation, Maintenance and Upkeep of Electrical Safety	Reverence for life, safety red line awareness, professional dedication, law and discipline abidance, risk prevention awareness, green operation and maintenance concept

2.3. Research Methods and Teaching Implementation Framework

Tailored to the course's defining characteristics—namely, its robust engineering practicality, strict adherence to technical standards, and high occupational relevance—this study employs a mixed-methods approach. This includes action research, case studies, questionnaire surveys, teacher-student interviews, and enterprise occupational investigations. A closed-loop research model—"Design–Implementation–Reflection–Optimization"—is constructed to continuously refine the pedagogical design, implementation pathways, and evaluation mechanisms across theoretical instruction, practical training, and project exercises. This model effectively addresses existing pedagogical issues, such as the superficial integration of ideological elements, inadequate emphasis on moral education during practical training, and a lack of targeted instructional strategies[5].

Ultimately, this study constructs an overarching educational framework termed "One Core, Dual Drives, Three Dimensions, and Four Pathways." Centered on the "One Core" of moral education, the system utilizes professional knowledge instruction and value cultivation as its "Dual Drives." Adhering to the principle of simultaneously building technical skills and shaping moral character, the framework integrates value orientation throughout the entire pedagogical process. This approach is dedicated to fostering the holistic development—encompassing moral, intellectual, physical, aesthetic, and labor competencies—of highly skilled electrical engineering professionals[6].

The system operationalizes ideological and political education (IPE) across "Three Dimensions": teaching content, teaching methods, and teaching evaluation. Regarding content, it deconstructs core course modules to systematically extract IPE resources specific to engineering disciplines. Regarding methods, it innovates diversified instructional modes by leveraging the advantages of integrating theory with practice. Regarding evaluation, it establishes a comprehensively value-oriented assessment

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mechanism to rectify the traditional paradigm's overemphasis on technical skills at the expense of moral development.

As shown in Figure 1, the framework relies on "Four Pathways": case-based teaching, project-based practice, immersive classroom experiences, and online-offline blended learning. Through these pathways, the course seamlessly integrates patriotism, an innovative spirit, safety consciousness, and a spirit of craftsmanship into every instructional phase. This constructs a continuous, immersive educational ecosystem that effectively enhances students' technical proficiencies and comprehensive professional ethics, precisely adapting to the talent requirements of the modern intelligent manufacturing industry，.

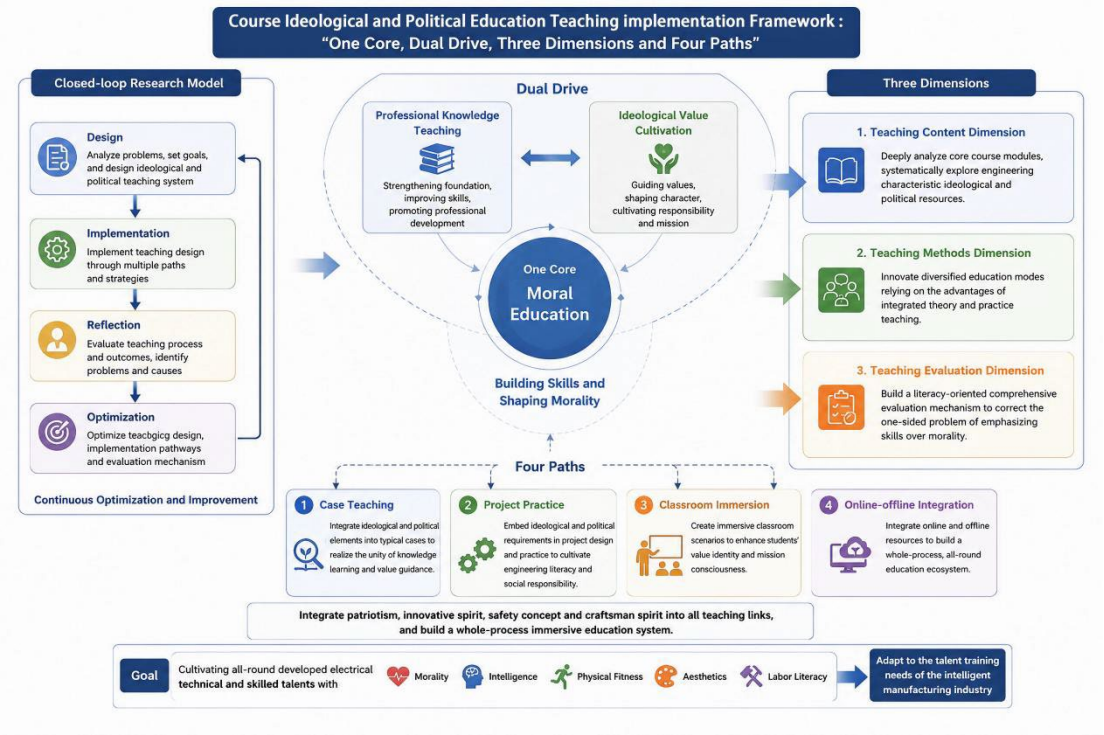

Figure 1: Teaching Implementation Framework for Ideological-Political Education in the Motor and Electrical Control Technology Course featuring "One Core, Dual Driver, Three Dimensions, Four Paths"

3. Design and Implementation of Curriculum Ideological and Political Education

3.1. Reconstruction of Ideological and Political Teaching Content

To address the limitations of traditional courses—which often prioritize technical skills over professional ethics and practical training over moral cultivation—this paper reconstructs the teaching content system. Rooted in the fundamental task of moral education and aligned with industry standards and developmental needs, this reconstruction adheres to the principles of professional modularization, the precise integration of ideological and political education (IPE), and continuous, whole-process value cultivation. The four-dimensional IPE elements are precisely embedded into each teaching module, dismantling the siloed approach to technical and moral instruction and establishing a bilaterally integrated pedagogical system of "professional content + ideological education."

At the theoretical instruction level, the traditional didactic teaching model is discarded. During the instruction of motor development, electrical principles, and control logic, diverse ideological resources—such as the technological breakthroughs of domestic equipment, the exemplary narratives of master craftsmen, safety incident case studies, and green energy-saving concepts—are seamlessly integrated. This ensures the synchronous advancement of knowledge acquisition and value orientation. At the practical instruction level, focusing on training projects such as circuit installation, equipment commissioning, fault troubleshooting, and motor maintenance, procedural specifications, safety protocols, quality standards, and occupational responsibilities are woven throughout the entire practical

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process. This facilitates the cultivation of a craftsman spirit and comprehensive professional ethics.

Aligning with the intelligent and green development trends of the electrical industry, the course deliberately incorporates cutting-edge topics, such as energy-efficient motors, advanced low-voltage electrical components, and intelligent operation and maintenance. By integrating the concepts of national technological empowerment, green development, and safe production, the curriculum achieves a synchronous upgrade of technical knowledge and ideological education, perfectly balancing occupational relevance with educational objectives.

3.2. Innovation of Ideological and Political Teaching Methods

To address the issues of superficial and formalized integration of ideological and political education (IPE), this study develops a diversified instructional system tailored to the course's dual emphasis on theory and practice. This system seamlessly integrates case-based, project-driven, situational-immersive, and inquiry-based teaching methods, achieving a mutual reinforcement of technical skill training and moral education.

First, Case-Based Integration. The course selects positive case studies—such as localized technological breakthroughs in domestic electrical equipment and the exemplary narratives of frontline technicians—to inspire students' confidence in the national industry and foster a spirit of craftsmanship. Conversely, cautionary cases of equipment failures and safety incidents caused by non-compliant operations are utilized to reinforce a zero-tolerance safety mindset and occupational accountability.

Second, Project-Driven Instruction. Utilizing comprehensive practical training projects—such as circuit commissioning, motor maintenance, and fault troubleshooting—as pedagogical vehicles, this method embeds core values like striving for perfection, overcoming technical challenges, teamwork, and quality prioritization throughout the project lifecycle. This enables students to simultaneously refine their technical skills and forge their professional character within authentic engineering contexts.

Third, Situational Immersive Learning. By simulating authentic occupational scenarios—including enterprise-level equipment operation and maintenance, on-site commissioning, and fault repair—this method replicates industrial operational standards. It guides students to immerse themselves in professional role-playing, thereby cultivating rigorous, dedicated, and responsible professional ethics.

Fourth, Inquiry-Based Exploration. This method facilitates group discussions and independent research on complex electrical control issues, fault diagnostics, and circuit optimization strategies. Through this collaborative problem-solving process, students cultivate a pragmatic, cooperative, and innovative scientific spirit.

3.3. Extension of Ideological and Political Teaching Means and Carriers

To broaden the reach and effectiveness of value-oriented education, this study develops a three-dimensional educational support system integrating online and offline learning, curricular and extracurricular activities, as well as theoretical and practical experiences. By extending learning beyond the boundaries of traditional classrooms, the system enables the continuous and systematic cultivation of students’ professional values, ethical awareness, and social responsibility.

For offline learning environments, practical training facilities, industrial equipment, engineering tools, and technical standards are employed as important educational resources. Professional norms, safety awareness, quality consciousness, and standardized operational practices are embedded into daily laboratory and training activities, fostering students’ rigorous work attitudes and professional discipline. In addition, skills competitions, innovation-oriented training projects, and activities promoting craftsmanship serve as experiential learning platforms that facilitate the integration of knowledge acquisition, skills development, and value cultivation.

For online learning environments, intelligent teaching platforms such as Xuexitong are utilized to establish a digital repository of educational resources. Materials related to industrial development, domestic technological innovation, engineering ethics, safety regulations, and exemplary professional practices are incorporated into teaching activities. Through pre-class preparation, online interaction, and post-class reflection, value-oriented learning is continuously reinforced throughout the learning process.

For extracurricular learning environments, enterprise internships, workplace observation, industrial field studies, and community engagement activities are incorporated into the educational framework.

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By engaging with real-world intelligent manufacturing scenarios, students gain a deeper understanding of the role of electrical technologies in industrial transformation and social development. At the same time, exposure to frontline engineers and technicians helps students develop professional identity, a sense of responsibility, and an appreciation of craftsmanship, thereby extending value-oriented education from classroom settings to authentic professional contexts.

4. Evaluation System of Curriculum Ideological and Political Education

4.1. Construction Principles of Evaluation System

To overcome the limitations of traditional curriculum evaluation, namely the overemphasis on results and skills rather than processes and broader competencies, a standardized, quantifiable, and implementable evaluation system has been constructed. This system adheres to four core principles in accordance with the ideological and political objectives of the curriculum.

First, the Principle of Moral Education Orientation. This principle prioritizes value orientation, dismantling the purely score- and skill-driven assessment model. It incorporates ideological cognition, professional ethics, a craftsman spirit, and a sense of responsibility into the core evaluation scope, thereby achieving a three-dimensional assessment of knowledge, skills, and core values.

Second, the Principle of Process-Oriented and Continuous Evaluation. To mitigate the reliance on singular summative assessments, this principle strengthens continuous dynamic evaluation. It comprehensively documents students' classroom performance, practical training progression, project execution, and ethical development, realizing an integrated approach to continuous education and assessment.

Third, the Principle of Scientific Standardization and Practicality. The evaluation indicators are closely aligned with actual pedagogical contexts and industry occupational standards. Featuring clear and quantifiable criteria, this principle balances theoretical rigor with practical classroom applicability to suit the developmental patterns of higher vocational students.

Fourth, the Principle of Multi-Stakeholder Participation and Objectivity. This principle establishes a diversified assessment framework encompassing instructor evaluations, student self-assessments, peer reviews, and enterprise mentor appraisals. This multidimensional approach comprehensively evaluates students' academic progress and professional ethics, ensuring fair and impartial assessment outcomes.

4.2. Contents and Methods of Multi-dimensional Assessment and Evaluation

Based on the aforementioned construction principles, this paper establishes a "four-in-one" multidimensional assessment framework encompassing knowledge, skills, professional ethics, and learning attitudes. By refining the scoring rubrics and evaluation methodologies, this system achieves a quantifiable and assessable evaluation of ideological and political education (IPE) outcomes[7].

The Professional Knowledge Dimension (30%): This dimension assesses students' mastery of theoretical concepts, including motor principles, low-voltage electrical components, electrical control circuits, and safety specifications. Evaluations are conducted through classroom Q&A, online quizzes, assignments, and final theoretical examinations, aiming to solidify the students' professional theoretical foundation.

The Practical Skill Dimension (40%): The focus of this dimension lies in evaluating students' practical capabilities, such as reading electrical schematics, component selection, circuit installation, motor maintenance, fault troubleshooting, and equipment operation. The assessment is based on the quality of practical training projects, procedural standardization, commissioning outcomes, and training reports. Students' engineering application proficiencies are strictly evaluated against industry standards.

The Ideological and Professional Ethics Dimension (20%): Corresponding to the four core IPE elements, this dimension comprehensively evaluates students' patriotism, innovative thinking, adherence to standardized operations, safety consciousness, teamwork, and professional identity. Assessments are derived from classroom observations, project performance, professional conduct during training, and reflective essays.

The Learning Attitude Dimension (10%): This dimension appraises students' daily performance, including attendance, classroom engagement, disciplinary compliance during training, equipment care,

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workspace organization, and assignment quality. The goal is to cultivate rigorous, pragmatic, and self-disciplined professional habits.

The overall course grade adopts a comprehensive scoring model comprising 70% continuous formative assessment and 30% summative assessment. This continuous, dynamic evaluation mechanism successfully facilitates learning through assessment. It compels students to prioritize the cultivation of professional ethics, effectively implements the fundamental task of moral education, and ultimately delivers high-quality electrical engineering professionals equipped with both technical expertise and moral integrity to the industry.

5. Conclusion

Against the backdrop of emerging engineering education and the growing emphasis on value-oriented talent development in vocational education, this study explores curriculum reform in the course Motor and Electrical Control Technology to address challenges such as the imbalance between technical competence and value cultivation, the fragmented integration of educational values into professional teaching, and inadequate evaluation mechanisms. By aligning higher vocational education practices with industrial competency requirements, the study reconstructs three-dimensional learning objectives and systematically integrates value-oriented elements into professional knowledge instruction, thereby promoting the coordinated development of technical skills and professional values.

The study proposes a systematic reform framework with clearly defined implementation pathways. Through the reconstruction of teaching content, innovation in pedagogical approaches, and the integration of diversified learning environments, values such as craftsmanship, patriotism, safety awareness, and sustainable development are embedded throughout the teaching process. In addition, a multidimensional and process-oriented evaluation system is established to address the limitations of traditional assessment approaches in measuring students' professional values and competencies, thereby enhancing the effectiveness of value-oriented education.

The results of teaching practice demonstrate that the proposed reform not only strengthens students' mastery of professional knowledge and practical skills but also promotes the development of professional ethics, engineering problem-solving capabilities, and a strong sense of professional responsibility. The reform contributes to cultivating technically competent and ethically responsible professionals while providing a practical reference for curriculum reform in electrical engineering and automation-related programs within higher vocational education. Future research will focus on further optimizing educational resources, instructional strategies, and assessment methods to improve the precision, adaptability, and long-term effectiveness of value-oriented education.

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