

Research on Teaching Practice of Curriculum-based Ideological and Political Education for Equipment-Manufacturing Majors in Higher Vocational Colleges

Xia Chunrong¹, Bian Xiaoyang²

¹Wuxi Communications School of Jiangsu Union Technical Institute, Wuxi, Jiangsu, China

²Wuxi Water Conservancy Engineering Management Center, Wuxi, Jiangsu, China

Abstract: Curriculum-based ideological and political education—the systematic embedding of value guidance within disciplinary instruction—serves as a core vehicle for integrating subject teaching with moral education, offering a new pedagogical approach for cultivating high-skilled talent in higher vocational colleges. Programs in equipment manufacturing at higher vocational institutions bear the critical mission of supplying frontline technical personnel to China's manufacturing industry, making the normalization of this approach an imperative. Taking the equipment manufacturing specialty in higher vocational education as its research object, this paper conducts a systematic study across four dimensions: the theoretical connotation of curriculum-based ideological and political education, its value for talent cultivation within the industry, the existing problems in current integration, and multi-dimensional implementation pathways. Using core courses such as Hydraulic Transmission as a case, it deconstructs ideological and political elements and explores their classroom implementation, proposing strategies adapted to the practical training context of higher vocational education. The study yields an implementable and replicable teaching model that helps resolve the "two skins" problem—the persistent disconnect between subject teaching and moral education—and provides a practical reference for curriculum-based ideological and political education in equipment manufacturing programs at comparable higher vocational colleges.

Keywords: Equipment-manufacturing Majors, Curriculum-based Ideological and Political Education, Teaching Practice

1. Introduction

Against continuous social development, talent demands are evolving constantly. As an important component of China's higher education, higher vocational education aims to cultivate high-quality talents with professional expertise and practical capabilities. General Secretary Xi pointed out at the National Conference on Ideological and Political Work in Institutions of Higher Learning: "Classroom teaching should be well-utilized as the main channel. Ideological and political theory courses should be strengthened through reform to enhance their appeal and relevance and meet the growth needs and expectations of students. All other courses should fulfill their educational responsibilities so that they can work in tandem with ideological and political theory courses to form a collaborative educational effect."^[1]

Though talent-training programs and courses for equipment-manufacturing majors contain ideological-political elements, they still prioritize the delivery of professional knowledge and hands-on skill development^[2]. Ideological and political education for students in higher vocational colleges largely relies on public basic courses. Educators in higher vocational colleges are confronted with an urgent major task: earnestly implementing General Secretary Xi's relevant instructions, cultivating high-quality skilled talents adapted to social development and enterprise demands, and aligning talent training, students' job competencies with industrial and corporate requirements.

2. Connotation and Significance of Curriculum-based Ideological and Political Education

2.1 Definition of the core connotations of curriculum-based ideological and political education

Curriculum-based ideological and political education is not a newly established course, nor does it forcibly add ideological and political theory lectures to professional courses; rather, it represents a brand-new concept of integrated education. Its core connotation is to adhere to the principle of moral education, organically integrating elements of moral education such as patriotism, craftsmanship, labor education, innovative thinking, legal norms, green development, and cultural confidence into the entire teaching chain of professional courses—lesson planning, classroom teaching, practical training, after-class extension, and assessment—achieving the simultaneous advancement of knowledge transmission, ability cultivation, and value shaping.

From the perspective of educational levels, ideological and political courses are explicit ideological and political education, relying on specialized classrooms to systematically explain theoretical knowledge; Curriculum-based ideological and political education is a form of implicit ideological and political education, relying on professional scenarios to cultivate immersive values. The two complement and complement each other, together forming a complete ideological and political education system in higher vocational colleges. Advancing ideological and political education in courses does not mean cutting or replacing existing professional teaching content, but rather exploring moral education carriers, optimizing teaching design, and enriching educational scenarios based on the existing curriculum framework, achieving mutual improvement in professional teaching quality and students' ideological literacy.

2.2 The unique educational value of curriculum-based ideological and political education in the Equipment Manufacturing major

The equipment manufacturing industry is characterized by strong practicality, a complete industrial chain, prominent national strategic attributes, and stringent standards and norms. It naturally contains abundant and unique ideological and political education materials and has inherent advantages in carrying out curriculum-based ideological and political education. Its educational value is mainly reflected in four levels.

First, deeply cultivate patriotism and a sense of serving the country through industry. China's high-end equipment manufacturing industry has long faced development challenges such as foreign technology blockades and key component "necks." Countless researchers and frontline craftsmen have rooted themselves in workshops and laboratories, overcoming core technical challenges in hydraulic systems, precision machine tools, industrial robots, and large construction machinery. Introducing cases of domestic equipment R&D and domestic substitution into professional courses can visually showcase the development of China's manufacturing industry from catching up to running alongside them, and leading in some fields. This allows students to truly feel the country's industrial achievements, establish the ideal and belief of serving the country through industry, and enhance national pride and industry confidence.

Second, cultivate a spirit of craftsmanship that strives for excellence. Equipment manufacturing places extremely high demands on machining precision, assembly standards, and quality control; even the slightest error can lead to equipment failures and production safety incidents. When explaining parts processing, precision assembly, equipment debugging, and other topics, the program draws on the real stories of craftsmen from a great nation who have worked on the front lines for decades and repeatedly refined their products, guiding students to abandon restless attitudes, establish rigorous, meticulous, and persistent professional qualities, and shape craftsmanship qualities that meet the needs of modern manufacturing.

Third, strengthen labor education and team collaboration awareness. The higher vocational equipment manufacturing major offers numerous practical training, hands-on operations, and project-based teaching components. Students are required to complete tasks such as parts processing, equipment disassembly and assembly, and production line debugging in groups. The hands-on process itself serves as a carrier for labor education, allowing students to experience the hard work of frontline workers through hands-on operations; The group project division and collaboration model helps students develop teamwork skills in communication, cooperation, mutual assistance, and solving technical problems together, and fosters a sense of collectivism.

Fourth, foster a sense of rules, green development, and innovative thinking. The machining workshop has strict safety production operating procedures and equipment usage standards, and practical training can simultaneously carry out legal and rule education; Currently, green manufacturing and low-carbon production have become the mainstream in the industry. By integrating pollution control in mechanical processing and the development of energy-saving equipment, students are guided to establish sustainable development concepts; Focusing on hot topics in intelligent manufacturing and industrial digital transformation, students are encouraged to proactively explore new technologies and processes, cultivating a sense of innovation and creativity.

3. Existing Issues in the Integration of Ideological and Political Education with Professional Teaching in Higher Vocational Equipment Manufacturing Courses

Based on comprehensive analysis of classroom surveys, student questionnaires, and enterprise visits data from equipment manufacturing majors in multiple vocational colleges, there are currently multiple practical obstacles to ideological and political education in domestic higher vocational equipment manufacturing courses, mainly including five core issues: shallow integration of moral education, uneven mining of professional ideological and political materials, homogenized classroom teaching design, insufficient teachers' ability to educate students, and weak development of collaborative ideological and political resources between schools and enterprises.

3.1 The integration of ideological and political education with professional teaching is shallow, and the educational philosophy is not well implemented

Currently, most teachers of ideological and political courses in equipment manufacturing courses in higher vocational colleges have long "emphasized skills over moral education," believing that the core task of the classroom is to teach students how to operate equipment and complete practical processing training, and ideological education falls within the scope of ideological and political course teachers. During lesson preparation, there is rarely proactive exploration of moral education materials; during teaching, professional ethics are only briefly mentioned at the beginning and end of the course, while the professional knowledge is taught without value guidance, making moral education content a dispensable additional component. At the student level, vocational college students are generally aged 17 to 22. Some tend to develop one-sided ideas such as "technology first," "worship of foreign things," or "lie flat for employment," believing that studying a major is only to obtain high-paying jobs, neglecting their own mission in manufacturing development, and showing low enthusiasm for actively accepting ideological and political education, further reducing the effectiveness of moral education in the classroom.

3.2 Uneven mining of endogenous moral education materials in professional courses, with obvious shortcomings in coverage

The research team conducted a questionnaire survey of 204 students majoring in equipment manufacturing, and calculated the frequency of students being exposed to various ideological and political elements in their professional courses. The data results are as follows:

Teaching content related to craftsmanship spirit accounts for 88.24%, professional norms and literacy 78.82%, innovative thinking cultivation content 71.76%, patriotic industry development education 70.59%, contemporary industrial development concepts 60%, national industrial confidence content 58.82%, traditional manufacturing culture content 54.12%, and labor practice education content only 47.06%.

Data shows that there is a serious imbalance in the mining of ideological and political materials in equipment manufacturing majors: content related to craftsmanship spirit and professional qualities is relatively sufficiently explored, while the coverage of materials related to labor education, traditional manufacturing culture, and national spirit is seriously insufficient. Most teachers only habitually use cases of great craftsmen in teaching, neglecting ancient mechanical manufacturing civilization, the stories of ordinary frontline workers, and educational materials for workshop labor practice. The exploration of ideological and political elements is too narrow to form a complete and three-dimensional moral education content system, making it difficult to comprehensively shape students' overall thinking qualities.

3.3 Ideological and political classroom teaching design is homogeneous, and the effectiveness of student education is relatively weak

From the perspective of classroom teaching implementation, ideological and political instruction design faces serious homogenization issues and lacks customized teaching plans that align with the workshop training and equipment operation characteristics of equipment manufacturing majors. Some professional teachers lack the intrinsic motivation to proactively carry out ideological and political education in courses, and schools lack regular teaching research and incentive assessment mechanisms. Teachers lack enthusiasm for participating in ideological and political teaching reform, making it difficult to form a collaborative effort for all-staff education.

The survey also collected data on the channels of literacy cultivation recognized by students. Student recognition rates ranked from highest to lowest as follows: on-campus training courses (40.78%), enterprise internships (31.07%), and independent online and offline extracurricular learning (14.56%); The recognition rate for conventional theoretical classroom education is only 8.74%, while the recognition rate for themed activities in the second classroom is just 2.91%. Although this sample has certain limitations, it directly reflects the weak effectiveness of traditional theoretical classroom ideological and political education, with students more recognizing hands-on and internship-based immersive educational scenarios, further highlighting the necessity and urgency of optimizing ideological and political teaching design in professional courses and relying on practical training platforms to carry out moral education.

3.4 Shortcomings in the Comprehensive Ability of Ideological and Political Education for Professional Course Teachers

Currently, some equipment manufacturing faculty have dual shortcomings. On one hand, some teachers lack sufficient theoretical reserves for ideological and political education, making it difficult to accurately combine industry cases with positive value guidance. When explaining topics such as patriotism and cultural confidence, the content is hollow and difficult to resonate with students; On the other hand, most teachers have long focused on professional technical research and lack training related to ideological and political teaching design. They have not mastered the skills to integrate moral education elements with professional knowledge, making it easy for ideological and political content to be rigidly embedded and unrelated to the curriculum; The teacher training system includes multi-faceted training in new technologies and new processes, with relatively low frequency of ideological and political training; On-campus teaching and research activities mostly revolve around professional skills teaching, with very few organizing collective lesson planning, teaching observations, or sharing of excellent lesson cases in ideological and political courses. There is a lack of channels for communication and reference among teachers, and the pace of improving educational ability is slow.

3.5 Insufficient Integration of School-Enterprise Collaborative Ideological and Political Education Resources

The equipment manufacturing major heavily relies on enterprise training and on-the-job internships for talent cultivation, but most current school-enterprise cooperation remains at a superficial stage, arranging for students to intern in factories and enterprise engineers teaching on campus, and a school-enterprise collaborative ideological and political education mechanism has yet to be established. The abundant moral education resources within enterprises—such as frontline craftsmen, domestic equipment production, safety production, and green manufacturing—have not been transformed into classroom teaching materials; Schools have not synchronized the standards for ideological and political education in courses to enterprise internship mentors. Students lack coherent ideological guidance during enterprise internships, resulting in a gap between on-campus classroom and off-campus moral education, making it impossible to achieve fully integrated education.

4. Implementation path for deep integration of ideological and political education with professional teaching in higher vocational equipment manufacturing majors

Addressing the five major practical issues outlined above, and combining three teaching scenarios in equipment manufacturing—theoretical classrooms, training workshops, and enterprise internships—a systematic integrated implementation path is constructed from six dimensions: teacher philosophy, classroom thinking, element exploration, hot topic discussions, professional standards, and school-

enterprise collaboration, comprehensively connecting professional teaching with ideological and political education^[3].

4.1 Transform teachers' educational concepts and strengthen the comprehensive capacity building of ideological and political education

To promote the effective implementation of ideological and political education in courses, the primary task is to transform the traditional teaching mindset of professional course teachers. At the school level, it is necessary to regularly organize equipment manufacturing teachers to conduct theoretical study, deeply study relevant content of Thought on Socialism with Chinese Characteristics for a New Era, firmly establish confidence in the path, theory, system, and culture, and guide teachers to positively guide students throughout daily teaching to deeply cultivate ideals and beliefs of patriotism, love for the Party, and love for the people. We consider teacher ethics and conduct, and the effectiveness of curriculum-based ideological and political education as indicators in teachers' annual assessments and professional title evaluations. At the same time we organize teachers from different courses such as mechanical, hydraulic, numerical control, and intelligent manufacturing to exchange ideas on moral education material mining and classroom integration techniques, addressing shortcomings in teachers' ideological and political teaching design capabilities. Senior engineers from enterprises and master craftsmen from the university will be invited to give special lectures, combining real frontline industry cases, it helps teachers accumulate ideological and political teaching materials for the industry.

Professional course teachers must proactively reconstruct the full-process teaching mindset, embedding moral education content into every aspect from lesson plan writing, classroom teaching, practical training guidance, final assessment, to post-class expansion. Only when all professional teachers establish a normalized awareness of ideological and political education in courses can we promote the synergy between professional courses and public ideological and political courses, allowing value guidance to fully integrate into the entire teaching chain—from teaching design, classroom implementation, assessment and evaluation, to after-class expansion—and build a classroom environment without blind spots.

4.2 Set open-ended critical thinking questions based on professional knowledge points, guiding students to independently appreciate the essence of education

By leveraging professional knowledge points to set industry-related open questions, students are guided to think and understand independently, greatly enhancing the effectiveness of moral education. For example, the implementation path for green and low-carbon transformation in manufacturing, the balance between mechanical production and environmental protection, the practical challenges of overcoming foreign technology blockades in domestic high-end equipment, and the direction for the capability transformation of industrial workers in the era of intelligent manufacturing. Students analyze and discuss topics based on their own professional knowledge, while teachers only provide guidance and summaries, without directly delivering fixed conclusions. This model fully mobilizes students' initiative, allowing them to proactively recognize opportunities and challenges in China's manufacturing industry during independent analysis of industry problems, simultaneously training logical reasoning, comprehensive analysis, and independent thinking skills, allowing patriotism, innovation, and green development concepts to naturally internalize in their hearts.

4.3 Layered breakdown of ideological and political elements embedded in courses, using practical training scenarios as carriers to implement moral education

Every core course and knowledge point in the Equipment Manufacturing major contains exclusive moral education materials. Teachers need to organize and systematically break down ideological and political elements according to course chapters, relying on offline teaching scenarios such as case discussions, equipment disassembly and assembly, hands-on training, and project processing to seamlessly integrate value education into professional teaching^[4]. Taking the core course of "Hydraulic Transmission" as an example, the knowledge points are broken down into modules with supporting ideological and political materials and corresponding educational directions (see table 1), achieving one-to-one correspondence between knowledge points and moral education points:

Table 1 Ideological and political integration table for hydraulic transmission teaching content

Course Content		Ideological-Political Elements	General Principles
Hydraulic Transmission Overview		Pascal's principle — leverage small force to generate large force — thinking about problems — methodology — getting twice the result with half the effort	Dialectical Thinking
		Hydraulic system — basic components — R&D and manufacturing — scientists and great craftsmen—breaking the “neck-bottleneck” constraint — spirit of scientists and craftsmen	Patriotism, Professional Ethics
		Basic hydraulic components — complex hydraulic system — individual and collective — part and whole	Dialectical Thinking
		Application and development — national major equipment — engineering machinery — being constrained by others —arduous development course — new technologies such as the hydraulic system for China's FAST telescope	Patriotism, Professional Ethics
Composition of Each Part of Hydraulic System	Working Medium	Human blood and hydraulic oil — safety hazards and environmental pollution — maintaining hydraulic oil just like maintaining blood —hydraulic oil experiments and practical training — abiding by operating specifications	Rule Awareness, Professional Ethics
		Fluid mechanics — scientists Bernoulli and Reynolds — scientific spirit — patriotic sentiments	Patriotism
	Power Components	Hydraulic pump — converting low-pressure hydraulic oil into high-pressure oil — generating power —power comes from pressure — objective laws — subjective initiative	Dialectical Thinking
		Component symbols — Chinese hieroglyphs — profound culture	Patriotism
	Actuating Components	Hydraulic cylinder — jack cylinder — leverage small force for large output —large thin-wall cylinder — breaking foreign monopoly — hydraulic actuator cylinder for precise driving—rotating the “ball-eye” of China's FAST telescope	Dialectical Thinking, Patriotism
			Patriotism
	Control Components	Pressure-, direction- and flow-control valves — coping with various challenges — self-regulating pressure —knowing when to advance and retreat — changing movement direction and pace in a timely manner	Dialectical Thinking
	Auxiliary Components	Oil filters, heat exchangers, accumulators, seals, etc. — inconspicuous in appearance — indispensable components — workers in all walks of life — dedication — solidarity and cooperation	Professional Ethics, Patriotism
Application Cases of Hydraulic Transmission		China's infrastructure construction — national major equipment — engineering machinery — hydraulic system — key components — breaking technical blockades — independent R&D — craftsman spirit	Patriotism, Professional Ethics
		Practical training operation — safety and environmental-protection awareness	Rule Awareness, Professional Ethics

Overview module on hydraulic transmission: Explains dialectical thinking about local and whole, quantitative and qualitative changes based on Pascal's principle; Combining the domestic hydraulic component localization R&D process and the real stories of researchers and frontline craftsmen breaking foreign monopolies, it simultaneously carries out patriotic education and professional ethics cultivation;

Relying on the logic of the entire hydraulic system composed of countless basic components, it explains the dialectical relationship between the individual and the collective; Combining cases of major national equipment such as the "China Sky" supporting domestic hydraulic drive systems, the program showcases the struggles of the domestic equipment industry and strengthens students' sense of industrial mission.

Working Media Module: Analogy hydraulic oil maintenance work with human blood circulation, extending training workshop equipment maintenance and safety production standards; Combining the dedicated research stories of fluid mechanics scientists such as Bernoulli and Renault, it conveys the patriotic spirit of scientists who face difficulties and care deeply for their country.

Power components, actuators, control components, auxiliary component modules: Use Chinese graphic symbols in hydraulic components to explain Chinese pictographic culture and cultivate cultural confidence; Using the hydraulic power principles of ancient waterwheels, it showcases the manufacturing wisdom of the ancient Chinese working people; Relying on cases such as domestic large-tonnage cylinders breaking foreign barriers and precision hydraulic brakes supporting the rotation of the "Tian" equipment, patriotism is strengthened; Through indispensable auxiliary components such as oil filters, radiators, and seals, students are guided to recognize the professional qualities of teamwork and teamwork, regardless of hierarchy or hierarchy; Relying on pressure and flow control valves to automatically adjust working characteristics, it conveys a flexible and well-balanced approach to handling matters.

Comprehensive application case module for hydraulic transmission: Combining cases of infrastructure construction machinery and domestic large-scale hydraulic equipment breaking through technological monopoly to carry out patriotism and craftsmanship education; The training equipment operation segment emphasizes environmental protection requirements and safe operation standards, fostering a sense of rules and rigorous professional ethics.

The entire curriculum's ideological and political material system is entirely based on specialized hydraulic knowledge points, with no issue of distracting moral education from the major. Students simultaneously receive ideological immersion while learning hydraulic principles and equipment operation, achieving simultaneous advancement in knowledge learning and value formation.

4.4 Conduct group discussions based on hot topics in the manufacturing industry to cultivate innovative critical thinking and communication skills

Currently, intelligent manufacturing, industrial internet, digital factories, green manufacturing, and domestic substitution of equipment are the core hot topics for sustained development in manufacturing. Teachers can set up group discussions and classroom achievement presentation sessions based on course progress. Before class, students are assigned to research industry hotspots. Students review industry reports, news on domestic equipment development, and intelligent manufacturing enterprise cases in groups. In class, research results are shared in groups, and discussions are held on topics such as the transformation new technologies bring to the traditional machinery industry, new requirements for job competencies, and how young technical talents can help upgrade industries.

4.5 Integrate professional ethics education throughout the entire teaching process to foster positive professional values

Professional ethics and safety production standards are essential core competencies for equipment manufacturing students. Moral education integration cannot be limited to a single classroom; it must cover the entire teaching process: theoretical teaching, equipment operation, workshop training, and enterprise internships. In daily teaching, teachers continuously explain the industry standards for equipment manufacturing, equipment safety operation standards, product quality control standards, and workshop labor discipline. Combined with real warning cases such as production accidents caused by processing errors and major economic losses from substandard product precision, the teacher vividly demonstrates the importance of rigorous practice.

4.6 Deepen school-enterprise collaborative education and expand the implementation scenarios for ideological and political education in off-campus courses

Build an integrated school-enterprise curriculum-based ideological and political education model. Students are regularly organized to teach on-site at enterprises, where senior craftsmen from enterprises conduct on-site lectures based on their own work experience, sharing real stories of domestic equipment

R&D, frontline dedication, and technical overcoming difficulties, making them more engaging than on-campus classrooms.

At the same time, institutions simultaneously push ideological and political education requirements to enterprise internship mentors, formulate unified moral education assessment standards, and students receive professional ethics and industry patriotism education during enterprise internships, achieving a three-point linkage of on-campus theoretical classes, on-campus training workshops, and enterprise internship bases, forming a complete and uninterrupted ideological and political education chain to compensate for the shortcomings of limited teaching resources on campus.

5. Conclusion

The high-end equipment manufacturing industry is a key sector supporting the development of the national real economy. Comprehensively promoting ideological and political education in equipment manufacturing courses in higher vocational colleges is an inevitable requirement to fulfill the fundamental task of fostering virtue and supporting high-quality development in manufacturing. This article summarizes five prominent issues in the integration of curriculum-based ideological and political education theory, combining frontline research data, with superficiality in professional teaching and moral education integration, imbalanced material mining, single teaching design, insufficient faculty capabilities, and weak school-enterprise collaboration. It constructs a comprehensive integration implementation path from six dimensions: teacher philosophy innovation, classroom critical teaching, layered exploration of ideological and political elements in courses, industry hot topic discussions, full-process professional ethics cultivation, and school-enterprise collaborative education. Practice shows that only by breaking the "two skins" model of professional teaching and ideological and political education, relying on the practical training and practical characteristics of equipment manufacturing to mine endogenous moral education materials, building an integrated educational environment linking inside and outside the school, and improving supporting assessment and evaluation systems, can the hidden educational function of professional classrooms be fully realized, cultivating high-quality equipment manufacturing technical talents with solid professional skills, a strong sense of patriotism, a spirit of craftsmanship pursuing excellence, and good professional ethics.

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