

# Construction of a Teaching Paradigm for “Comprehensive Ideological and Political Education” in Higher Vocational Engineering Departments under a Virtual-Real Integration Environment

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**Abstract:** Under the dual background of improving the quality of vocational education and the wide application of virtual and real integration technology, the “big ideological and political course” of higher vocational engineering department, as the key carrier to implement the fundamental task of establishing morality and cultivating people, still faces the practical difficulties such as the disconnection between ideological and political education and professional teaching, the lack of teachers’ quality and the poor adaptability of resources, which is difficult to adapt to the cognitive characteristics and training needs of engineering students. This paper uses literature research method and practical analysis method to systematically sort out the current situation of the integration of virtual and real integration technology and the “big ideological and political course” of higher vocational engineering department, and clarify the core crux of the current teaching dilemma. On this basis, following the principles of professional adaptation, virtual and actual coordination, and people-oriented education, the teaching paradigm of “three layers, two environments and one evaluation” is constructed, and its core concept, educational objectives and overall framework are clarified. The implementation path of resource construction, model innovation, and teacher improvement and supporting safeguard measures at the institutional, technical, and collaborative levels are proposed. The research results show that the paradigm can effectively break the barriers between ideological and political education and professional teaching, realize the coordinated promotion of value guidance, skill training and quality improvement, and provide a practical scheme for the high-quality development of “big ideological and political course” in higher vocational engineering department.

**Keywords:** The Fusion of Virtual and Real; Department of Higher Vocational Engineering; Big Ideological and Political Course; Teaching Paradigm; Technical Morality Symbiosis

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## 1. Introduction

Against the backdrop of the in-depth implementation of the “Action Plan for Improving the Quality and Cultivating Excellence in Vocational Education (2020-2023),” the construction of “comprehensive ideological and political education

courses” in higher vocational engineering departments, as the core position for cultivating high-quality technical and skilled personnel, has become a key measure for implementing the fundamental task of fostering virtue and cultivating talent and promoting the connotative development of vocational education<sup>[1,2]</sup>. Currently, virtual and real fusion technologies (covering cutting-edge applications such as virtual simulation and AR/VR) have gradually and deeply penetrated the entire teaching process of higher vocational engineering majors. This not only provides immersive, repeatable, and low-risk teaching scenarios for professional skills training, but also offers new technical support for “comprehensive ideological and political education courses” to break through the limitations of traditional teaching time and space and achieve a deep integration of theory and practice between ideological and political education and professional teaching<sup>[3]</sup>. However, practical research shows that the teaching of “comprehensive ideological and political education courses” in higher vocational engineering departments still faces many practical bottlenecks<sup>[4,5]</sup>. Problems such as the disconnect between ideological and political education and engineering professional teaching, and the rigid and monotonous teaching methods are particularly prominent, making it difficult to adapt to the cognitive characteristics of engineering students who emphasize practice, application, and concrete thinking. Based on this real dilemma, systematically carrying out research on the construction of the teaching paradigm of “comprehensive ideological and political education” in higher vocational engineering departments under the integrated virtual and real environment can not only enrich the practical path and theoretical system of “comprehensive ideological and political education” in higher vocational education, but also promote the synergistic effect of “skills transmission” and “value guidance” in engineering talent training, and help cultivate high-quality engineering and technical talents with both professional literacy and national sentiment. It has important theoretical value and practical guiding significance<sup>[6]</sup>.

From an international research perspective, the application of virtual technology in vocational education has accumulated to a certain extent. Related findings mainly focus on core areas such as technology-enabled optimization of teaching scenarios and improvement of practical skills, emphasizing the use of virtual simulation technology to address the practical challenges of scarce practical scenarios, high operational risks, and high training costs in vocational education. However, due to fundamental differences in educational philosophies and value orientations between China and other countries, this research lacks a core orientation towards ideological and political education and differs significantly from the core needs of my country’s “comprehensive ideological and political education” and “cultivating morality and fostering talent as the fundamental principle,” making it difficult to directly apply to the teaching practice of “comprehensive ideological and political education” in higher vocational engineering departments in my country<sup>[7,8]</sup>. Domestic research on this topic largely focuses on the exploration of virtual-real integration practices in “comprehensive ideological and political education” in ordinary universities, emphasizing the innovation and optimization of classroom teaching methods, while specific research targeting higher vocational engineering departments is relatively scarce. Existing research is limited to the application of virtual technology and fails to closely integrate with the job characteristics and skills training objectives of vocational engineering majors. It has failed to construct a teaching paradigm that is systematic, targeted, and operable, and thus cannot effectively solve practical problems such as the lack of deep integration between ideological and political education and professional teaching in vocational engineering departments, the insufficient realization of the educational value of virtual and real technology, and the lack of adaptability to practical scenarios<sup>[9]</sup>. This study takes this as its starting point to make up for the shortcomings and deficiencies of existing research.

## **2. The Real-World Dilemmas of “Comprehensive Ideological and Political Education” in Higher Vocational Engineering Departments under a Virtual-Real Integration Environment**

The widespread adoption of virtual and real-world integration technology in vocational engineering education has provided a significant opportunity for the high-quality development of “comprehensive ideological and political education courses.” However, the current teaching practice of “comprehensive ideological and political education courses” in vocational engineering departments still faces many practical difficulties, severely restricting the improvement of educational effectiveness. Among these, the insufficient synergy between ideological and political education and engineering professional

teaching is the core dilemma, with the two exhibiting a clear disconnect. In most teaching practices, virtual and real-world technology is often used solely for professional skills training, while the integration of ideological and political elements lacks systematicness and pertinence, failing to truly achieve the educational goal of “using skills to cultivate morality and using morality to enrich skills”<sup>[10]</sup>. This results in ideological and political education becoming merely a formality, failing to resonate with students and effectively guiding them to internalize ideological and political concepts into their professional qualities. The shortcomings in the comprehensive quality of the teaching staff further exacerbate this dilemma. Some teachers lack both proficient application skills in virtual and real-world integration technology and insufficient ideological and political teaching skills, making it difficult to design teaching content that combines professionalism and ideological and political elements in conjunction with engineering professional scenarios, thus failing to fully leverage the educational value of virtual and real-world technology. At the same time, the homogenization and lack of adaptability of teaching resources are prominent issues. Existing virtual simulation ideological and political education resources are mostly general-purpose content, lacking exclusive resources that match the needs of engineering professional positions and the cultivation of professional qualities, thus failing to meet the cognitive and growth needs of engineering students. The lag in the teaching evaluation system is also not to be ignored. The current evaluation is still mainly based on theoretical assessment, and has failed to build a diversified and comprehensive evaluation system that adapts to the virtual and real integrated teaching model and takes into account ideological and political performance, skill level and professional qualities, making it difficult to fully reflect the teaching effectiveness and students’ growth.

### **3. Construction of a Teaching Paradigm for “Comprehensive Ideological and Political Education” in Higher Vocational Engineering Departments under a Virtual-Real Integration Environment**

#### **3.1 Paradigm Construction Principles**

The construction of a virtual-real integrated teaching paradigm for the “Comprehensive Ideological and Political Education” in vocational engineering departments must be based on the characteristics of vocational engineering education and the educational requirements of the “Comprehensive Ideological and Political Education,” following scientific and reasonable construction principles to ensure the paradigm’s relevance and operability. Professional suitability is the primary prerequisite, requiring close alignment with the job requirements and skills training objectives of engineering majors. Ideological and political elements should be organically integrated into the engineering practice process and professional knowledge transmission, achieving a deep coupling between ideological and political education and professional teaching, and preventing the hollowing out and formalization of ideological and political education<sup>[11]</sup>. The principle of virtual-real synergy is the core support, fully considering the immersive, repeatable, and low-risk advantages of virtual simulation scenarios with the practical and comprehensive characteristics of real engineering scenarios. This achieves a complementary and symbiotic relationship between virtual and real scenarios, effectively enhancing the effectiveness of ideological and political education through the synergistic effect of “practicing skills in virtual scenarios and cultivating morality in real scenarios.” The principle of putting people first is the fundamental guideline<sup>[12]</sup>. We must always take moral education as the core, highlight the cultivation of professional qualities of engineering students, and integrate ideological and political elements such as craftsmanship, model worker spirit, and innovative spirit into the entire teaching process to achieve the organic unity of value guidance, skills training and quality improvement.

#### **3.2 Core Concepts and Educational Goals**

This study constructs a virtual-real integrated teaching paradigm with the core concept of “virtual-real integration and the symbiosis of skills and morality.” It breaks down the barriers between traditional ideological and political education and professional teaching, relying on virtual-real integration technology to build an integrated teaching scenario of “ideological and political education + professional knowledge.” This promotes the transformation of ideological and political education from “passive indoctrination” to “active understanding,” allowing students to subtly cultivate correct professional values, a sense of national responsibility, and a sense of patriotism while mastering engineering professional skills. Based on this core concept, a multi-level and comprehensive educational goal system is established: at the value level, it focuses on cultivating

national responsibility, craftsmanship, and a sense of duty, guiding students to closely integrate their personal career development with national engineering construction and industry development, and establishing the ideal and belief of “serving the country with skills”; at the ability level, it emphasizes the synergistic improvement of engineering practice skills, virtual-real technology application capabilities, and innovative thinking, adapting to the ability requirements of the engineering field for high-quality technical and skilled personnel; at the quality level, it strives to cultivate students’ rigorous, pragmatic, meticulous, and collaborative professional qualities, helping students achieve the organic unity of career growth and personal development<sup>[13]</sup>.

### **3.3 Overall Framework of the Paradigm**

Combining the teaching characteristics of “comprehensive ideological and political education” in vocational engineering departments with the advantages of virtual-real integration technology, this study constructs a holistic teaching paradigm framework of “three layers, two scenarios, and one evaluation.” Each component permeates and synergizes with the others to ensure the effective achievement of educational goals. The “three layers,” as the core support of the paradigm, correspond to the value guidance layer, the skills training layer, and the quality enhancement layer. The value guidance layer focuses on the core requirements of ideological and political education, clarifying the value orientation of education; the skills training layer closely aligns with the skills objectives of engineering majors, solidifying students’ professional foundation; and the quality enhancement layer emphasizes the cultivation of professional qualities, improving students’ comprehensive qualities. These three layers form an organic whole of “value guidance, skills support, and quality assurance.” The “two scenarios,” as the core carriers of teaching implementation, include virtual simulation ideological and political education scenarios and real engineering ideological and political education scenarios. Virtual simulation scenarios are mainly used to simulate dangerous, complex, and difficult-to-repeat engineering scenarios, achieving immersive penetration of ideological and political elements; real engineering ideological and political education scenarios rely on enterprise job practice, engineering project training, and other carriers, allowing students to practice ideological and political requirements in real practice, achieving complementary symbiosis between virtual and real scenarios. “Evaluation” serves as a crucial guarantee for the implementation of the paradigm. It involves constructing a multi-dimensional and comprehensive evaluation system that takes into account both formative and summative evaluations. This system comprehensively covers students’ ideological and political performance, skill levels, and overall quality improvement. Through scientific evaluation, it drives improvements in teaching quality and ensures the paradigm’s effectiveness in nurturing students.

## **4. Implementation Path and Safeguard Measures for the Teaching Paradigm**

### **4.1 Core Implementation Path**

The effective implementation of teaching paradigms requires a scientifically feasible implementation path, combined with the actual teaching situation of vocational engineering departments, focusing on three key aspects: resources, models, and faculty. Regarding the construction of teaching resources, it is necessary to create a virtual-real integrated ideological and political education resource system adapted to the characteristics of engineering majors. This involves developing targeted virtual simulation ideological and political education cases based on core engineering courses, focusing on materials such as responsibility education in engineering safety regulations, patriotism education in major engineering construction, and innovative spirit education in engineering technology innovation. Simultaneously, it is crucial to systematically integrate ideological and political elements from real engineering cases, constructing a three-dimensional “virtual + real” ideological and political education resource library to effectively improve the adaptability and relevance of resources. In terms of innovative teaching models, it is essential to break through the limitations of traditional classroom teaching and construct an integrated teaching model of “virtual simulation exercises + real-world job practice + ideological and political thematic discussions.” Through virtual simulation scenarios, students can intuitively understand the connotations of ideological and political education; through real-world job practice, students can practice ideological and political requirements; and through ideological and political thematic discussions, students can deepen their value cognition, achieving “integration of learning, thinking, and application; unity of knowledge, belief, and action.” In terms of faculty development, we will strengthen the improvement of teachers’ comprehensive qualities, carry out special training on the integration of virtual and

real technologies with ideological and political education, improve teachers' technical application capabilities and ideological and political education level, and encourage teachers to conduct in-depth research in enterprises to explore ideological and political materials in engineering practice, so as to promote the transformation of teachers from "professional teachers" to "ideological and political + professional" compound teachers.

## 4.2 Supporting Safeguards

To ensure the smooth implementation and long-term operation of this teaching paradigm, a comprehensive and multi-layered support system needs to be constructed, providing strong support from three dimensions: institutional, technological, and collaborative. At the institutional level, a sound management system for the virtual-real integration of ideological and political education should be established, clarifying teaching requirements, assessment standards, and incentive mechanisms. Virtual-real integration ideological and political education should be incorporated into the teacher assessment and teaching evaluation system to fully stimulate teachers' enthusiasm and initiative, and promote the standardization and normalization of the teaching paradigm. At the technological level, investment in virtual-real integration technology and equipment should be increased, the construction of the virtual simulation teaching platform should be improved, and the platform's stability and usability should be optimized. Simultaneously, a professional technical service team should be established to provide comprehensive technical support for teaching implementation and promptly resolve various problems encountered by teachers in the application of technology. At the collaborative level, in-depth cooperation between schools and enterprises and industry associations should be strengthened. High-quality enterprise resources should be introduced to participate in ideological and political education, and enterprise technical backbones and industry model workers should be invited to the classroom to share their stories of ideological and political education and professional insights from the front lines of engineering, achieving collaborative education between schools and enterprises, further enhancing the relevance and effectiveness of teaching, and providing solid practical support for the implementation of the teaching paradigm.

## 5. Conclusion and Outlook

### 5.1 Research Conclusions

This paper focuses on the teaching dilemmas of "comprehensive ideological and political education" in vocational engineering departments under a virtual-real integration environment. Through systematic analysis and practical exploration, it constructs a teaching paradigm of "three layers, two contexts, and one evaluation," clarifying the core principles, core concepts, educational goals, and overall framework of the paradigm construction, and proposing corresponding implementation paths and safeguard measures. Research shows that this teaching paradigm can effectively break down the barriers between ideological and political education and engineering professional teaching, achieving the coordinated advancement of value guidance, skills training, and quality improvement through virtual-real integration technology. It effectively solves the current problems in the teaching of "comprehensive ideological and political education" in vocational engineering departments, such as insufficient coordination, monotonous forms, and poor resource adaptability. It provides a practical solution that can be learned from and promoted for the construction of "comprehensive ideological and political education" in vocational engineering majors, and has important practical significance for promoting the high-quality development of "comprehensive ideological and political education" in vocational engineering departments and improving the quality of technical and skilled personnel training.

### 5.2 Research Prospects

With the continuous iteration of virtual-real integration technology and the ongoing development of higher vocational education, the teaching paradigm of "comprehensive ideological and political education" in higher vocational engineering departments still needs continuous optimization and improvement. Future research can further explore the deep integration of cutting-edge technologies such as artificial intelligence and big data with the teaching paradigm, utilizing technological means to achieve precise delivery of teaching content and personalized guidance in the teaching process, thereby enhancing the level of intelligent teaching. Simultaneously, considering the specific characteristics of different engineering majors (such as civil engineering, mechanical engineering, and electrical engineering), the implementation details of the paradigm should be refined to enhance its professional adaptability. Furthermore, cross-institutional and cross-regional cooperation and

exchange can be strengthened to summarize and promote excellent practical experiences in virtual-real integration ideological and political education, thereby promoting the overall improvement of the teaching quality of “comprehensive ideological and political education” in higher vocational engineering departments and providing stronger support for the implementation of the fundamental task of cultivating morality and talent in vocational education.

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## Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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