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Research on the Integration Path of Ideological and Political Education into the Artificial Intelligence Course of Mechanical Engineering Empowered by Domestic DeepSeek

Yu Zhu*

School of Mechanical Engineering, University of Shanghai for Science and Technology, Shanghai, 200093, China
**Corresponding author: jxzhuyu@usst.edu.cn*

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Abstract: Against the dual backdrop of the rapid development of artificial intelligence technology and the increasingly urgent national strategic demand for self-reliance and self-improvement in science and technology, the *Artificial Intelligence* course for mechanical engineering majors undertakes the dual mission of imparting technical knowledge and shaping value identity. Taking DeepSeek, a domestically independent artificial intelligence tool, as the teaching starting point, this paper systematically explores the implementation paths for integrating ideological and political elements such as self-reliance and self-improvement in science and technology and independent innovation into the *Artificial Intelligence* course of mechanical engineering. The study proposes a three-stage integration model of "Technical Tool Selection - Ideological and Political Element Mapping - Teaching Design Integration" and combines typical teaching cases such as mechanical fault diagnosis and intelligent optimal design to deeply analyze the unique value of DeepSeek in carrying the function of ideological and political education. The research shows that guiding students to use domestic large models to complete the development of AI applications in the mechanical field can subtly enhance students' national pride and the awareness of serving the country through science and technology in technical learning, realizing the organic integration of knowledge imparting, ability training, and value guidance. This paper aims to provide theoretical reference and a practical paradigm for the in-depth integration of artificial intelligence teaching and curriculum ideological and political education in mechanical engineering-related professional courses.

1. Introduction

1.1. Research Background and Problem Statement

At present, artificial intelligence technology is reshaping the development pattern of all walks of

life with an unprecedented depth and breadth. In the manufacturing industry, the widespread application of technologies such as intelligent equipment, industrial internet, and digital twin has put forward brand-new requirements for the knowledge structure and competency quality of mechanical engineering talent. Meanwhile, the country's strategic demand for self-reliance and self-improvement in science and technology is becoming increasingly urgent, and the problem of "bottleneck restrictions" where core technologies are controlled by others has become a key bottleneck restricting industrial upgrading. Against this background, the *Artificial Intelligence* course for mechanical engineering majors not only undertakes the task of imparting technical knowledge but also shoulders the important mission of cultivating high-quality talents with national pride and the awareness of serving the country through science and technology.

As an important measure for higher education in the new era to implement the fundamental task of fostering virtue through education, curriculum ideological and political education requires all professional courses to integrate value guidance into knowledge imparting. However, the current artificial intelligence teaching in mechanical engineering majors generally has the problems of "emphasizing technology over values" and "focusing on application over identity." Students have a strong sense of dependence on foreign technology platforms, and their cognition and recognition of domestically independent technologies are relatively weak. The practice of the School of Mechanical and Electrical Engineering of Lingnan Normal University shows that combining the technological innovation and breakthroughs of DeepSeek to guide students to understand the development trend of China's artificial intelligence industry and strengthen the sense of responsibility in fields such as intelligent manufacturing and robot technology is crucial for cultivating young scientific and technological talents [1].

As a representative of domestic independent large models, DeepSeek provides a unique teaching starting point to solve the above predicaments. Jiangxi University of Science and Technology officially launched the university-level public elective course *DeepSeek Technology and Application* in the spring semester of 2025, becoming the first AI general education course in China focusing on the deep integration of domestic large models and the mining and metallurgical machinery industry, which reflects the active exploration of the new track of "AI + characteristic industries" [2]. Based on the actual teaching of mechanical engineering majors, this study systematically explores the effective path to realize the deep integration of technical teaching and ideological and political education in the *Artificial Intelligence* course with DeepSeek as the carrier.

1.2. Research Significance

The theoretical significance of this study lies in three aspects: first, constructing a three-stage integration model of "Technical Tool - Ideological and Political Element - Teaching Design" for mechanical engineering majors, enriching the methodological system of curriculum ideological and political education; second, exploring the unique mechanism of domestically independent technical tools in value guidance and revealing the internal correlation between technical identity and value identity; third, promoting the in-depth integration of artificial intelligence education and engineering ethics education and expanding the theoretical vision of professional curriculum ideological and political education.

Its practical value is reflected in providing operable implementation paths for mechanical engineering teachers to carry out ideological and political education in the *Artificial Intelligence* course; offering case references for similar courses to select domestic technology platforms for teaching; and providing teaching support for cultivating compound engineering and technical talents with the feelings of serving the country through science and technology.

2. Theoretical Construction of the Three-Stage Integration Model

2.1. Technical Tool Selection: The Unique Value of DeepSeek

As a domestically independent large model, DeepSeek has irreplaceable teaching value in the *Artificial Intelligence* course of mechanical engineering. From a technical perspective, DeepSeek has core functions such as natural language processing, code generation and programming assistance, and multi-modal data processing, which can support typical application scenarios in the mechanical field such as intelligent diagnosis, optimal design, and production line data processing and visualization. From the perspective of ideological and political education, the domestic independent attribute of DeepSeek makes it naturally carry the value connotation of self-reliance and self-improvement in science and technology, becoming a vivid teaching material to guide students to understand the country's scientific and technological strength and enhance national pride.

Professor Gong Manfeng from Lingnan Normal University, in the first ideological and political lesson, *Scientific and Technological Confidence and Engineering Mission in the Wave of Artificial Intelligence*, took the technological innovation and breakthroughs of DeepSeek as the starting point, analyzed the rapid development trend of China's artificial intelligence industry, guided students to understand the wide application of artificial intelligence in fields such as intelligent manufacturing, robot technology, and new energy, and integrated personal ideal pursuit into the overall national development [1]. This natural fit of "technology as ideological and political education" is irreplaceable by other foreign technology platforms.

2.2. Ideological and Political Element Mapping: The Transformation Mechanism from Technology to Value

Transforming the technical characteristics of DeepSeek into teachable ideological and political elements requires the establishment of a systematic mapping mechanism. Chen Junjie, vice dean of the School of Mechanical and Electrical Engineering of Jiangxi University of Science and Technology, pointed out that it is necessary to build a complete ecological chain from technological research and development to talent delivery so that more AI solutions with the warmth of "red soil" can walk out of the laboratory [2]. This concept enlightens us that the excavation of ideological and political elements can be carried out from the following dimensions:

Independent innovation dimension: The technological breakthroughs of DeepSeek themselves are vivid cases of independent innovation. In teaching, students can be guided to compare the similarities and differences between domestic large models and international mainstream technologies, understand China's technological accumulation and innovation capabilities in the field of artificial intelligence, and enhance scientific and technological confidence.

Industry serving the country dimension: The application of DeepSeek in fields such as mining and metallurgical machinery and intelligent manufacturing directly serves the national strategy of the transformation and upgrading of traditional industries.

Security and controllability dimension: The independent and controllable core technology is related to national security. Through the use of DeepSeek, students are guided to think about the profound truth that key technologies "cannot be begged, bought, or taken" and establish a sense of responsibility to safeguard national scientific and technological security.

2.3. Teaching Design Integration: A Trinity Integration Path

On the basis of technical tool selection and ideological and political element mapping, elaborate teaching design is needed to realize the organic integration of the two. The practice of The Open

University of Fujian has proposed the "four AI thinking abilities" -integration ability, guidance ability, judgment ability, and innovation ability -to help teachers integrate AI technology into teaching design and curriculum ideological and political education [3]. Drawing on this idea, this paper proposes a trinity integration path of "goal - content - method":

Integration of teaching objectives: Write ideological and political objectives clearly into the syllabus so that students can achieve a valuable identity of self-reliance and self-improvement in science and technology while learning technical knowledge. It can be specifically expressed as enhancing national pride and the awareness of serving the country through science and technology through the learning and application of the domestic large model DeepSeek.

Integration of teaching content: Integrate ideological and political elements into each teaching module organically, rather than attaching them rigidly. For example, when learning neural networks, introduce China's independent innovation achievements in the field of deep learning; when explaining model optimization, connect the technological breakthrough process of domestic large models.

Integration of teaching methods: Adopt diverse methods such as project-driven teaching, case teaching, and flipped classroom to make ideological and political education integrate naturally into the technical learning process. The practice of Shijiazhuang University shows that generating ideological and political teaching plans in line with professional characteristics for different majors using generative artificial intelligence can effectively guide students to integrate ideological and political theories with professional practice [4]. Table 1 summarizes the DeepSeek integration model for the *Artificial Intelligence* course.

Table 1: The Three-Stage Integration Model of Ideological and Political Education in the Artificial Intelligence Course of Mechanical Engineering.

Integration Stage	**Core Task**	**Specific Content**	**Ideological and Political Mapping Point**	**Teaching Carrier**
Stage 1: Technical Tool Selection.	Establish teaching platform.	Domestic large model DeepSeek.	Independent innovation, technological confidence.	Model introduction, function demonstration.
Stage 2: Ideological and Political Element Mapping.	Excavate value connotation.	Independent innovation, industry serving the country, security and controllability.	Self-reliance and self-improvement in science and technology, patriotism.	Case analysis, special seminar.
Stage 3: Teaching Design Integration.	Realize organic integration.	Goal integration, content integration, method integration.	Value guidance, ability training.	Project practice, classroom interaction.

3. Teaching Case Design and Implementation

3.1. Case 1: Intelligent Diagnosis of Mechanical Faults Based on DeepSeek

Teaching Background: Mechanical fault diagnosis is an important module of machine learning applications in the *Artificial Intelligence* course. Traditional teaching mostly adopts foreign public data sets and open-source frameworks. Although students can master technical methods, they have insufficient understanding of the industrial background and national needs behind the technology.

Teaching Design: Taking mining machinery as the application scenario, this case draws on the design concept of the real industrial case of "intelligent diagnosis of mining equipment" from

Jiangxi University of Science and Technology [2]. The teaching is divided into three stages (as shown in Figure 1):

The first stage is "problem introduction." Teachers present the actual problem of bearing faults in mine crushers and guide students to think, "What risks may be faced if relying on foreign diagnosis systems when key technologies are restricted?" Through discussion, students initially establish the awareness of technical independence and controllability.

The second stage is "technical practice." Students use the DeepSeek platform to train fault diagnosis models based on the provided vibration data. In this process, teachers guide students to compare the similarities and differences between DeepSeek and foreign platforms and understand the distinctive advantages of domestic large models in industrial scene understanding and feature extraction.

The third stage is "value sublimation." Organize students to discuss: What is the significance of the research and development of domestic intelligent diagnosis systems for the independent guarantee of China's mining equipment? Through discussion, students elevate technical learning to the height of serving the country through industry.

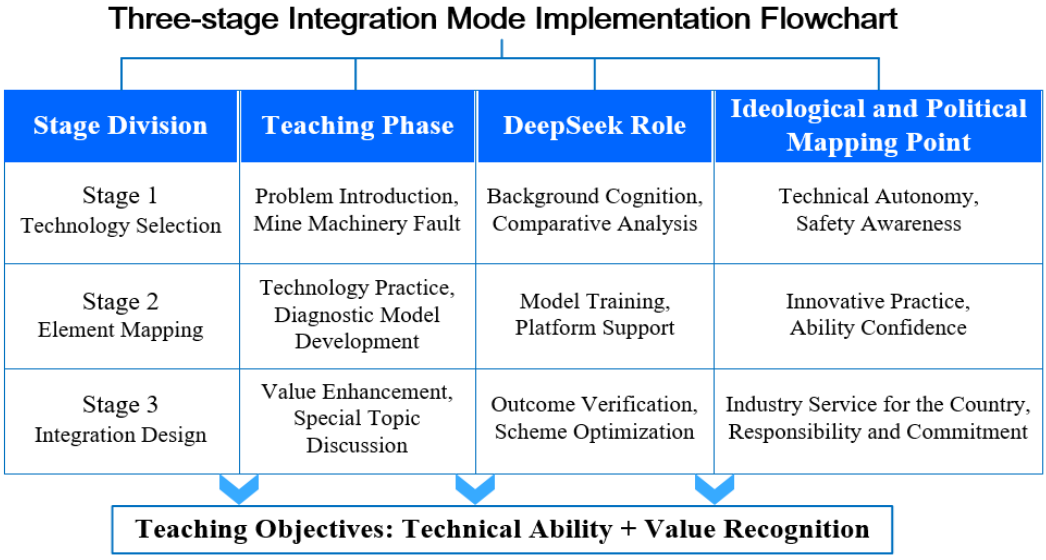

Figure 1: Implementation Process of the Three-Stage Integration Model in the Case of Mechanical Fault Diagnosis.

3.2. Case 2: DeepSeek-Driven Intelligent Optimal Design of Mechanical Structures

Teaching Background: Intelligent optimal design is a cutting-edge interdisciplinary field of mechanical engineering and artificial intelligence. In traditional teaching, students often focus on the algorithm itself and have insufficient understanding of the engineering constraints and value considerations behind the optimization results.

Teaching Design: Taking lightweight design as the task, this case guides students to use DeepSeek for structural optimization. The following ideological and political elements are integrated into the teaching:

First, the cultivation of innovation confidence. Teachers introduce China's development process from following to keeping pace and then leading in the field of structural optimization, especially the breakthroughs of domestic industrial software in some fields, to enhance students' innovation confidence. As emphasized by Lingnan Normal University, it is necessary to guide students to strengthen the sense of responsibility in the interdisciplinary integrated development and constantly

burst out the "scientific and technological inspiration" belonging to young people in the era of reform and innovation [1].

Second, the infiltration of engineering ethics. Optimal design needs to seek a balance between weight reduction effect, manufacturing cost, and safety margin. Through multiple optimization schemes generated by DeepSeek, students are guided to discuss the engineering rationality of different schemes and understand the social responsibility of engineers for public safety.

Third, the guidance of green development. Lightweight design has important value for energy conservation and emission reduction. In teaching, students are guided to understand the environmental impact of the whole life cycle of mechanical products, establish the concept of green design, and integrate personal professional development into the overall situation of ecological civilization construction.

3.3. Case 3: Virtual Commissioning of Digital Twin Production Lines Empowered by DeepSeek

Teaching Background: Digital twin is one of the core technologies of intelligent manufacturing. As an important application of digital twins, virtual commissioning is of great significance for improving production line commissioning efficiency and reducing R&D costs.

Teaching Design: This case is based on the construction experience of the intelligent course of the *Theory of Machines and Mechanisms* at Zhengzhou University of Light Industry. The course has built a teaching system of "knowledge graph + task engine + AI application + new empowerment of DeepSeek," connecting the knowledge points of the whole course through real engineering cases to cultivate students' ability to solve complex mechanical engineering problems [5].

In teaching, students are divided into groups to complete the virtual commissioning task of a simple automated production line. DeepSeek plays multiple roles in this process: code generation assists in writing PLC programs, natural language interaction helps understand equipment manuals, and multi-modal data processing realizes visual analysis of production line data.

The integration of ideological and political education is reflected in three levels: first, through the application of large domestic models, students understand the development potential of China in the field of industrial software; second, through team cooperation, cultivate students' craftsman spirit of striving for perfection; third, through production line efficiency analysis, guide students to establish the awareness of industrial civilization of resource conservation and efficiency priority. Discussions at Ocean University of China point out that education and teaching in the AI era are developing from the dual relationship of "teacher - student" to the tripartite relationship of "teacher - AI - student," and this new teaching relationship provides more abundant interactive possibilities for ideological and political education [6].

4. Implementation Effects and Key Supports

4.1. Students' Gains and Changes

Through the implementation of the above teaching cases, students have achieved growth in multiple dimensions. At the technical level, students have mastered the ability of AI application development based on domestic large models and can apply DeepSeek to solve practical problems in the mechanical field. The experience of Yi Guotao, a student from Jiangxi University of Science and Technology, is representative: in the intelligent mineral processing shaking table project, the optimization exploration of equipment control parameters with the help of DeepSeek's deep learning ability and intelligent optimization algorithm effectively improved the mineral processing

efficiency of the equipment [2].

At the cognitive level, students' recognition of domestic technologies has been significantly enhanced. From the initial mindset of "foreign platforms are easier to use," they gradually recognize the distinctive advantages and rapid development trend of domestic large models in specific fields, and scientific and technological confidence is established.

At the value level, students' professional identity and social responsibility have been strengthened. By connecting technical learning with industrial needs and national strategies, students begin to think about the question of "what can I do for the country" and integrate personal growth into the overall situation of the development of the times.

4.2. Teachers' Competency Requirements

The implementation of curriculum ideological and political education teaching empowered by DeepSeek puts forward new competency requirements for teachers. Teachers need to cultivate the "four AI thinking abilities" - integration ability, guidance ability, judgment ability, and innovation ability [3].

Integration ability is reflected in the ability to organically integrate the technical characteristics of DeepSeek with ideological and political elements and design teaching plans that both impart knowledge and guide values. Generative artificial intelligence can assist teachers in completing curriculum planning, activity design, learning path planning, and evaluation scheme formulation and also create inquiry-based questions and prompts to build innovative evaluation ideas.

Guidance ability is reflected in the ability to naturally guide students to think about value issues in technical teaching rather than rigid preaching. Taking the technological innovation of DeepSeek as the starting point to guide students to integrate personal ideals into the overall national development demonstrates excellent classroom guidance art.

Judgment ability is reflected in the ability to accurately identify the opportunities for ideological and political education in technical teaching and grasp the timing and propriety of integrating ideological and political education.

Innovation ability is reflected in the ability to continuously explore new methods and paths for the deep integration of AI technology and curriculum ideological and political education.

4.3. Institutional Guarantee Conditions

The effective implementation of curriculum ideological and political education requires institutional guarantees at the university level. The experience of Jiangxi University of Science and Technology shows that relying on the advantages of engineering technology research centers, co-building joint laboratories with leading enterprises in the industry, and building a complete ecological chain from technological research and development to talent delivery can provide continuous support for curriculum reform [2].

Specifically, universities can provide support in the following aspects: first, incorporate curriculum ideological and political education into the teacher development training system and organize special seminars and experience exchanges; second, set up curriculum ideological and political education teaching reform projects to encourage teachers to carry out innovative practices; third, build an AI teaching platform to provide technical support for the application of domestic tools such as DeepSeek; and fourth, establish a school-enterprise cooperation mechanism and introduce real industrial cases to enrich teaching resources.

5. Challenges and Prospects

5.1. Main Current Challenges

Although a DeepSeek-empowered curriculum ideological and political education shows a good prospect, there are still multiple challenges in practice.

From a technical perspective, the performance of domestic large models in specific fields still lags behind the advanced foreign level, which may affect students' user experience. Teachers need to guide students to view the gap rationally and transform the desire for technical improvement into motivation to engage in independent innovation.

From the teachers' perspective, some teachers have insufficient proficiency in AI technology and in-depth understanding of curriculum ideological and political education, making it difficult to achieve the organic integration of technology and values. In the AI era, the majority of teachers need to open their minds, learn actively, and give full play to the positive role of artificial intelligence tools.

From the evaluation perspective, the effect of curriculum ideological and political education is difficult to measure and assess quantitatively, and the effect of value guidance has the characteristics of lag and implicitness. How to scientifically evaluate the teaching effect remains an unsolved problem.

5.2. Future Development Directions

Looking forward to the future, the integration of ideological and political education into the *Artificial Intelligence* course of mechanical engineering empowered by DeepSeek can be further deepened and expanded in the following directions.

Curriculum system expansion: Universities should promote the application of DeepSeek from a single course to a broader professional course group, thereby building an AI-empowered ideological and political education system that covers core specialized courses. For example, Jiangxi University of Science and Technology plans to co-establish a "Mining and Metallurgical Machinery Large Model Joint Laboratory" with leading enterprises to continuously deepen the curriculum reform of "AI + mining and metallurgical machinery" [2].

Teaching resource sharing: It is essential to build a DeepSeek teaching case database that gathers typical practices from various universities, forming replicable and scalable teaching resources. The Theory of Machines and Mechanisms course at Zhengzhou University of Light Industry has already developed 154 extended resources, including engineering cases, disciplinary frontier cases, and curriculum ideological and political education cases [5].

Evaluation mechanism innovation: Universities should explore a curriculum ideological and political education effect evaluation method that combines formative evaluation and developmental evaluation, and incorporate students' technical application ability and value identity level into the comprehensive evaluation system.

School-enterprise collaborative education: Universities will deepen cooperation with DeepSeek developers and leading enterprises in the industry, transform cutting-edge industrial needs into teaching cases, and enable students to deepen their technical understanding and value identity while solving real-world problems.

6. Conclusions

Taking DeepSeek, a domestically independent artificial intelligence tool, as the starting point, this paper systematically explores the implementation paths for integrating ideological and political

elements such as self-reliance and self-improvement in science and technology and independent innovation into the *Artificial Intelligence* course of mechanical engineering. The study proposes a three-stage integration model of "Technical Tool Selection - Ideological and Political Element Mapping - Teaching Design Integration" and demonstrates the unique value of DeepSeek in carrying the function of ideological and political education by combining typical teaching cases such as mechanical fault diagnosis, intelligent optimal design, and virtual commissioning of digital twin production lines. The research shows that as a representative of domestic large models, DeepSeek's independent and controllable technical attribute naturally fits the ideological and political connotation of self-reliance and self-improvement in science and technology. Guiding students to use DeepSeek to complete the development of AI applications in the mechanical field can not only enable students to master cutting-edge technical methods but also subtly enhance their national pride and the awareness of serving the country through science and technology in technical practice.

Looking forward to the future, with the rapid development of artificial intelligence technology and the continuous iteration of domestic large models, the application space of DeepSeek in mechanical engineering education will be further expanded. As mechanical engineering educators, we should embrace technological changes with an open mind, grasp value guidance with a prudent attitude, explore integration paths with an innovative spirit, make domestic AI tools truly an effective carrier for cultivating high-quality engineering and technical talents with patriotism and innovation capabilities, and contribute educational strength to serving the national strategy of self-reliance and self-improvement in science and technology.

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